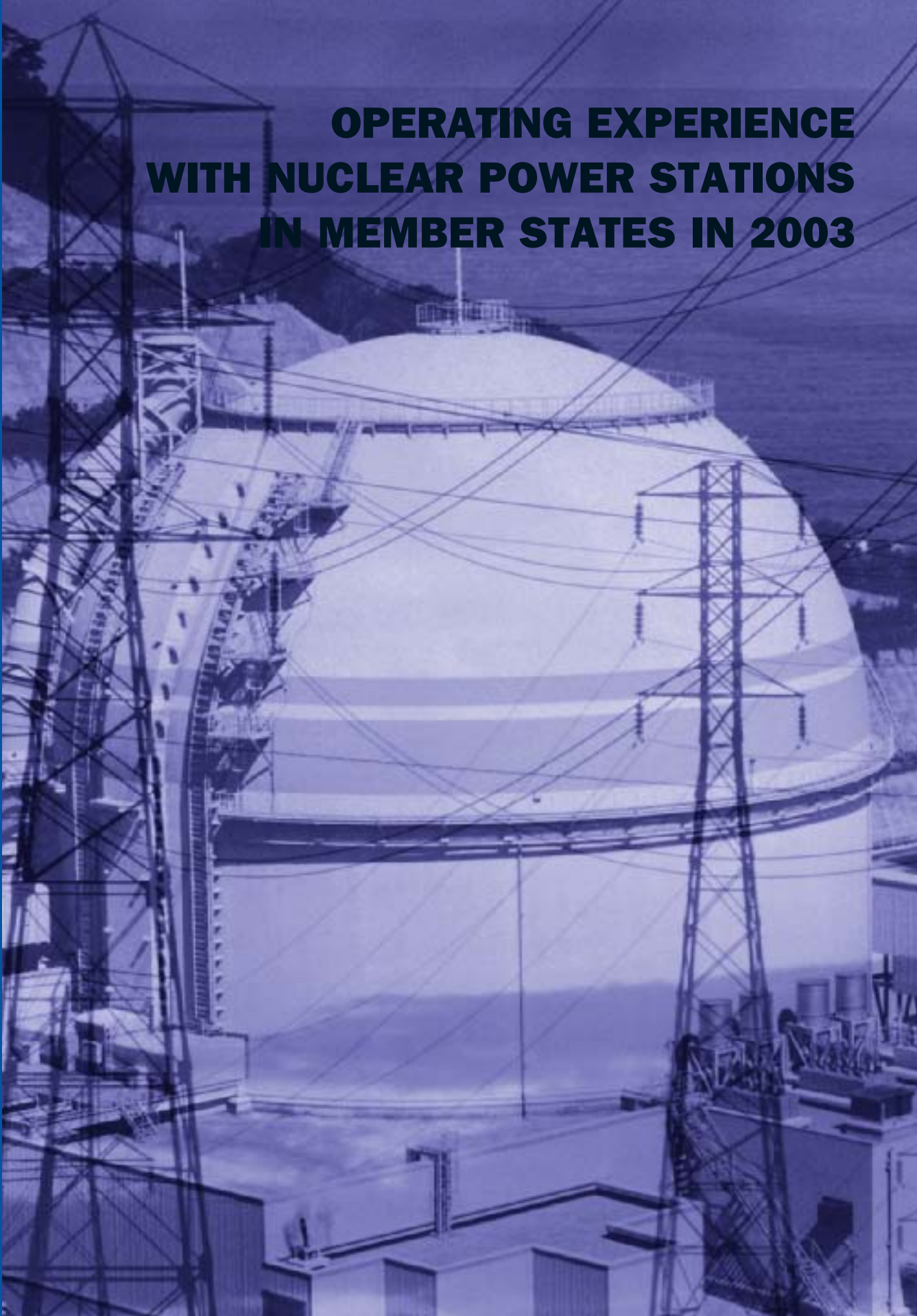




**IAEA**

International Atomic Energy Agency

**OPERATING EXPERIENCE  
WITH NUCLEAR POWER STATIONS  
IN MEMBER STATES IN 2003**



OPERATING EXPERIENCE  
WITH NUCLEAR POWER STATIONS  
IN MEMBER STATES IN 2003

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ERITREA	MOROCCO	VIETNAM
ESTONIA	MYANMAR	YEMEN
ETHIOPIA	NAMIBIA	ZAMBIA
FINLAND	NETHERLANDS	ZIMBABWE
FRANCE	NEW ZEALAND	
GABON	NICARAGUA	
GEORGIA	NIGER	
GERMANY	NIGERIA	
GHANA	NORWAY	
GREECE	PAKISTAN	
	PANAMA	
	PARAGUAY	

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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## FOREWORD

This report is the thirty-fifth 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 five figures illustrating worldwide performance and statistical data.

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.

Director  
Division of Nuclear Power  
International Atomic Energy Agency  
Wagramer Strasse 5, P. O. Box 100  
A-1400 Vienna, Austria



## CONTENTS

1.	Introduction .....	9
2.	Nuclear power station units in Member States .....	11
3.	Definitions .....	19
4.	Figures .....	27
5.	Abbreviations .....	31
6.	Data sheets on individual nuclear power station units .....	37





# 1. INTRODUCTION

This report is the thirty-fifth in the Agency's series of annual reports on operating experience with nuclear power stations in Member States.

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 1971 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 two services: PRIS-PC, MicroPRIS and PRIS CD-ROM. The PRIS-PC allows direct access to the database through the Internet. The MicroPRIS contains a subset of the PRIS database and is available in a form readily accessible by standard, commercially available personal computer packages. Since 1999 the IAEA offers PRIS on CD-ROM version. The PRIS-PC on CD-ROM only includes data for reactors in operation, under construction and shutdown. It keeps the same feature as in the current front-end-tool PRIS-PC interface. This front-end-tool interface allows to search and query through pre-designed statistics. The PRIS-PC on CD-ROM contains mapping interface including a view of the world map with zooming features to country, region and site map and links to PRIS database to retrieve related (nuclear power plant) information. PRIS is also available in the Internet at <http://www.iaea.org/programmes/a2>.

Load, operation and availability factors are used as the basic performance factors. Energy unavailability factors, separate for planned and unplanned unavailability, due either to causes in the plant or causes external to the plant, 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 with relation to a maximum capacity which may change several times during the year. In addition, there are different practices in reporting planned and unplanned unavailability among Member States. The unavailability factors in this report should therefore be used with caution. 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 3. In Section 4 this report presents figures illustrating worldwide performance indicators up to 2003.

According to the information available to the Agency at the end of 2003, there were 439 nuclear power reactors operating in the world, with a total net capacity of 361.09 GW(e).

During 2003, two new reactors having a total capacity of 1625 MW(e) were connected to the grid in China and in the Republic of Korea. There were 31 nuclear power plants under construction in the world.

The information contained in the report was made available to the Agency through designated national correspondents, the Statistical Office of the European Commission (EC) and the US Nuclear Regulatory Commission (NRC) and Department of Energy (DOE). According to an agreement on co-ordination and collaboration, the EC has the responsibility of collecting operating experience reports from nuclear reactor operators in EC Member States and supplying this information to the Agency. For information on reactors operating in the USA, the Agency receives on an annual basis, through an arrangement with the USDOE and NRC, the computer version of the Licensed Operating Reactor Status Summary Report.

The Agency appreciates the valuable assistance that it has obtained from the USDOE, NRC, the EC, national authorities, official correspondents and various electrical utilities in gathering the information for this report.

This publication includes information received by the Agency up to 30 June 2004. Information received after that date, although not included in this publication, is available in the PRIS database.

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 with nuclear power reactors. Suggestions and corrections from readers would be most welcome.

## 2. NUCLEAR POWER STATION UNITS IN MEMBER STATES (as of January 2004)

Country Name	Reactor Code	Reactor Name	Page	
ARGENTINA	AR—1	ATUCHA-1	35	
	AR—2	EMBALSE	37	
ARMENIA	AM—19	ARMENIA-2	39	
BELGIUM	BE—2	DOEL-1	41	
	BE—4	DOEL-2	43	
	BE—5	DOEL-3	45	
	BE—7	DOEL-4	47	
	BE—3	TIHANGE-1	49	
	BE—6	TIHANGE-2	51	
	BE—8	TIHANGE-3	53	
BRAZIL	BR—1	ANGRA-1	55	
	BR—2	ANGRA-2	57	
BULGARIA	BG—3	KOZLODUY-3	59	
	BG—4	KOZLODUY-4	61	
	BG—5	KOZLODUY-5	63	
	BG—6	KOZLODUY-6	65	
CANADA	CA—10	BRUCE-3		
	CA—11	BRUCE-4		
	CA—18	BRUCE-5		
	CA—19	BRUCE-6		
	CA—20	BRUCE-7		
	CA—21	BRUCE-8		
	CA—22	DARLINGTON-1	67	
	CA—23	DARLINGTON-2	69	
	CA—24	DARLINGTON-3	71	
	CA—25	DARLINGTON-4	73	
	CA—12	GENTILLY-2	75	
	CA—7	PICKERING-4	77	
	CA—13	PICKERING-5	79	
	CA—14	PICKERING-6	81	
	CA—15	PICKERING-7	83	
	CA—16	PICKERING-8	85	
	CA—17	POINT LEPREAU	87	
CHINA	CN—2	GUANGDONG-1	89	
	CN—3	GUANGDONG-2	91	
	CN—6	LINGAO 1	93	
	CN—7	LINGAO 2	95	
	CN—4	QINSHAN 2 - 1	97	
	CN—8	QINSHAN 3 - 1	99	
	CN—9	QINSHAN 3 - 2		
	CN—1	QINSHAN-1	101	
	(Including TAIWAN, CHINA)	TW—1	CHIN SHAN-1	103
		TW—2	CHIN SHAN-2	105
		TW—3	KUOSHENG-1	107
		TW—4	KUOSHENG-2	109
		TW—5	MAANSHAN-1	111
TW—6		MAANSHAN-2	113	

Country Name	Reactor Code	Reactor Name	Page
CZECH REPUBLIC	CZ—4	DUKOVANY-1	115
	CZ—5	DUKOVANY-2	117
	CZ—8	DUKOVANY-3	119
	CZ—9	DUKOVANY-4	121
	CZ—23	TEMELIN-1	123
	CZ—24	TEMELIN-2	
FINLAND	FI—1	LOVIISA-1	125
	FI—2	LOVIISA-2	127
	FI—3	OLKILUOTO-1	129
	FI—4	OLKILUOTO-2	131
FRANCE	FR—54	BELLEVILLE-1	133
	FR—55	BELLEVILLE-2	135
	FR—32	BLAYAIS-1	137
	FR—33	BLAYAIS-2	139
	FR—34	BLAYAIS-3	141
	FR—35	BLAYAIS-4	143
	FR—13	BUGEY-2	145
	FR—14	BUGEY-3	147
	FR—15	BUGEY-4	149
	FR—16	BUGEY-5	151
	FR—50	CATTENOM-1	153
	FR—53	CATTENOM-2	155
	FR—60	CATTENOM-3	157
	FR—65	CATTENOM-4	159
	FR—40	CHINON-B-1	161
	FR—41	CHINON-B-2	163
	FR—56	CHINON-B-3	165
	FR—57	CHINON-B-4	167
	FR—62	CHOOZ-B-1	169
	FR—70	CHOOZ-B-2	171
	FR—72	CIVAUX-1	173
	FR—73	CIVAUX-2	175
	FR—42	CRUAS-1	177
	FR—43	CRUAS-2	179
	FR—44	CRUAS-3	181
	FR—45	CRUAS-4	183
	FR—22	DAMPIERRE-1	185
	FR—29	DAMPIERRE-2	187
	FR—30	DAMPIERRE-3	189
	FR—31	DAMPIERRE-4	191
	FR—11	FESSENHEIM-1	193
	FR—12	FESSENHEIM-2	195
	FR—46	FLAMANVILLE-1	197
	FR—47	FLAMANVILLE-2	199
	FR—61	GOLFECH-1	201
	FR—68	GOLFECH-2	203
	FR—20	GRAVELINES-1	205
	FR—21	GRAVELINES-2	207
	FR—27	GRAVELINES-3	209
	FR—28	GRAVELINES-4	211
	FR—51	GRAVELINES-5	213
FR—52	GRAVELINES-6	215	
FR—58	NOGENT-1	217	
FR—59	NOGENT-2	219	
FR—36	PALUEL-1	221	
FR—37	PALUEL-2	223	
FR—38	PALUEL-3	225	
FR—39	PALUEL-4	227	

Country Name	Reactor Code	Reactor Name	Page
FRANCE	FR—63	PENLY-1	229
	FR—64	PENLY-2	231
	FR—10	PHENIX	
	FR—48	ST. ALBAN-1	233
	FR—49	ST. ALBAN-2	235
	FR—17	ST. LAURENT-B-1	237
	FR—23	ST. LAURENT-B-2	239
	FR—18	TRICASTIN-1	241
	FR—19	TRICASTIN-2	243
	FR—25	TRICASTIN-3	245
	FR—26	TRICASTIN-4	247
GERMANY	DE—12	BIBLIS-A (KWB A)	249
	DE—18	BIBLIS-B (KWB B)	251
	DE—32	BROKDORF (KBR)	253
	DE—13	BRUNSBUETTEL (KKB)	255
	DE—33	EMSLAND (KKE)	257
	DE—23	GRAFENRHEINFELD (KKG)	259
	DE—27	GROHNDE (KWG)	261
	DE—26	GUNDREMMINGEN-B (GUN-B)	263
	DE—28	GUNDREMMINGEN-C (GUN-C)	265
	DE—16	ISAR-1 (KKI 1)	267
	DE—31	ISAR-2 (KKI 2)	269
	DE—20	KRUJEMMEL (KKK)	271
	DE—15	NECKARWESTHEIM-1 (GKN 1)	273
	DE—44	NECKARWESTHEIM-2 (GKN 2)	275
	DE—5	OBRIGHEIM (KWO)	277
	DE—14	PHILIPPSBURG-1 (KKP 1)	279
	DE—24	PHILIPPSBURG-2 (KKP 2)	281
DE—10	STADE (KKS)		
DE—17	UNTERWESER (KKU)	283	
HUNGARY	HU—1	PAKS-1	285
	HU—2	PAKS-2	287
	HU—3	PAKS-3	289
	HU—4	PAKS-4	291
INDIA	IN—13	KAIGA-1	293
	IN—14	KAIGA-2	295
	IN—9	KAKRAPAR-1	297
	IN—10	KAKRAPAR-2	299
	IN—5	KALPAKKAM-1	301
	IN—6	KALPAKKAM-2	303
	IN—7	NARORA-1	305
	IN—8	NARORA-2	307
	IN—3	RAJASTHAN-1	309
	IN—4	RAJASTHAN-2	311
	IN—11	RAJASTHAN-3	313
	IN—12	RAJASTHAN-4	315
	IN—1	TARAPUR-1	317
	IN—2	TARAPUR-2	319
JAPAN	JP—20	FUGEN ATR	
	JP—5	FUKUSHIMA-DAIICHI-1	321
	JP—9	FUKUSHIMA-DAIICHI-2	323
	JP—10	FUKUSHIMA-DAIICHI-3	325
	JP—16	FUKUSHIMA-DAIICHI-4	327
	JP—17	FUKUSHIMA-DAIICHI-5	329
	JP—18	FUKUSHIMA-DAIICHI-6	331
	JP—25	FUKUSHIMA-DAINI-1	333
	JP—26	FUKUSHIMA-DAINI-2	335

Country Name	Reactor Code	Reactor Name	Page
JAPAN	JP—35	FUKUSHIMA-DAINI-3	337
	JP—38	FUKUSHIMA-DAINI-4	339
	JP—12	GENKAI-1	341
	JP—27	GENKAI-2	343
	JP—45	GENKAI-3	345
	JP—46	GENKAI-4	347
	JP—11	HAMAOKA-1	349
	JP—24	HAMAOKA-2	351
	JP—36	HAMAOKA-3	353
	JP—49	HAMAOKA-4	355
	JP—23	IKATA-1	357
	JP—32	IKATA-2	359
	JP—47	IKATA-3	361
	JP—33	KASHIWAZAKI KARIWA-1	363
	JP—39	KASHIWAZAKI KARIWA-2	365
	JP—52	KASHIWAZAKI KARIWA-3	367
	JP—53	KASHIWAZAKI KARIWA-4	369
	JP—40	KASHIWAZAKI KARIWA-5	371
	JP—55	KASHIWAZAKI KARIWA-6	373
	JP—56	KASHIWAZAKI KARIWA-7	375
	JP—4	MIHAMA-1	377
	JP—6	MIHAMA-2	379
	JP—14	MIHAMA-3	381
	JP—15	OHI-1	383
	JP—19	OHI-2	385
	JP—50	OHI-3	387
	JP—51	OHI-4	389
	JP—22	ONAGAWA-1	391
	JP—54	ONAGAWA-2	393
	JP—57	ONAGAWA-3	395
	JP—28	SENDAI-1	397
	JP—37	SENDAI-2	399
	JP—48	SHIKA-1	401
	JP—7	SHIMANE-1	403
	JP—41	SHIMANE-2	405
	JP—8	TAKAHAMA-1	407
	JP—13	TAKAHAMA-2	409
	JP—29	TAKAHAMA-3	411
	JP—30	TAKAHAMA-4	413
	JP—21	TOKAI-2	415
	JP—43	TOMARI-1	417
JP—44	TOMARI-2	419	
JP—3	TSURUGA-1	421	
JP—34	TSURUGA-2	423	
KOREA, REPUBLIC OF	KR—1	KORI-1	425
	KR—2	KORI-2	427
	KR—5	KORI-3	429
	KR—6	KORI-4	431
	KR—9	ULCHIN-1	433
	KR—10	ULCHIN-2	435
	KR—13	ULCHIN-3	437
	KR—14	ULCHIN-4	439
	KR—3	WOLSONG-1	441
	KR—4	WOLSONG-2	443
	KR—15	WOLSONG-3	445
KR—16	WOLSONG-4	447	
KR—7	YONGGWANG-1	449	
KR—8	YONGGWANG-2	451	
KR—11	YONGGWANG-3	453	

Country Name	Reactor Code	Reactor Name	Page	
KOREA, REPUBLIC OF	KR—12	YONGGWANG-4	455	
	KR—17	YONGGWANG-5	457	
	KR—18	YONGGWANG-6	459	
LITHUANIA, REPUBLIC OF	LT—46	IGNALINA-1	461	
	LT—47	IGNALINA-2	463	
MEXICO	MX—1	LAGUNA VERDE-1	465	
	MX—2	LAGUNA VERDE-2	467	
NETHERLANDS	NL—2	BORSSELE	469	
PAKISTAN	PK—2	CHASNUPP 1	471	
	PK—1	KANUPP	473	
ROMANIA	RO—1	CERNAVODA-1	475	
RUSSIAN FEDERATION	RU—96	BALAKOVO-1	477	
	RU—97	BALAKOVO-2	479	
	RU—98	BALAKOVO-3	481	
	RU—99	BALAKOVO-4	483	
	RU—21	BELOYARSKY-3(BN-600)	485	
	RU—141	BILIBINO UNIT A	487	
	RU—142	BILIBINO UNIT B	489	
	RU—143	BILIBINO UNIT C	491	
	RU—144	BILIBINO UNIT D	493	
	RU—30	KALININ-1	495	
	RU—31	KALININ-2	497	
	RU—12	KOLA-1	499	
	RU—13	KOLA-2	501	
	RU—32	KOLA-3	503	
	RU—33	KOLA-4	505	
	RU—17	KURSK-1	507	
	RU—22	KURSK-2	509	
	RU—38	KURSK-3	511	
	RU—39	KURSK-4	513	
	RU—15	LENINGRAD-1	515	
	RU—16	LENINGRAD-2	517	
	RU—34	LENINGRAD-3	519	
	RU—35	LENINGRAD-4	521	
	RU—9	NOVOVORONEZH-3	523	
	RU—11	NOVOVORONEZH-4	525	
	RU—20	NOVOVORONEZH-5	527	
	RU—59	ROSTOV-1	529	
	RU—23	SMOLENSK-1	531	
	RU—24	SMOLENSK-2	533	
	RU—67	SMOLENSK-3	535	
	SLOVAK REPUBLIC	SK—2	BOHUNICE-1	537
		SK—3	BOHUNICE-2	539
		SK—13	BOHUNICE-3	541
SK—14		BOHUNICE-4	543	
SK—6		MOCHOVCE-1	545	
SK—7		MOCHOVCE-2	547	
SLOVENIA	SI—1	KRSKO	549	
SOUTH AFRICA	ZA—1	KOEBERG-1	551	
	ZA—2	KOEBERG-2	553	



Country Name	Reactor Code	Reactor Name	Page
SPAIN	ES—6	ALMARAZ-1	555
	ES—7	ALMARAZ-2	557
	ES—8	ASCO-1	559
	ES—9	ASCO-2	561
	ES—10	COFRENTES	563
	ES—1	JOSE CABRERA-1(ZORITA)	565
	ES—2	SANTA MARIA DE GARONA	567
	ES—11	TRILLO-1	569
	ES—16	VANDELLOS-2	571
SWEDEN	SE—8	BARSEBECK-2	
	SE—9	FORSMARK-1	573
	SE—11	FORSMARK-2	575
	SE—14	FORSMARK-3	577
	SE—2	OSKARSHAMN-1	579
	SE—3	OSKARSHAMN-2	581
	SE—12	OSKARSHAMN-3	583
	SE—4	RINGHALS-1	585
	SE—5	RINGHALS-2	587
	SE—7	RINGHALS-3	589
SE—10	RINGHALS-4	591	
SWITZERLAND	CH—1	BEZNAU-1	593
	CH—3	BEZNAU-2	595
	CH—4	GOESGEN	597
	CH—5	LEIBSTADT	599
	CH—2	MUEHLEBERG	601
UKRAINE	UA—40	KHMELNITSKI-1	603
	UA—27	ROVNO-1	605
	UA—28	ROVNO-2	607
	UA—29	ROVNO-3	609
	UA—44	SOUTH UKRAINE-1	611
	UA—45	SOUTH UKRAINE-2	613
	UA—48	SOUTH UKRAINE-3	615
	UA—54	ZAPOROZHE-1	617
	UA—56	ZAPOROZHE-2	619
	UA—78	ZAPOROZHE-3	621
	UA—79	ZAPOROZHE-4	623
	UA—126	ZAPOROZHE-5	625
	UA—127	ZAPOROZHE-6	627
UNITED KINGDOM	GB—1	CALDER HALL	
	GB—2	CHAPELCROSS	
	GB—9	DUNGENESS-A	
	GB—18A	DUNGENESS-B1 UNIT A	
	GB—18B	DUNGENESS-B2 UNIT B	
	GB—19A	HARTLEPOOL-A1 UNIT A	
	GB—19B	HARTLEPOOL-A2 UNIT B	
	GB—20A	HEYSHAM-1 UNIT A	
	GB—20B	HEYSHAM-1 UNIT B	
	GB—22A	HEYSHAM-2 UNIT A	
	GB—22B	HEYSHAM-2 UNIT B	
	GB—16A	HINKLEY POINT-B UNIT A	
	GB—16B	HINKLEY POINT-B UNIT B	
	GB—17A	HUNTERSTON-B1 UNIT A	
	GB—17B	HUNTERSTON-B2 UNIT B	
	GB—11	OLDBURY-A	
	GB—10	SIZEWELL-A	
GB—24	SIZEWELL-B		

Country Name	Reactor Code	Reactor Name	Page
UNITED KINGDOM	GB—23A	TORNESS UNIT A	
	GB—23B	TORNESS UNIT B	
	GB—13	WYLFA	
UNITED STATES OF AMERICA	US—313	ARKANSAS ONE-1	629
	US—368	ARKANSAS ONE-2	631
	US—334	BEAVER VALLEY-1	633
	US—412	BEAVER VALLEY-2	635
	US—456	BRAIDWOOD-1	637
	US—457	BRAIDWOOD-2	639
	US—259	BROWNS FERRY-1	641
	US—260	BROWNS FERRY-2	643
	US—296	BROWNS FERRY-3	645
	US—325	BRUNSWICK-1	647
	US—324	BRUNSWICK-2	649
	US—454	BYRON-1	651
	US—455	BYRON-2	653
	US—483	CALLAWAY-1	655
	US—317	CALVERT CLIFFS-1	657
	US—318	CALVERT CLIFFS-2	659
	US—413	CATAWBA-1	661
	US—414	CATAWBA-2	663
	US—461	CLINTON-1	665
	US—397	COLUMBIA	667
	US—445	COMANCHE PEAK-1	669
	US—446	COMANCHE PEAK-2	671
	US—298	COOPER	673
	US—302	CRYSTAL RIVER-3	675
	US—346	DAVIS BESSE-1	677
	US—275	DIABLO CANYON-1	679
	US—323	DIABLO CANYON-2	681
	US—315	DONALD COOK-1	683
	US—316	DONALD COOK-2	685
	US—237	DRESDEN-2	687
	US—249	DRESDEN-3	689
	US—331	DUANE ARNOLD-1	691
	US—341	ENRICO FERMI-2	693
	US—348	FARLEY-1	695
	US—364	FARLEY-2	697
	US—333	FITZPATRICK	699
	US—285	FORT CALHOUN-1	701
	US—416	GRAND GULF-1	703
	US—261	H.B. ROBINSON-2	705
	US—321	HATCH-1	707
	US—366	HATCH-2	709
US—354	HOPE CREEK-1	711	
US—247	INDIAN POINT-2	713	
US—286	INDIAN POINT-3	715	
US—305	KEWAUNEE	717	
US—373	LASALLE-1	719	
US—374	LASALLE-2	721	
US—352	LIMERICK-1	723	
US—353	LIMERICK-2	725	
US—369	MCGUIRE-1	727	
US—370	MCGUIRE-2	729	
US—336	MILLSTONE-2	731	
US—423	MILLSTONE-3	733	
US—263	MONTICELLO	735	
US—220	NINE MILE POINT-1	737	
US—410	NINE MILE POINT-2	739	

Country Name	Reactor Code	Reactor Name	Page
UNITED STATES OF AMERICA	US—338	NORTH ANNA-1	741
	US—339	NORTH ANNA-2	743
	US—269	OCONEE-1	745
	US—270	OCONEE-2	747
	US—287	OCONEE-3	749
	US—219	OYSTER CREEK	751
	US—255	PALISADES	753
	US—528	PALO VERDE-1	755
	US—529	PALO VERDE-2	757
	US—530	PALO VERDE-3	759
	US—277	PEACH BOTTOM-2	761
	US—278	PEACH BOTTOM-3	763
	US—440	PERRY-1	765
	US—293	PILGRIM-1	767
	US—266	POINT BEACH-1	769
	US—301	POINT BEACH-2	771
	US—282	PRAIRIE ISLAND-1	773
	US—306	PRAIRIE ISLAND-2	775
	US—254	QUAD CITIES-1	777
	US—265	QUAD CITIES-2	779
	US—244	R.E. GINNA	781
	US—458	RIVER BEND-1	783
	US—272	SALEM-1	785
	US—311	SALEM-2	787
	US—361	SAN ONOFRE-2	789
	US—362	SAN ONOFRE-3	791
	US—443	SEABROOK-1	793
	US—327	SEQUOYAH-1	795
	US—328	SEQUOYAH-2	797
	US—400	SHEARON HARRIS-1	799
	US—498	SOUTH TEXAS-1	801
	US—499	SOUTH TEXAS-2	803
	US—335	ST. LUCIE-1	805
	US—389	ST. LUCIE-2	807
	US—280	SURRY-1	809
	US—281	SURRY-2	811
	US—387	SUSQUEHANNA-1	813
	US—388	SUSQUEHANNA-2	815
	US—289	THREE MILE ISLAND-1	817
	US—250	TURKEY POINT-3	819
	US—251	TURKEY POINT-4	821
	US—271	VERMONT YANKEE	823
	US—395	VIRGIL C. SUMMER-1	825
	US—424	VOGTLE-1	827
	US—425	VOGTLE-2	829
	US—382	WATERFORD-3	831
	US—390	WATTS BAR-1	833
	US—482	WOLF CREEK	835

### 3. DEFINITIONS

#### 1. Nuclear thermal capacity ( $P_{(th)}$ , MW(th))

Reactor nuclear thermal capacity  
(as derived from a heat balance measurement on the reactor primary coolant system).

#### 2. Maximum electrical capacity of a nuclear station ( $P_g$ or $P_n$ , MW(e))

The 'maximum capacity of a nuclear station' is the maximum power that could be maintained or is authorized to be maintained throughout a period of continuous operation, in practice 15 hours or longer. It is specified that this value must remain constant for a given unit unless, following permanent modification, or a new permanent authorization, the management of the undertaking decides to amend the original value.

Electrical capacity may be gross or net:

– The gross capacity ( $P_g$ , 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 capacity ( $P_n$ , 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.

It is recognized that the maximum capacity may be set by an authorized maximum thermal capacity and in these cases the 'reference' maximum net electrical capacities corresponding to the authorized maximum thermal capacity should be used for simplicity in the calculations.

#### 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. Maximum net energy produced ( $E_m$ , MW(e)·h)

Net electrical energy which would have been produced at maximum capacity under continuous operation during the whole of the reference period.

## 6. Net energy produced (E, MW(e)·h)

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

## 7. Load factor (LF, %)

$$LF = \frac{E}{E_m} \times 100$$

$E$  = net energy produced ((MW(e)·h)  
 $E_m$  = maximum net energy produced (MW(e)·h)

The load factor for a unit or station for a given period of time is the ratio of the energy that it produced during the period considered to the energy that it could have produced at maximum capacity under continuous operation during the whole of that period.

## 8. Operation factor (OF, %)

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

$t$  = number of hours on-line (h) (MW(e)·h)  
 $T$  = number of hours in the reference period (h)

The operation factor is the ratio between the number of hours the unit or station was on-line and the total number of hours in the reference period.

## 9. Available capacity (P, MW)

The available capacity at a given moment is the maximum capacity at which the station can be or is authorized to be operated at a continuous rating under the prevailing conditions assuming unlimited transmission facilities.

## 10. Energy loss (EL, MW(e)·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 – ELP, ELU and ELX – i.e. energy loss planned, energy loss unplanned due to causes in the plant and energy loss unplanned due to causes external to the plant.

## 11. Unavailability

Unavailability means that the available capacity is lower than the maximum capacity. Unavailability is classified as planned if it is foreseen at least 1–3 months 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 when it is due either to causes in the plant or causes external to the plant. Power plant operation at lower than maximum capacity because of lower demand from the grid (other than stretch-out operations) but available to operate at the maximum capacity, does not constitute unavailability, either planned or unplanned.

## 12. Energy unavailability (EUF, %)

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

The unavailability factor over a specified period is the ratio of the energy EL that could have been produced during this period by a capacity equal to the unavailable capacity P and the energy E<sub>m</sub> that could have been produced during the same period by the maximum capacity.

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.

**13. Energy availability factor (EAF, %)**

$$EAF = 100 - EUF$$

**14. Unit capability factor (UCF, %)**

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

**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. Shutdown**

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

**20. Significant outages**

A significant outage is a power reduction resulting in a loss of energy corresponding to at least ten hours of continuous operation at maximum capacity. (When reported to the IAEA, outages smaller than significant ones are also included in the report.)

**21. Outage duration (hours)**

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.

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

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

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

## **25. Types of outages**

Outages or unavailabilities are categorized as full or partial. The outage/unavailability is considered full when net power is reduced to zero per cent. The outage/unavailability is considered partial when the available capacity is lower than the maximum net capacity. The following abbreviations are used to indicate the type of outage.

### *First digit:*

P = planned outage

U = unplanned outage

X = outage due to causes not attributable to the plant itself.

#### Examples:

- shortage of fuel
- shortage of water
- special testing caused by experience at other plants
- requirements of manufacturers, especially for new plants
- staff shortages and strikes
- regulatory requirements.

### *Second digit:*

F = full outage

P = partial outage.

### *Third digit:*

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 refuelling 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 = Outage extension

4 = Reactor scram, automatic

5 = Reactor scram, manual

## **26. Main causes of outages/unavailabilities (full or partial)**

- (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<sup>1</sup>, 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

## 27. Plant systems affected

### *Nuclear System*

#### 11 Reactor and accessories

*Includes:*

Reactor vessel and main shielding

Reactor core (including fuel assemblies)

Reactor internals (including steam separators/dryers)

Auxiliary shielding and heat insulation

Moderator and auxiliaries (PHWR)

Annulus gas system (PHWR/RBMK)

Non of them above system

#### 12 Reactor instrumentation and control (I&C) systems

*Includes:*

Control and safety rods and drives

Neutron monitoring (in-core plus external)

Reactor instrumentation (except neutron)

Reactor control system

Reactor protection system

Process computer

Reactor recirculation control (BWR)

Non of them above system

#### 13 Reactor Auxiliary Systems

*Includes:*

Primary coolant treatment and cleanup system (BWR and GCR)

Chemical and volume control system (PWR)

Residual heat removal system (including heat exchangers)

Component cooling system

Gaseous, liquid and solid radwaste treatment

Nuclear building ventilation and containment inerting systems

Nuclear equipment venting and drainage system (including room floor drainage)

Borated or refuelling water storage system

CO<sub>2</sub> injection and storage system (GCR)

Sodium heating system (FBR)

Primary pump oil system (including RCP or make-up pump oil)

D<sub>2</sub>O leakage collection and dryer system (PHWR)

Essential auxiliary system (GCR)

Non of them above system



14 Safety systems

*Includes:*

Emergency core cooling systems (including accumulators and core spray system)  
High pressure safety injection and emergency poisoning system  
Auxiliary and emergency feedwater system  
Containment spray system (active)  
Containment pressure suppression system (passive)  
Containment isolation system (isolation valves, doors, locks and penetrations)  
Containment structures  
Fire protection system  
None of the above systems

15 Reactor cooling system

*Includes:*

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

16 Steam generation system

*Includes:*

Steam generator (PWR), boiler (PHWR, AGR), steam drum vessel (RBMK, BWR)  
Steam generator blow-down system  
Steam drum level control system (RBMK, BWR)  
None of the above systems

17 Safety I&C systems (excluding reactor I&C)

*Includes:*

Engineered safeguard feature actuation system  
Fire detection system  
Containment isolation function  
Main steam/feedwater isolation function  
Main steam pressure emergency control system (turbine bypass and steam dump valve control)  
Failed fuel detection system (DN monitoring system for PHWR)  
RCS integrity monitoring system (RBMK)  
None of the above systems

*Fuel and Refuelling System*

21 Fuel Handling and Storage Facilities

*Includes:*

On-power refuelling machine  
Fuel transfer system  
Storage facilities, including treatment plant and final loading and cask handling facilities  
None of the above systems

*Secondary Plant System*

31 Turbine and auxiliaries

*Includes:*

Turbine  
Moisture separator and re-heater  
Control valves and turbine stop valves  
Turbine control valves and stop valves  
Main condenser (including vacuum system)  
Turbine by-pass valves  
Turbine auxiliaries (lubricating oil, gland steam, steam extraction)  
Turbine control and protection system  
None of the above systems

32 Feedwater and Main Steam System

*Includes:*

Main steam piping and valves  
Main steam safety and relief valves  
Feedwater system (including feedwater tank, piping, pumps and heaters)  
Condensate system (including condensate pumps, piping and heaters)  
Condensate treatment system  
None of the above systems

33 Circulating water system

*Includes:*

Circulating water system (pumps and piping/ducts excluding heat sink system)  
Cooling towers / heat sink system  
Emergency ultimate heat sink system  
None of the above systems

34 Miscellaneous systems

*Includes:*

Compressed air (essential and non-essential / high-pressure and low-pressure)  
Gas storage, supply and cleanup systems (nitrogen, hydrogen, carbon dioxide  
etc.)  
Service water / process water supply system (including water treatment)  
Demineralized water supply system (including water treatment)  
Auxiliary steam supply system (including boilers and pressure control  
equipment)  
Non-nuclear area ventilation (including main control room)  
Chilled water supply system  
Chemical additive injection and makeup systems  
Non-nuclear equipment venting and drainage system  
Communication system  
None of the above systems

35 All other I&C systems

*Includes:*

Plant process monitoring systems (excluding process computer)  
Leak monitoring systems  
Alarm annunciation system  
Plant radiation monitoring system  
Plant process control systems  
None of the above systems

*Electrical System*

41 Main generator

*Includes:*

- Main Generator Systems
  - Generator and exciter (including generator output breaker)
  - Sealing oil system
  - Rotor cooling gas system

42 Electrical power supply systems

*Includes:*

- Main transformers
- Unit self-consumption transformers (station, auxiliary, house reserve etc.)
- Vital AC and DC plant power supply systems (medium and low voltage)
- Non-vital AC plant power supply system (medium and low voltage)
- Emergency power generation system (e.g. emergency diesel generator and auxiliaries)
- Power supply system logics (including load shed logic, emergency bus transfer logic, load sequencer logic, breaker trip logic etc.)
- Plant switchyard equipment
- None of the above systems

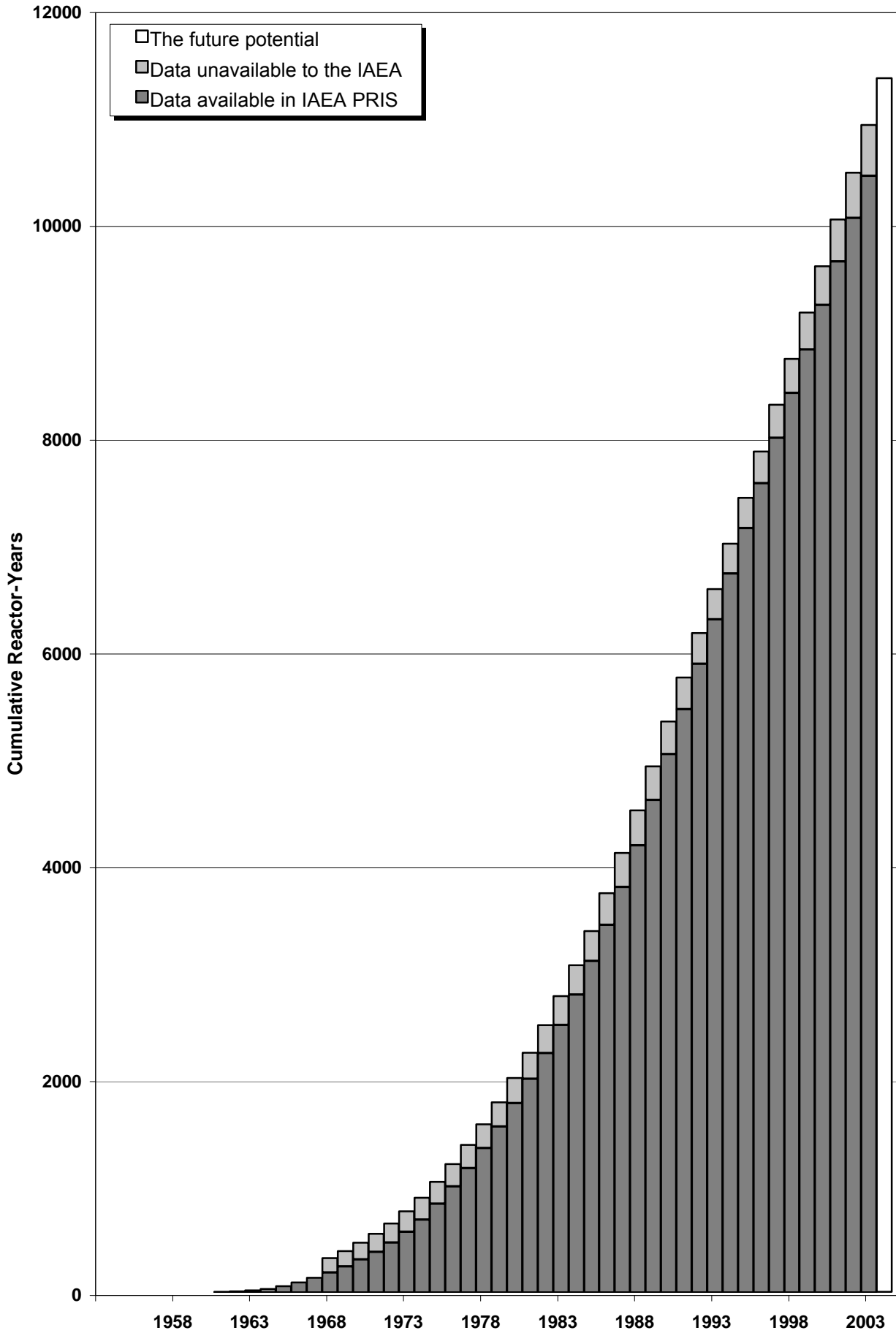
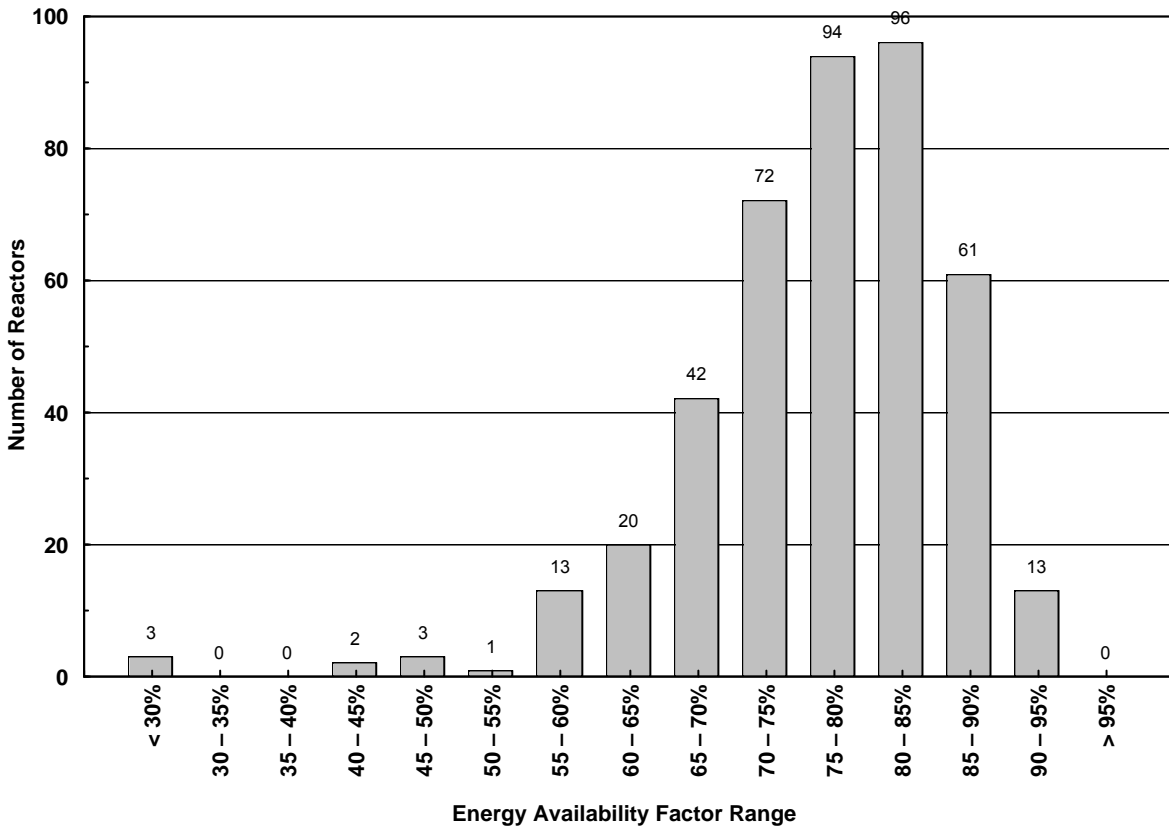
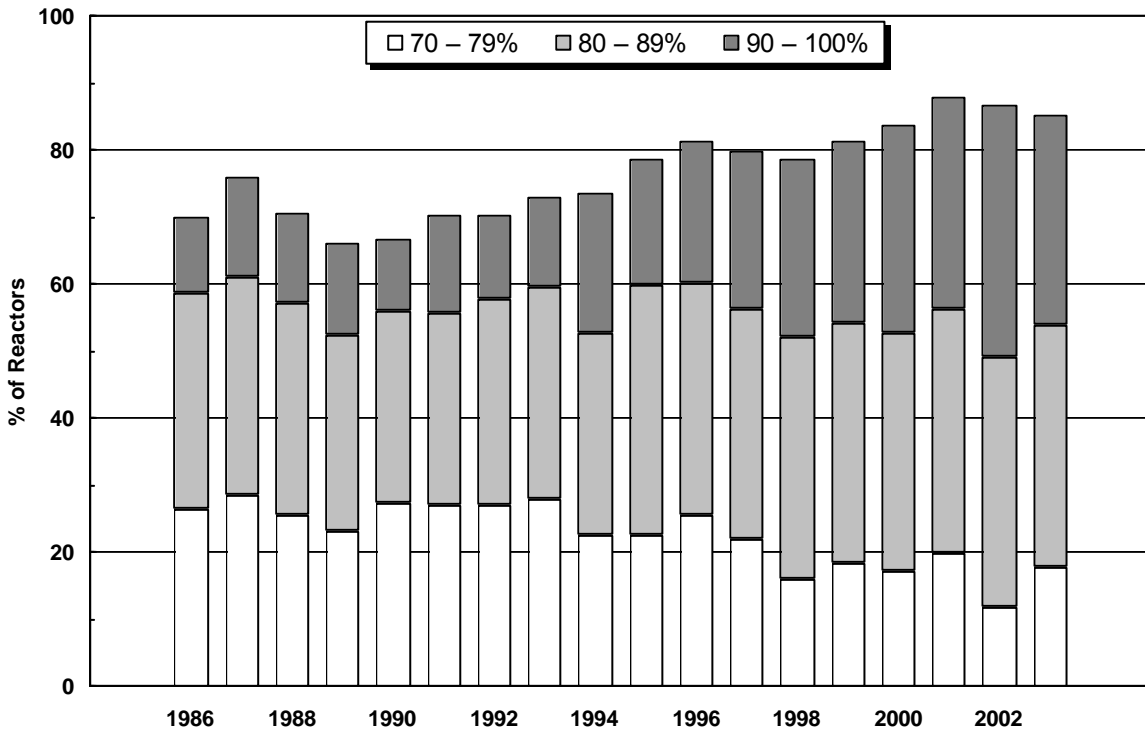


Figure 1 — Nuclear Power Reactors Operating Experience

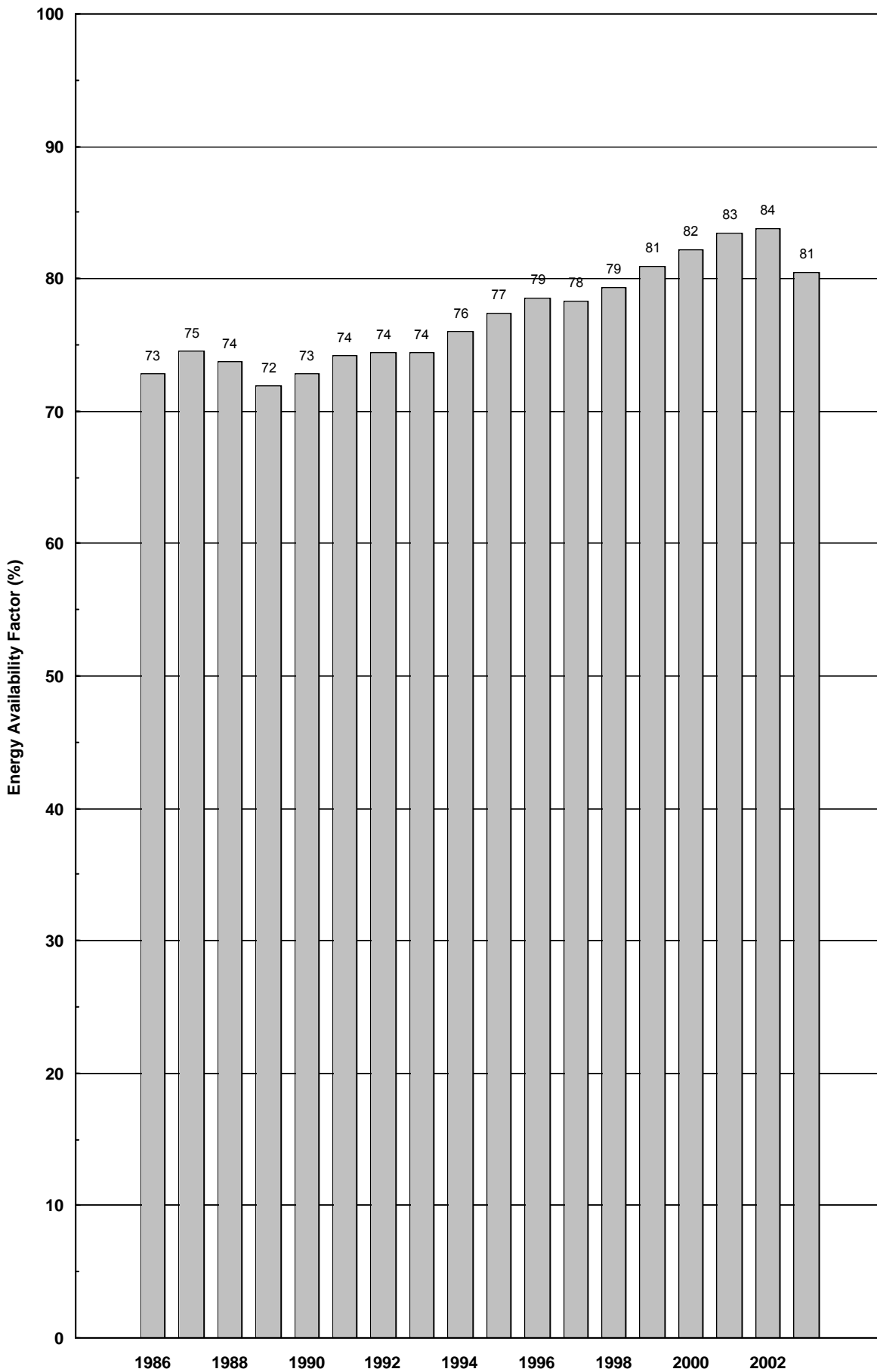


**Figure 2 — Lifetime Energy Availability Factors up to 2003**

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

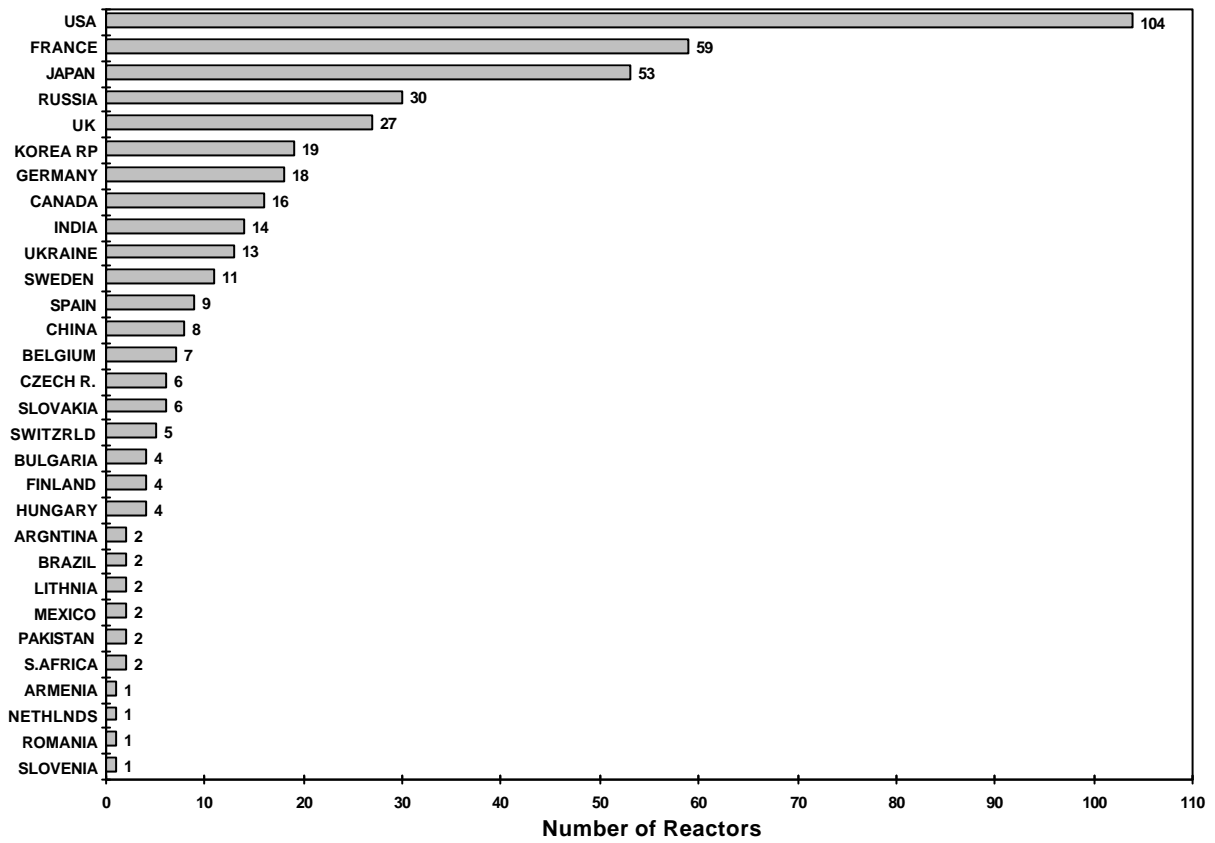


**Figure 3 — Reactors with High Availability Factors**



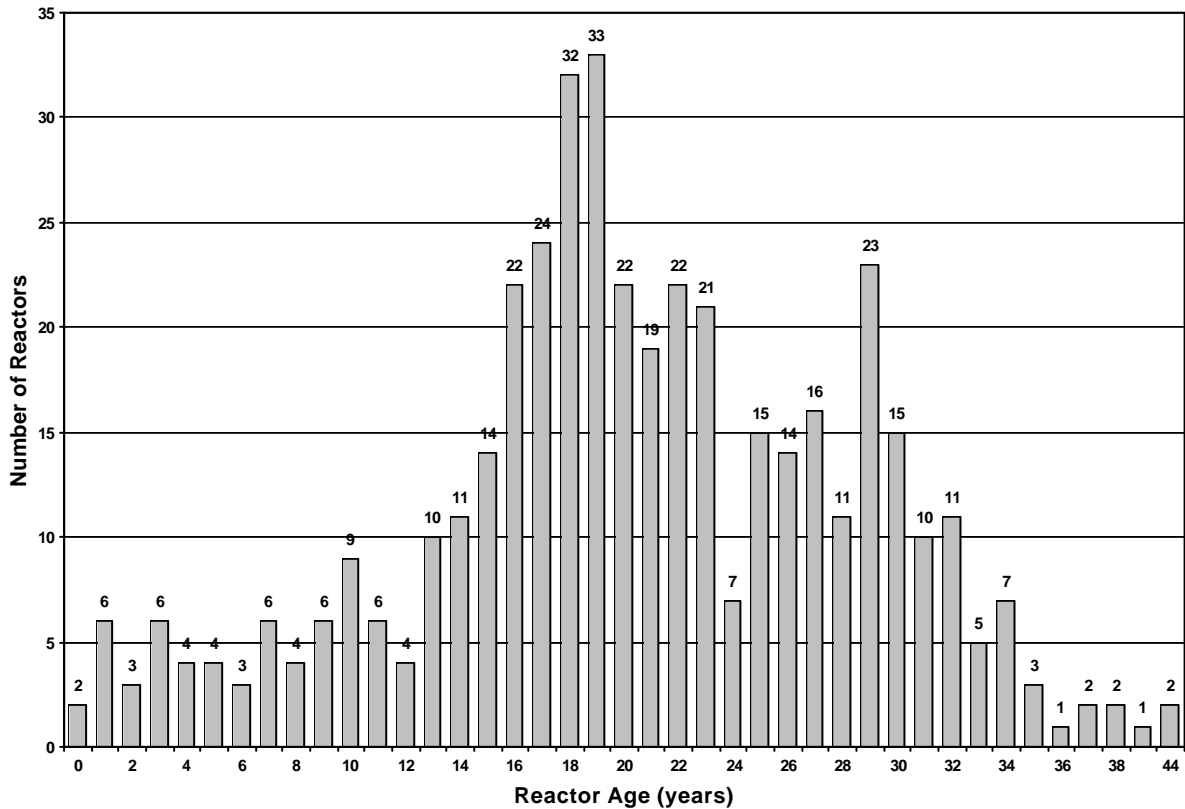
**Figure 4 — Average Energy Availability Factors**

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



**Figure 5 — Number of Reactors in Operation (as of 1 January 2004)**

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



**Figure 6 — Number of Reactors by Age (as of 1 January 2004)**

## 5. 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

ABWR	Advanced Boiling Light-Water-Cooled and Moderated Reactor
AGR	Advanced Gas-Cooled, Graphite-Moderated Reactor
BWR	Boiling Light-Water-Cooled and Moderated Reactor
FBR	Fast Breeder Reactor
GCR	Gas-Cooled, Graphite-Moderated Reactor
HTGR	High-Temperature Gas-Cooled, Graphite-Moderated Reactor
HWGCR	Heavy-Water-Moderated, Gas-Cooled Reactor
HWLWR	Heavy-Water-Moderated, Boiling Light-Water-Cooled Reactor
LWGR	Light-Water-Cooled, Graphite-Moderated Reactor
PHWR	Pressurized Heavy-Water-Moderated and Cooled Reactor
PWR	Pressurized Light-Water-Moderated and Cooled Reactor
SGHWR	Steam-Generating Heavy-Water Reactor
WWER	Water Cooled Water Moderated Power Reactor

### OPERATORS

AMEREN	AMEREN
AMERGEN	AMERGEN ENERGY CO.
ANAV	ASOCIACION NUCLEAR ASCO-VANDELLOS A.I.E.
	(ENDESA/ID)
ANPP	ARIZONA NUCLEAR POWER PROJECT
BE	BRITISH ENERGY
BKAB	BARSEBECK KRAFT AB
BKW	BKW ENERGIE AG
BNFL	BRITISH NUCLEAR FUELS PLC
BRUCEPOW	BRUCE POWER
CEA/EDF	COMMISSARIAT A L'ENERGIE ATOMIQUE / ELECTRICITE DE FRANCE
CEZ	CZECH POWER COMPANY , CEZ A.S.
CFE	COMISION FEDERAL DE ELECTRICIDAD



CHUBU	CHUBU ELECTRIC POWER CO.
CHUGOKU	CHUGOKU ELECTRIC POWER CO.
CNAT	CENTRALES NUCLEARES ALMARAZ-TRILLO(ID/UFG/ENDESA/HC/NUCLENOR )
CONST	CONSTELLATION NUCLEAR GROUP
DETED	DETROIT EDISON CO.
DOMIN	DOMINION VIRGINIA POWER
DUKE	DUKE POWER CO.
EBO	ELECTROSTATION BOHUNICE
EDF	ELECTRICITE DE FRANCE
ELECTRAB	ELECTRABEL M. V. NUCLEAIRE PRODUKTIE
ELETRONU	ELETROBRAS TERMONUCLEAR SA – ELETRONUCLEAR
EMO	ELECTROSTATION MOCHOVCE
EnBW	ENBW KRAFTWERK AG
ENERGYNW	ENERGY NORTHWEST
ENERGY	ENERGY NUCLEAR
EON	EON KERNKRAFT GES.M.B.H
EPZ	N.V. ELEKTRICITEITS-PRODUKTIEMAATSCHAPPIJ ZUID-NEDERLAND
ESKOM	ESKOM
EXELON	EXELON NUCLEAR CO.
FENOC	FIRST ENERGY NUCLEAR OPERATING CO.
FKA	FORSMARK KRAFTGRUPP AB
FORTUMPH	FORTUM POWER AND HEAT OY (FORMER IVO)
FPL	FLORIDA POWER & LIGHT CO.
GNPJVC	GUANDONG NUCLEAR POWER JOINT VENTURE COMPANY LIMITED(GNPJVC)
HEPCO	HOKKAIDO ELECTRIC POWER CO.
HEW	HAMBURGISCHE ELEKTRIZITAETSWERKE
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.
JNC	JAPAN NUCLEAR CYCLE DEVELOPEMENT INSTITUTE
JSC	JOINT STOCK COMPANY ARMENIA NPP
KEPCO	KANSAI ELECTRIC POWER CO.
KHNP	KOREA HYDRO AND NUCLEAR POWER CO.
KKG	KERNKRAFTWERK GOESGEN-DAENIKEN AG
KKL	KERNKRAFTWERK LEIBSTADT
KYUSHU	KYUSHU ELECTRIC POWER CO.
LANPC	LINGAO NUCLEAR POWER COMPANY LTD.
NASA	NUCLEOELECTRICA ARGENTINA S.A.
NBEP	NEW BRUNSWICK ELECTRIC POWER COMMISSION
NEC	NATIONAL ELECTRICITY COMPANY, BRANCH NPP-KOZLODUY
NEK	NUKLEARNA ELEKTRARNA KRSKO
NNEG	NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>
NOK	NORDOSTSCHWEIZERISCHE KRAFTWERKE
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.
NUCMAN	NUCLEAR MANAGEMENT CO.
OKG	OKG AKTIEBOLAG
OPG	ONTARIO POWER GENERATION
OPPD	OMAHA PUBLIC POWER DISTRICT
PAEC	PAKISTAN ATOMIC ENERGY COMMISSION
PAKS RT.	PAKS NUCLEAR POWER PLANT LTD
PGE	PACIFIC GAS & ELECTRIC CO.
PP&L	PENNSYLVANIA POWER & LIGHT CO.
PROGRESS	PROGRESS ENERGY CORPORATION
PSEG	PUBLIC SERVICE ELECTRIC & GAS CO.
QNPC	QINSHAN NUCLEAR POWER COMPANY
RAB	RINGHALS AB
REA	ROSENERGOATOM, CONSORTIUM
RGE	ROCHESTER GAS & ELECTRIC CORP.
RWE	RWE ENERGIE AG
SCE	SOUTHERN CALIFORNIA EDISON
SCEG	SOUTH CAROLINA ELECTRIC & GAS CO.
SHIKOKU	SHIKOKU ELECTRIC POWER CO.
SNN	SOCIETATEA NATIONALA NUCLEARELECTRICA S.A.
SOUTH	SOUTHERN NUCLEAR OPERATING CO.

STP	STP NUCLEAR OPERATING CO.
TEPCO	TOKYO ELECTRIC POWER CO.
TOHOKU	TOHOKU ELECTRIC POWER CO.
TPC	TAI POWER CO.
TQNPC	THE THIRD QINSHAN JOINTED VENTURE COMPANY LTD.
TVA	TENNESSEE VALLEY AUTHORITY
TVO	TEOLLISUUDEN VOIMA OY
TXU	TXU ELECTRIC CO.
UFG	UNION FENOSA GENERATION S.A.
WOLF	WOLF CREEK NUCLEAR OPERATION CORP.

### CONTRACTORS

AA	ALSTHOM ATLANTIQUE
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 - NEYRPIC
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.
FRAM	FRAMATOME
FRAMACEC	FRAMACECO ( FRAMATOME-ACEC-COCKERILL )
GE	GENERAL ELECTRIC COMPANY (US)
GEC	GENERAL ELECTRIC COMPANY (UK)
GETSCO	GENERAL ELECTRIC TECHNICAL SERVICES CO.
HITA/GE	HITACHI LTD./GENERAL ELECTRIC CO.
HITACHI	HITACHI LTD.
KWU	SIEMENS KRAFTWERK UNION AG
KWU/STOR	KRAFTWERK UNION AG / STORK
M	MITSUBISHI HEAVY INDUSTRY LTD
MAEP	MINATOMENERGOPROM, MINISTRY OF NUCLEAR POWER AND INDUSTRY
MNE	MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION
NEI.P	NEI PARSONS
NNC	NATIONAL NUCLEAR CORPORATION
NPC	NUCLEAR POWER CO. LTD.
NPCIL	NUCLEAR POWER CORPORATION OF INDIA LTD.
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
SIEM,KWU	SIEMENS AG, KRAFTWERK UNION AG
SIEMENS	SIEMENS AG
SKODA	SKODA CONCERN NUCLEAR POWER PLANT WORKS
TNPG	THE NUCLEAR POWER GROUP LTD.
TOSHI/GE	TOSHIBA CORPORATION/GENERAL ELECTRIC CO.
TOSHIBA	TOSHIBA CORPORATION
UKAEA	UNITED KINGDOM ATOMIC ENERGY AUTHORITY
WEST	WESTINGHOUSE ELECTRIC CORPORATION



**6. DATA SHEETS ON  
INDIVIDUAL NUCLEAR POWER STATIONS UNITS**



**AR-1 ATUCHA-1**

Operator: NASA (NUCLEOELECTRICA ARGENTINA S.A.)

Contractor: SIEMENS (SIEMENS AG)

**1. Station Details**

Type: PHWR  
 Maximum Net Capacity  
 at the beginning of 2003: 335.0 MW(e)  
 Design Net Capacity: 319.0 MW(e)  
 Design Discharge Burnup: 5600 MW.d/t

**2. Production Summary 2003**

Energy Production: 2020.6 GW(e).h  
 Energy Availability Factor: 68.8%  
 Load Factor: 68.9%  
 Operating Factor: 69.6%  
 Energy Unavailability Factor: 31.2%  
 Total Off-line Time: 2666 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	0.0	0.0	16.0	239.8	184.2	216.6	251.3	250.7	242.0	248.7	239.6	131.8	2020.6
EAF (%)	0.0	0.0	6.7	99.8	73.1	88.9	100.0	100.0	100.0	100.0	100.0	53.6	68.8
UCF (%)	0.0	0.0	6.7	99.8	73.1	88.9	100.0	100.0	100.0	100.0	100.0	53.6	68.8
LF (%)	0.0	0.0	6.4	99.5	73.9	89.8	100.8	100.6	100.4	99.7	99.3	52.9	68.9
OF (%)	0.0	0.0	8.3	100.1	76.3	91.4	100.0	100.0	100.0	99.9	100.0	55.6	69.6
EUf (%)	100.0	100.0	93.3	0.2	26.9	11.1	0.0	0.0	0.0	0.0	0.0	46.4	31.2
PUF (%)	100.0	100.0	93.3	0.0	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	0.2	26.9	11.1	0.0	0.0	0.0	0.0	0.0	46.4	7.2
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. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Jun 1968      Lifetime Generation: 58066.2 GW(e).h  
 Date of First Criticality: 13 Jan 1974      Cumulative Energy Availability Factor: 70.2%  
 Date of Grid Connection: 19 Mar 1974      Cumulative Load Factor: 67.2%  
 Date of Commercial Operation: 24 Jun 1974      Cumulative Unit Capability Factor: 77.1%  
    Cumulative Energy Unavailability Factor: 29.8%

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	1753.6	335.0	59.2	77.8	59.2	77.8	59.8	77.7	5600	63.9
1983	2356.0	335.0	78.4	77.9	78.4	77.9	80.3	78.0	8101	92.5
1984	1706.1	335.0	98.7	80.0	98.7	80.0	58.0	75.9	8678	98.8
1985	1470.5	335.0	91.6	81.0	91.6	81.0	50.1	73.6	7159	81.7
1986	2205.0	335.0	75.8	80.6	75.8	80.6	75.1	73.7	7532	86.0
1987	1405.8	335.0	49.2	78.2	49.2	78.2	47.9	71.7	4391	50.1
1988	808.1	335.0	27.1	74.5	27.1	74.5	27.5	68.5	2515	28.6
1989	0.0	335.0	0.0	69.5	0.0	69.5	0.0	63.9	0	0.0
1990	1722.6	335.0	84.9	70.5	58.7	68.8	58.7	63.6	7201	82.2
1991	2721.9	335.0	92.6	71.8	92.6	70.2	92.8	65.3	8390	95.8
1992	2230.2	335.0	76.3	72.0	76.3	70.6	75.8	65.9	7089	80.7
1993	2403.7	335.0	82.2	72.6	82.2	71.2	81.9	66.8	7287	83.2
1994	2651.9	335.0	90.4	73.5	90.4	72.1	90.4	67.9	7916	90.4
1995	2671.7	335.0	92.3	74.4	92.3	73.1	91.0	69.1	8376	95.6
1996	2038.8	335.0	70.6	74.2	70.6	73.0	69.3	69.1	6990	79.6
1997	2720.1	335.0	93.4	75.0	93.4	73.9	92.7	70.1	8329	95.1
1998	2374.4	335.0	81.4	75.3	81.3	74.2	80.9	70.5	7242	82.7
1999	1395.5	335.0	47.8	74.2	47.8	73.1	47.6	69.6	4364	49.8
2000	1677.9	335.0	72.8	74.1	56.8	72.5	57.0	69.1	5038	57.4
2001	1426.0	335.0	64.6	73.8	48.4	71.6	48.6	68.4	4405	50.3
2002	1011.5	335.0	34.6	72.4	34.6	70.3	34.5	67.2	3030	34.6
2003	2020.6	335.0	68.8	72.3	68.8	70.2	68.9	67.2	6094	69.6

**AR-1 ATUCHA-1****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	2112.0	707.5	PF	D11	REPLACEMENT OF FUEL CHANNELS AND CONTROL RODS GUIDE TUBES, INSTALLATION AND COMMISSIONING OF A NEW EMERGENCY FEEDWATER SYSTEM AND TURBINE INSPECTION
14 Dec	330.0	110.6	UF1	A42	MANUAL SHUTDOWN DUE TO A LOCAL INCREASE OF TEMPERATURE IN A CONNECTION OF MAIN TRANSFORMER.

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

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		330			818	2
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling				7		
D. Inspection, maintenance or repair without refuelling	2112			1223		
E. Testing of plant systems or component				6		
H. Nuclear regulatory requirement					1	93
J. Grid failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					16	57
Subtotal	2112	330	0	1236	849	154
Total		2442			2239	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		127
12. Reactor I&C Systems		57
13. Reactor Auxiliary System:		167
14. Safety Systems		43
15. Reactor Cooling System:		219
16. Steam generation system:		63
17. Safety I&C Systems (excluding reactor I&C)		13
31. Turbine and auxiliaries:		11
32. Feedwater and Main Steam System		28
33. Circulating Water System		10
41. Main Generator System:		6
42. Electrical Power Supply System:	330	47
Total	330	791

# AR-2 EMBALSE

**Operator:** NASA (NUCLEOELECTRICA ARGENTINA S.A.)  
**Contractor:** AECL (ATOMIC ENERGY OF CANADA LTD.)

## 1. Station Details

**Type:** PHWR  
**Maximum Net Capacity at the beginning of 2003:** 600.0 MW(e)  
**Design Net Capacity:** 600.0 MW(e)  
**Design Discharge Burnup:** 7200 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5004.1 GW(e).h  
**Energy Availability Factor:** 95.1%  
**Load Factor:** 95.2%  
**Operating Factor:** 95.5%  
**Energy Unavailability Factor:** 4.9%  
**Total Off-line Time:** 393 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	442.1	399.5	443.3	430.3	447.3	433.1	448.5	448.4	433.2	298.3	337.3	442.9	5004.1
<b>EAF (%)</b>	99.0	99.1	99.3	99.6	100.0	100.0	100.0	100.0	100.0	66.9	78.1	99.2	95.1
<b>UCF (%)</b>	99.0	99.1	99.3	99.6	100.0	100.0	100.0	100.0	100.0	67.1	78.5	99.2	95.1
<b>LF (%)</b>	99.0	99.1	99.3	99.7	100.2	100.3	100.5	100.4	100.3	66.7	78.1	99.2	95.2
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	67.4	79.2	100.0	95.5
<b>EUf (%)</b>	1.0	0.9	0.7	0.4	0.0	0.0	0.0	0.0	0.0	33.1	21.9	0.8	4.9
<b>PUf (%)</b>	1.0	0.9	0.7	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.9	21.5	0.1	4.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.0	0.1

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

EMBALSE NPP WAS IN OPERATION AT FULL POWER DURING 459 DAYS IN AN UNINTERRUPTED WAY, SINCE JULY 07, 2002 TO OCTOBER 09, 2003, ACHIEVING A NEW RECORD FOR CANDU PLANTS.

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1974      **Lifetime Generation:** 89630.5 GW(e).h  
**Date of First Criticality:** 13 Mar 1983      **Cumulative Energy Availability Factor:** 87.1%  
**Date of Grid Connection:** 25 Apr 1983      **Cumulative Load Factor:** 84.1%  
**Date of Commercial Operation:** 20 Jan 1984      **Cumulative Unit Capability Factor:** 77.7%  
**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 (%)
1983	815.4	600.0	0.0	0.0	38.6	100.0	16.6	0.0	2098	25.6
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	83.0	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	85.3	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



## AR-2 EMBALSE

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
09 Oct	243.0	147.0	UF	A16	SG TUBE FAILURE
01 Nov	150.0	92.9	UF	A16	SG TUBE FAILURE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		393		7	270	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling				114		
D. Inspection, maintenance or repair without refuelling				656		
E. Testing of plant systems or component				68	1	
H. Nuclear regulatory requirement				10	2	
J. Grid failure or grid unavailability					2	22
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					4	
Subtotal	0	393	0	855	279	22
Total		393			1156	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		10
12. Reactor I&C Systems		6
13. Reactor Auxiliary System:		53
15. Reactor Cooling System:		15
16. Steam generation system:	393	63
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries:		43
32. Feedwater and Main Steam System		28
41. Main Generator System:		42
42. Electrical Power Supply System:		9
Total	393	270

## AM-19 ARMENIA-2

**Operator:** JSC (JOINT STOCK COMPANY ARMENIA NPP)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

### 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 376.0 MW(e)  
**Design Net Capacity:** 376.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 1997.6 GW(e).h  
**Energy Availability Factor:** 60.6%  
**Load Factor:** 60.6%  
**Operating Factor:** 69.9%  
**Energy Unavailability Factor:** 39.4%  
**Total Off-line Time:** 2640 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	56.8	236.9	259.3	25.7	0.0	0.0	238.6	253.8	246.0	231.6	181.1	267.7	1997.6
<b>EAF (%)</b>	20.3	93.8	92.7	9.4	0.0	0.0	85.3	90.7	90.9	82.8	66.9	95.7	60.6
<b>UCF (%)</b>	20.3	93.8	92.7	42.7	0.0	0.0	85.3	90.7	90.9	82.8	66.9	95.7	63.4
<b>LF (%)</b>	20.3	93.8	92.7	9.5	0.0	0.0	85.3	90.7	90.9	82.7	66.9	95.7	60.6
<b>OF (%)</b>	35.5	100.0	100.0	10.0	0.0	0.0	93.5	100.0	100.0	99.9	100.0	100.0	69.9
<b>EUf (%)</b>	79.7	6.2	7.3	90.6	100.0	100.0	14.7	9.3	9.1	17.2	33.1	4.3	39.4
<b>PUF (%)</b>	79.7	6.2	7.3	57.3	100.0	100.0	14.7	9.3	9.1	17.2	33.1	4.3	36.6
<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	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

DURING THE YEAR THE UNIT DID NOT WORK WITH ITS FULL CAPACITY BECAUSE OF LIMITATION OF DAILY SHARE OF ENERGY GENERATION PROVIDED BY THE NPP TO THE ENERGY GRID OF ARMENIA.

### 5. Historical Summary

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

**Lifetime Generation:** 37074.9 GW(e).h  
**Cumulative Energy Availability Factor:** 63.4%  
**Cumulative Load Factor:** 55.1%  
**Cumulative Unit Capability Factor:** 77.4%  
**Cumulative Energy Unavailability Factor:** 36.6%

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	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	99.9	84.1	99.9	84.1	20.4	54.6	1838	21.0
1996	2098.0	376.0	86.3	84.6	63.6	79.1	63.5	56.8	7561	86.1
1997	1430.0	376.0	43.4	76.5	43.4	72.1	43.4	54.2	5700	65.1
1998	1416.5	376.0	44.6	71.3	44.6	67.5	43.0	52.3	6408	73.2
1999	1890.4	376.0	57.4	69.3	57.4	66.1	57.4	53.0	6193	70.7
2000	1841.5	376.0	55.8	67.6	55.8	64.8	55.8	53.4	5699	64.9
2001	1815.4	376.0	55.1	66.3	55.1	63.8	55.1	53.6	5660	64.6
2002	2078.9	376.0	63.3	66.0	63.2	63.7	63.1	54.5	6961	79.5
2003	1997.6	376.0	63.4	65.7	60.6	63.4	60.6	55.1	6120	69.9

## AM-19 ARMENIA-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	480.0	180.5	PF	D	MAINTENANCE ACTIVITIES STARTED IN 2002
04 Apr	239.0	90.2	XF4	J42	DUE TO INSTABILITY OF EXTERNAL GRID PARAMETERS THE REACTOR WAS SCRAMMED BY PROTECTION SYSTEM. DURING TRANSIENT ALL SAFETY SYSTEMS WERE AVAILABLE.
14 Apr	1872.0	703.9	PF	C	MAINTENANCE AND REFUELLING ACTIVITIES

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					67	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	1872			963		
D. Inspection, maintenance or repair without refuelling	480			70		
J. Grid failure or grid unavailability			239			1
Subtotal	2352	0	239	1033	70	1
Total		2591			1104	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		0
15. Reactor Cooling Systems		8
16. Steam generation systems		12
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		1
42. Electrical Power Supply Systems		1
Total	0	24

## BE-2 DOEL-1

**Operator:** ELECTRAB (ELECTRABEL M. V. NUCLEAIRE PRODUKTIE)  
**Contractor:** ACECOWEN (ACECOWEN ( ACEC-COCKERILL-WESTINGHOUSE ))

### 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 392.0 MW(e)  
**Design Net Capacity:** 392.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 3024.6 GW(e).h  
**Energy Availability Factor:** 86.4%  
**Load Factor:** 88.1%  
**Operating Factor:** 90.8%  
**Energy Unavailability Factor:** 13.6%  
**Total Off-line Time:** 807 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	298.6	269.6	297.8	287.2	295.4	214.4	287.6	167.0	25.7	294.3	287.1	299.9	3024.6
<b>EAF (%)</b>	99.7	99.6	99.7	99.4	99.2	75.5	97.9	57.9	9.1	98.4	99.2	100.0	86.4
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	75.9	98.1	100.0	10.0	98.6	99.5	100.0	90.3
<b>LF (%)</b>	102.4	102.3	102.1	101.9	101.3	76.0	98.6	57.3	9.1	100.8	101.7	102.8	88.1
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	76.3	98.4	100.0	13.3	100.0	100.0	100.0	90.8
<b>EUf (%)</b>	0.3	0.4	0.3	0.6	0.8	24.5	2.1	42.1	90.9	1.6	0.8	0.0	13.6
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	24.2	0.0	0.0	85.5	0.8	0.5	0.0	9.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	4.5	0.5	0.0	0.0	0.6
<b>XUF (%)</b>	0.3	0.4	0.3	0.6	0.8	0.4	0.2	42.1	0.9	0.2	0.3	0.0	3.9

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Jul 1969  
**Date of First Criticality:** 18 Jul 1974  
**Date of Grid Connection:** 28 Aug 1974  
**Date of Commercial Operation:** 15 Feb 1975

**Lifetime Generation:** 85652.7 GW(e).h  
**Cumulative Energy Availability Factor:** 85.4%  
**Cumulative Load Factor:** 85.6%  
**Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	3184.5	395.0	91.7	98.8	91.7	83.4	92.0	83.7	8103	92.5
1983	2823.0	393.0	82.1	96.7	82.1	83.2	82.0	83.5	7316	83.5
1984	3129.0	393.0	90.2	96.0	90.2	84.0	90.6	84.3	7988	90.9
1985	2896.3	392.0	82.4	94.7	82.4	83.8	84.3	84.3	7330	83.7
1986	2685.9	392.0	79.2	93.3	78.8	83.4	78.2	83.8	7040	80.4
1987	2928.4	400.0	85.5	92.6	85.4	83.6	83.6	83.7	7306	83.4
1988	2694.1	400.0	86.6	92.1	81.3	83.4	76.7	83.2	7686	87.5
1989	2513.1	400.0	73.6	90.8	71.9	82.6	71.7	82.4	6475	73.9
1990	2859.9	400.0	85.6	90.5	83.5	82.6	81.6	82.3	7380	84.2
1991	3061.4	400.0	89.5	90.4	89.2	83.0	87.4	82.6	7860	89.7
1992	2990.5	400.0	87.7	90.2	86.5	83.2	85.1	82.8	7741	88.1
1993	2908.9	400.0	86.0	90.0	84.4	83.3	83.0	82.8	7580	86.5
1994	2921.8	400.0	88.7	89.9	84.8	83.4	83.4	82.8	7635	87.2
1995	2791.5	392.0	82.7	89.6	81.0	83.3	81.3	82.7	7342	83.8
1996	3169.4	392.0	91.5	89.7	91.3	83.6	92.0	83.2	8141	92.7
1997	3113.8	392.0	89.0	89.6	88.9	83.9	90.7	83.5	7899	90.2
1998	3292.5	392.0	94.0	89.8	93.7	84.3	95.9	84.1	8277	94.5
1999	3196.8	392.0	92.6	89.9	91.1	84.6	93.1	84.4	8123	92.7
2000	3264.8	392.0	94.3	90.1	92.3	84.9	94.8	84.8	8317	94.7
2001	3157.6	392.0	91.4	90.2	90.5	85.1	91.9	85.1	8098	92.4
2002	3260.7	392.0	93.4	90.3	93.3	85.4	95.0	85.5	8308	94.8
2003	3024.6	392.0	90.3	90.3	86.4	85.4	88.1	85.6	7953	90.8

## BE-2 DOEL-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
19 Jun	171.0	68.2	PF	E14	COLD SHUTDOWN FOR THE PERFORMANCE OF PERIODIC TESTS ON THE SAFETY INJECTION SYSTEMS
14 Jul	12.0	4.6	UF4	A41	SCRAM DUE TOT EARTH FAULT STATOR (INTERNAL FAILURE)
04 Aug		116.4	XP	N	MODULATION DUE TO COOLING WATER TEMPERATURE LIMITS
01 Sep	54.0	1.3	XP	S	STRETCH-OUT
03 Sep	591.0	232.5	PF	C	REFUELING OUTAGE
28 Sep	32.0	12.6	UF3	Z	REFUELING OUTAGE EXTENTION
24 Oct	25.0	1.6	UP	A32	POWER REDUCTION FOR REPAIR HIGH PRESSURE FEEDWATER PUMP B
01 Nov	6.0	1.5	PP	E31	TESTING TURBINE CONTROL AND PROTECTION SYSTEM. (AND REPAIR FEEDWATER PUMP B)

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		12			213	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	591			789		
D. Inspection, maintenance or repair without refuelling				9		
E. Testing of plant systems or components	171			25	1	
H. Nuclear regulatory requirements					6	
J. Grid failure or grid unavailability						7
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				28	52	
Z. Others		32				
Subtotal	762	44	0	851	275	7
Total		806			1133	

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

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		12
12. Reactor I&C Systems		14
14. Safety Systems		10
15. Reactor Cooling Systems		17
16. Steam generation systems		44
31. Turbine and auxiliaries		80
32. Feedwater and Main Steam System		23
33. Circulating Water System		0
41. Main Generator Systems	12	7
42. Electrical Power Supply Systems		0
Total	12	207

## BE-4 DOEL-2

**Operator:** ELECTRAB (ELECTRABEL M. V. NUCLEAIRE PRODUKTIE)  
**Contractor:** ACECOWEN (ACECOWEN ( ACEC-COCKERILL-WESTINGHOUSE ))

### 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 392.0 MW(e)  
**Design Net Capacity:** 392.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 3142.6 GW(e).h  
**Energy Availability Factor:** 90.1%  
**Load Factor:** 91.5%  
**Operating Factor:** 93.4%  
**Energy Unavailability Factor:** 9.9%  
**Total Off-line Time:** 576 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	298.6	269.4	297.3	285.4	249.6	47.0	291.7	249.9	284.7	298.3	289.9	280.7	3142.6
<b>EAF (%)</b>	100.0	100.0	100.0	99.6	85.6	16.6	99.9	86.0	100.0	100.0	99.9	93.5	90.1
<b>UCF (%)</b>	100.0	100.0	100.0	99.8	99.6	21.9	99.9	97.9	100.0	100.0	99.9	97.2	93.1
<b>LF (%)</b>	102.4	102.3	101.9	101.3	85.6	16.7	100.0	85.7	100.9	102.2	102.7	96.3	91.5
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	24.2	100.0	98.5	100.0	100.0	100.0	97.4	93.4
<b>EUf (%)</b>	0.0	0.0	0.0	0.4	14.4	83.4	0.1	14.0	0.0	0.0	0.1	6.5	9.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.4	76.3	0.1	0.0	0.0	0.0	0.0	0.0	6.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.2	0.0	1.9	0.0	2.2	0.0	0.0	0.1	2.8	0.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.2	14.0	5.3	0.0	11.8	0.0	0.0	0.0	3.8	3.0

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Sep 1971      **Lifetime Generation:** 78555.5 GW(e).h  
**Date of First Criticality:** 04 Aug 1975      **Cumulative Energy Availability Factor:** 80.2%  
**Date of Grid Connection:** 21 Aug 1975      **Cumulative Load Factor:** 80.3%  
**Date of Commercial Operation:** 01 Dec 1975      **Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	2582.0	395.0	74.2	96.3	74.2	76.7	74.6	76.7	6598	75.3
1983	2017.0	393.0	58.5	91.6	58.5	74.4	58.6	74.4	5190	59.2
1984	2916.0	393.0	84.2	90.8	84.1	75.5	84.5	75.5	7508	85.5
1985	2908.7	392.0	83.0	90.0	83.0	76.2	84.7	76.5	7341	83.8
1986	2282.6	392.0	69.8	88.2	69.8	75.6	66.5	75.6	5891	67.2
1987	2616.4	400.0	77.8	87.3	76.8	75.7	74.7	75.5	6612	75.5
1988	2906.7	400.0	83.2	87.0	82.6	76.3	82.7	76.0	7408	84.3
1989	2479.8	400.0	71.8	85.9	70.8	75.9	70.8	75.7	6436	73.5
1990	1982.6	400.0	66.5	84.6	56.6	74.6	56.6	74.4	5170	59.0
1991	2779.8	400.0	81.2	84.4	81.0	75.0	79.3	74.7	7136	81.5
1992	2971.9	400.0	86.3	84.5	86.1	75.6	84.6	75.3	7617	86.7
1993	2949.5	400.0	85.9	84.6	85.7	76.2	84.2	75.8	7551	86.2
1994	2982.4	392.0	87.3	84.7	86.2	76.7	86.9	76.4	7810	89.2
1995	2867.5	392.0	82.9	84.6	82.7	77.0	83.5	76.7	7342	83.8
1996	2888.8	392.0	83.4	84.6	83.1	77.3	83.9	77.0	7390	84.1
1997	2935.0	392.0	87.7	84.7	84.5	77.6	85.5	77.4	7749	88.5
1998	3145.0	392.0	90.2	84.9	90.1	78.2	91.6	78.0	7987	91.2
1999	3091.7	392.0	89.6	85.1	88.9	78.6	90.0	78.5	7875	89.9
2000	3135.6	392.0	90.4	85.3	89.8	79.1	91.1	79.0	8022	91.3
2001	3150.5	392.0	90.9	85.5	90.3	79.5	91.7	79.5	8060	92.0
2002	3104.5	392.0	91.4	85.8	89.5	79.9	90.4	79.9	8076	92.2
2003	3142.6	392.0	93.1	86.0	90.1	80.2	91.5	80.3	8184	93.4

## BE-4 DOEL-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
27 Apr	967.0	56.1	XP	S	STRETCH-OUT
04 May	42.0	1.1	PP	D31	CONDENSOR PART OUT OF ORDER FOR REPAIR LEAKAGE.
06 Jun	532.0	208.8	PF	C	REFUELING OUTAGE
29 Jun	13.0	5.3	UF3	Z	REFUELING OUTAGE EXTENSION
29 Jun	34.0	6.2	PP	C	START-UP AFTER REFUELING OUTAGE
06 Aug	168.0	33.0	XP	N	MODULATION DUE TO COOLING WATER TEMPERATURE LIMITS
22 Aug	10.0	6.3	UF4	A32	FEEDWATER SYSTEM FAILURE
23 Dec	5.0	0.9	UP1	A41	STOP FOR REPAIR EARTH FAULT ROTOR - PARTIAL
24 Dec	18.0	7.2	UF1	A41	STOP FOR REPAIR EARTH FAULT ROTOR - TOTAL
24 Dec	38.0	11.0	XP	K	MODULATION FOR GENCO (= GRID OWNER)

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1975 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		28			353	
B. Refuelling without a maintenance					17	
C. Inspection, maintenance or repair combined with refuelling	532			831		
D. Inspection, maintenance or repair without refuelling				187		
E. Testing of plant systems or components				76	16	
J. Grid failure or grid unavailability						15
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				10	12	
Z. Others		13				
Subtotal	532	41	0	1104	398	15
Total		573			1517	

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

System	2003 Hours Lost	1975 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		12
13. Reactor Auxiliary Systems		6
14. Safety Systems		10
15. Reactor Cooling Systems		29
16. Steam generation systems		103
31. Turbine and auxiliaries		100
32. Feedwater and Main Steam System	10	19
41. Main Generator Systems	18	12
42. Electrical Power Supply Systems		10
Total	28	301

## BE-5 DOEL-3

**Operator:** ELECTRAB (ELECTRABEL M. V. NUCLEAIRE PRODUKTIE)  
**Contractor:** FRAMACEC (FRAMACECO ( FRAMATOME-ACEC-COCKERILL ))

### 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1006.0 MW(e)  
**Design Net Capacity:** 890.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 7870.8 GW(e).h  
**Energy Availability Factor:** 89.7%  
**Load Factor:** 89.3%  
**Operating Factor:** 90.5%  
**Energy Unavailability Factor:** 10.3%  
**Total Off-line Time:** 832 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	753.5	657.4	153.8	697.8	620.0	594.9	720.3	720.6	717.6	752.5	728.0	754.5	7870.8
<b>EAF (%)</b>	100.0	96.2	20.5	96.4	82.8	82.9	99.5	99.8	100.0	100.0	100.0	100.0	89.7
<b>UCF (%)</b>	100.0	96.2	20.5	96.4	82.8	83.6	99.9	100.0	100.0	100.0	100.0	100.0	89.8
<b>LF (%)</b>	100.7	97.3	20.5	96.5	82.8	82.1	96.2	96.3	99.1	100.4	100.5	100.8	89.3
<b>OF (%)</b>	100.0	97.6	22.4	100.1	82.9	84.3	100.0	100.0	100.0	100.0	100.0	100.0	90.5
<b>EUf (%)</b>	0.0	3.8	79.5	3.6	17.2	17.1	0.5	0.2	0.0	0.0	0.0	0.0	10.3
<b>PUF (%)</b>	0.0	0.0	79.5	1.9	17.2	11.9	0.0	0.0	0.0	0.0	0.0	0.0	9.3
<b>UCLF (%)</b>	0.0	3.8	0.0	1.7	0.0	4.5	0.1	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	0.7	0.3	0.2	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Jan 1975      **Lifetime Generation:** 151275.2 GW(e).h  
**Date of First Criticality:** 14 Jun 1982      **Cumulative Energy Availability Factor:** 85.5%  
**Date of Grid Connection:** 23 Jun 1982      **Cumulative Load Factor:** 85.4%  
**Date of Commercial Operation:** 01 Oct 1982      **Cumulative Unit Capability Factor:** 77.6%  
**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 (%)
1982	2631.0	944.0	0.0	0.0	80.5	100.0	33.9	0.0	3505	42.6
1983	6705.0	900.0	100.0	100.0	85.0	85.0	85.0	85.0	7807	89.1
1984	7074.0	900.0	89.5	94.8	89.5	87.3	89.5	87.3	8084	92.0
1985	6496.3	900.0	82.4	90.6	82.4	85.7	82.4	85.6	7515	85.8
1986	6860.0	897.0	100.0	93.0	88.5	86.4	87.3	86.1	8007	91.4
1987	5713.2	897.0	75.7	89.5	73.5	83.8	72.7	83.4	6905	78.8
1988	6777.5	890.0	88.7	89.4	85.9	84.1	86.7	83.9	7875	89.7
1989	5774.9	900.0	82.1	88.3	73.4	82.6	73.2	82.4	7470	85.3
1990	6811.8	900.0	89.9	88.5	86.4	83.1	86.4	82.9	8021	91.6
1991	6742.9	900.0	90.0	88.7	85.8	83.4	85.5	83.2	7913	90.3
1992	6732.2	900.0	92.3	89.1	90.1	84.1	85.2	83.4	7778	88.5
1993	5377.2	900.0	69.6	87.3	65.8	82.4	68.2	82.0	6198	70.8
1994	7482.3	970.0	88.4	87.4	87.7	82.9	88.1	82.6	7888	90.0
1995	7025.1	970.0	83.4	87.1	82.6	82.9	82.7	82.6	7396	84.4
1996	7334.2	993.0	84.4	86.8	83.8	82.9	84.1	82.7	7447	84.8
1997	8108.2	1006.0	93.5	87.3	91.9	83.6	92.0	83.4	8250	94.2
1998	8012.6	1006.0	92.0	87.7	90.9	84.1	90.9	83.9	8171	93.3
1999	8231.2	1006.0	94.8	88.1	93.4	84.7	93.4	84.5	8330	95.1
2000	7884.9	1006.0	89.3	88.2	89.0	84.9	89.2	84.8	7892	89.8
2001	7993.3	1006.0	90.9	88.3	90.2	85.2	90.7	85.1	7989	91.2
2002	7636.6	1006.0	86.7	88.2	86.2	85.3	86.7	85.2	7647	87.3
2003	7870.8	1006.0	89.8	88.3	89.7	85.5	89.3	85.4	7928	90.5



## BE-5 DOEL-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
16 Feb	16.0	24.9	UF4	A15	SCRAM DUE TO FAILURE PRESSURIZER SAFETY VALVE
07 Mar	576.0	580.3	PF	C	REFUELING OUTAGE
31 Mar	72.0	28.4	PP	C	STARTUP AFTER REFUELING OUTAGE
04 Apr	361.0	12.3	UP	A31	MECHANICAL PROBLEM HP-TURBINE
26 May	208.0	210.1	PF	D31	STOP FOR INSPECTION TURBINE
04 Jun	32.0	32.7	UF	A42	BREAKER TRIP DUE TO MALFUNCTION OF SWITCH 24 KV (EARTHFAULT)

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		48			185	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	576			713	2	
D. Inspection, maintenance or repair without refuelling	208					
E. Testing of plant systems or components				1	1	
H. Nuclear regulatory requirements					1	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					12	
Subtotal	784	48	0	714	201	0
Total		832			915	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		14
12. Reactor I&C Systems		1
13. Reactor Auxiliary Systems		1
15. Reactor Cooling Systems	16	35
16. Steam generation systems		64
17. Safety I&C Systems (excluding reactor I&C)		21
31. Turbine and auxiliaries		22
32. Feedwater and Main Steam System		10
41. Main Generator Systems		8
42. Electrical Power Supply Systems	32	5
Total	48	181

## BE-7 DOEL-4

**Operator:** ELECTRAB (ELECTRABEL M. V. NUCLEAIRE PRODUKTIE)  
**Contractor:** ACECOWEN (ACECOWEN ( ACEC-COCKERILL-WESTINGHOUSE ))

### 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 985.0 MW(e)  
**Design Net Capacity:** 1000.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 7781.2 GW(e).h  
**Energy Availability Factor:** 90.5%  
**Load Factor:** 90.2%  
**Operating Factor:** 91.5%  
**Energy Unavailability Factor:** 9.5%  
**Total Off-line Time:** 745 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	726.1	660.7	703.3	703.4	726.8	684.2	7.2	709.4	699.1	729.1	705.4	726.3	7781.2
<b>EAF (%)</b>	98.7	99.8	96.5	99.7	100.0	97.0	0.8	98.7	99.6	99.4	99.4	98.9	90.5
<b>UCF (%)</b>	100.0	100.0	96.5	100.0	100.0	98.8	0.8	98.7	100.0	100.0	100.0	100.0	91.1
<b>LF (%)</b>	99.1	99.8	96.0	99.3	99.2	96.5	1.0	96.8	98.6	99.4	99.5	99.1	90.2
<b>OF (%)</b>	100.0	100.0	96.8	100.1	100.0	99.0	3.9	100.0	100.0	100.0	100.0	100.0	91.5
<b>EUf (%)</b>	1.3	0.2	3.5	0.3	0.0	3.0	99.2	1.3	0.4	0.6	0.6	1.1	9.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	1.2	97.3	1.3	0.0	0.0	0.0	0.0	8.5
<b>UCLF (%)</b>	0.0	0.0	3.5	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.5
<b>XUF (%)</b>	1.3	0.2	0.0	0.3	0.0	1.8	0.0	0.0	0.3	0.6	0.6	1.1	0.5

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Dec 1978      **Lifetime Generation:** 134698.2 GW(e).h  
**Date of First Criticality:** 31 Mar 1985      **Cumulative Energy Availability Factor:** 82.9%  
**Date of Grid Connection:** 08 Apr 1985      **Cumulative Load Factor:** 82.8%  
**Date of Commercial Operation:** 01 Jul 1985      **Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1985	4282.1	981.0	0.0	0.0	76.0	100.0	50.8	0.0	5263	61.3
1986	7722.9	1006.0	90.6	90.6	90.6	90.6	87.6	87.6	7973	91.0
1987	6809.3	1006.0	81.4	86.0	77.0	83.8	77.3	82.5	7448	85.0
1988	7552.0	1000.0	87.6	86.5	85.9	84.5	86.0	83.6	7784	88.6
1989	7445.9	1010.0	87.4	86.8	84.4	84.5	84.2	83.8	7737	88.3
1990	7535.8	1010.0	88.2	87.0	85.3	84.7	85.2	84.0	7790	88.9
1991	7425.4	1010.0	84.8	86.7	84.1	84.6	83.9	84.0	7673	87.6
1992	7418.6	1010.0	86.7	86.7	85.9	84.8	83.6	84.0	7481	85.2
1993	6980.9	1010.0	79.6	85.8	78.9	84.0	78.9	83.3	7112	81.2
1994	3462.7	1001.0	39.2	80.7	39.2	79.1	39.5	78.5	3637	41.5
1995	6769.7	1001.0	76.9	80.3	76.8	78.8	77.2	78.4	7381	84.3
1996	6186.8	1001.0	70.6	79.4	69.9	78.0	70.4	77.6	6565	74.7
1997	7548.7	1001.0	87.1	80.0	87.0	78.8	86.1	78.3	7653	87.4
1998	7844.0	985.0	90.0	80.8	90.0	79.6	90.9	79.3	7998	91.3
1999	8008.4	985.0	92.5	81.6	92.4	80.5	92.8	80.2	8150	93.0
2000	7992.9	985.0	92.0	82.3	92.0	81.3	92.4	81.0	8323	94.8
2001	8098.9	985.0	93.3	83.0	93.2	82.0	93.9	81.8	8264	94.3
2002	7831.9	985.0	90.6	83.4	90.4	82.5	90.8	82.3	8017	91.5
2003	7781.2	985.0	91.1	83.8	90.5	82.9	90.2	82.8	8015	91.5

## BE-7 DOEL-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
21 Mar	22.0	23.1	UF4	E31	SCRAM DURING VACUUM TEST
09 Jun	511.0	12.5	XP1	S	STRETCH-OUT
30 Jun	722.0	712.1	PF	C	REFUELING OUTAGE
30 Jul	81.0	17.9	PP	C	STARTUP AFTER REFUELING OUTAGE
30 Jul	15.0	14.5	UP	H	POWER LIMITATION DURING STARTUP DUE TO CHEMISTRY PROBLEM

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					333	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	722			833		
D. Inspection, maintenance or repair without refuelling				36		
E. Testing of plant systems or components		22		2		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					64	
Subtotal	722	22	0	871	398	0
Total		744			1269	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		0
14. Safety Systems		1
15. Reactor Cooling Systems		23
16. Steam generation systems		274
31. Turbine and auxiliaries		8
32. Feedwater and Main Steam System		15
33. Circulating Water System		0
41. Main Generator Systems		4
42. Electrical Power Supply Systems		2
Total	0	327

# BE-3 TIHANGE-1

**Operator:** ELECTRAB (ELECTRABEL M. V. NUCLEAIRE PRODUKTIE)  
**Contractor:** ACLF ((ACECOWEN - CREUSOT LOIRE - FRAMATOME))

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 962.0 MW(e)  
**Design Net Capacity:** 870.0 MW(e)  
**Design Discharge Burnup:** 37000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7990.4 GW(e).h  
**Energy Availability Factor:** 95.1%  
**Load Factor:** 94.8%  
**Operating Factor:** 97.6%  
**Energy Unavailability Factor:** 4.9%  
**Total Off-line Time:** 209 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	724.1	654.3	695.8	687.4	612.8	642.6	683.8	588.8	598.5	727.7	670.7	704.0	7990.4
<b>EAF (%)</b>	100.0	100.0	96.9	100.0	86.6	96.4	100.0	84.6	86.4	100.0	95.2	95.6	95.1
<b>UCF (%)</b>	100.0	100.0	96.9	100.0	86.6	96.4	100.0	89.7	86.4	100.0	95.2	95.6	95.5
<b>LF (%)</b>	101.2	101.2	97.2	99.3	85.6	92.8	95.5	82.3	86.4	101.5	96.8	98.4	94.8
<b>OF (%)</b>	100.0	100.0	97.0	100.0	96.0	96.4	100.0	100.0	86.5	100.0	95.3	100.0	97.6
<b>EUf (%)</b>	0.0	0.0	3.1	0.0	13.4	3.6	0.0	15.4	13.6	0.0	4.8	4.4	4.9
<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	3.1	0.0	13.4	3.6	0.0	10.3	13.6	0.0	4.9	4.4	4.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	0.0	0.0	0.0	0.0	0.4

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1970      **Lifetime Generation:** 184539.9 GW(e).h  
**Date of First Criticality:** 21 Feb 1975      **Cumulative Energy Availability Factor:** 82.9%  
**Date of Grid Connection:** 07 Mar 1975      **Cumulative Load Factor:** 82.6%  
**Date of Commercial Operation:** 01 Oct 1975      **Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	6164.8	870.0	80.9	94.5	80.9	76.0	80.9	75.9	7269	83.0
1983	5843.0	870.0	76.6	92.3	76.6	76.1	76.7	76.0	7135	81.4
1984	6374.0	870.0	83.4	91.3	83.4	76.9	83.4	76.8	7774	88.5
1985	5979.0	870.0	90.8	91.3	81.1	77.3	78.5	77.0	8077	92.2
1986	4005.0	870.0	59.1	88.3	54.8	75.3	52.6	74.8	5429	62.0
1987	7337.0	870.0	98.5	89.2	97.6	77.1	96.3	76.6	8733	99.7
1988	6310.0	870.0	84.9	88.8	83.9	77.6	82.6	77.0	7520	85.6
1989	6508.0	870.0	88.4	88.8	87.9	78.4	85.4	77.6	7854	89.7
1990	6683.0	870.0	90.8	89.0	88.4	79.0	87.7	78.3	8082	92.3
1991	6163.0	870.0	86.7	88.8	81.0	79.2	80.9	78.5	7714	88.1
1992	6059.0	870.0	80.5	88.3	79.1	79.2	79.3	78.5	7807	88.9
1993	7317.0	870.0	99.8	89.0	96.4	80.1	96.0	79.5	8459	96.6
1994	6737.0	863.0	90.7	89.0	90.0	80.6	89.1	80.0	8018	91.5
1995	5442.0	882.0	72.9	88.2	69.9	80.1	70.4	79.5	6488	74.1
1996	7210.7	931.0	88.4	88.2	88.2	80.5	88.2	79.9	7823	89.1
1997	7942.6	962.0	95.5	88.6	94.3	81.2	94.3	80.7	8385	95.7
1998	7264.0	962.0	87.4	88.5	86.3	81.4	86.2	80.9	7777	88.8
1999	7272.0	962.0	86.9	88.5	85.5	81.6	86.3	81.2	7905	90.2
2000	8457.0	962.0	99.3	88.9	99.3	82.4	100.1	82.0	8782	100.0
2001	6969.0	962.0	91.2	89.0	82.5	82.4	82.7	82.0	7481	85.4
2002	7047.2	962.0	86.0	88.9	83.9	82.4	83.6	82.1	7631	87.1
2003	7990.4	962.0	95.5	89.2	95.1	82.9	94.8	82.6	8552	97.6

## BE-3 TIHANGE-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
26 Mar	22.0	21.6	UF4	A32	REACTOR SCRAM FOLLOWING SHUTDOWN OF FEEDWATER VALVE.
06 May	153.0	66.3	UP2	A31	UNPLANNED SHUTDOWN OF SOUTH GROUP (1/2 POWER) DUE TO INTERN LEAK ON A STEAM REHEATER.
14 May	30.0	29.7	UF4	A12	SCRAM DURING A REACTOR PROTECTION TEST.
06 Jun	26.0	25.0	UF4	A33	REACTOR SCRAM BY LOW LEVEL STEAM GENERATOR 1 DUE TO THE AUTOMATIC SHUTDOWN OF A CIRCULATING PUMP.
07 Aug	241.0	36.7	XP	N33	POWER LIMITATION DUE TO DRY WEATHER AND LACK OF COOLING WATER.
25 Aug	154.0	73.9	UP	A42	SHUTDOWN OF THE SOUTH GROUP (1/2 POWER) DUE TO DAMAGE ON 6KV CABLE.
01 Sep	97.0	93.9	UF4	A42	SCRAM DUE TO DAMAGE ON A MAIN TRANSFORMER.
28 Nov	34.0	33.5	UF4	A32	SCRAM BY ELECTRIC DEFECT ON A MAIN CONDENSATE PUMP.
07 Dec	68.0	31.5	UP	A31	STOP OF NORTH GROUP (1/2 POWER) DUE TO INTERN LEAK ON STEAM REHEATER.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1975 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		209			92	
C. Inspection, maintenance or repair combined with refuelling				863		
D. Inspection, maintenance or repair without refuelling				14		
G. Major back-fitting, refurbishment or upgrading activities without refuelling						10
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					5	98
L. Human factor related					1	
Subtotal	0	209	0	877	98	108
Total		209			1083	

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

System	2003 Hours Lost	1975 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	30	9
14. Safety Systems		2
15. Reactor Cooling Systems		31
16. Steam generation system:		16
31. Turbine and auxiliaries		14
32. Feedwater and Main Steam System	56	5
33. Circulating Water System	26	0
42. Electrical Power Supply System:	97	9
XX. Miscellaneous Systems		1
Total	209	87

# BE-6 TIHANGE-2

**Operator:** ELECTRAB (ELECTRABEL M. V. NUCLEAIRE PRODUKTIE)  
**Contractor:** FRAMACEC (FRAMACECO ( FRAMATOME-ACEC-COCKERILL ))

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1008.0 MW(e)  
**Design Net Capacity:** 902.0 MW(e)  
**Design Discharge Burnup:** 33700 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7601.0 GW(e).h  
**Energy Availability Factor:** 85.6%  
**Load Factor:** 86.1%  
**Operating Factor:** 86.6%  
**Energy Unavailability Factor:** 14.4%  
**Total Off-line Time:** 1171 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	761.9	693.2	762.7	729.4	625.2	691.8	673.5	698.3	721.7	431.3	49.0	763.2	7601.0
<b>EAF (%)</b>	99.3	99.8	99.9	99.4	82.7	96.0	91.1	94.2	99.9	57.8	6.8	100.0	85.6
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	83.6	96.5	91.2	100.0	100.0	58.1	6.8	100.0	86.3
<b>LF (%)</b>	101.6	102.3	101.7	100.5	83.4	95.3	89.8	93.1	99.4	57.5	6.8	101.8	86.1
<b>OF (%)</b>	100.0	100.0	99.9	100.0	84.7	98.2	91.9	100.0	100.0	58.1	6.8	100.0	86.6
<b>EUf (%)</b>	0.7	0.2	0.1	0.6	17.3	4.0	8.9	5.8	0.1	42.2	93.2	0.0	14.4
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	16.5	0.0	0.0	0.0	0.0	41.9	88.8	0.0	12.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	3.5	8.9	0.0	0.0	0.0	4.4	0.0	1.4
<b>XUF (%)</b>	0.7	0.2	0.1	0.6	0.8	0.5	0.1	5.8	0.1	0.3	0.0	0.0	0.8

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1976      **Lifetime Generation:** 146896.4 GW(e).h  
**Date of First Criticality:** 05 Oct 1982      **Cumulative Energy Availability Factor:** 86.9%  
**Date of Grid Connection:** 13 Oct 1982      **Cumulative Load Factor:** 86.7%  
**Date of Commercial Operation:** 01 Jul 1983      **Cumulative Unit Capability Factor:** 77.7%  
**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 (%)
1982	0.0	960.0	0.0	0.0	0.0	100.0	0.0	0.0	0	0.0
1983	5507.0	901.0	0.0	0.0	69.8	100.0	69.8	0.0	6373	72.8
1984	6856.0	901.0	86.4	86.4	86.4	86.4	86.6	86.6	7693	87.6
1985	6636.0	900.0	89.4	87.9	87.8	87.1	84.2	85.4	7890	90.1
1986	6189.0	900.0	85.0	86.9	83.1	85.7	78.5	83.1	7509	85.7
1987	6584.0	900.0	84.3	86.3	83.4	85.2	83.5	83.2	7477	85.4
1988	6966.0	900.0	89.9	87.0	87.9	85.7	88.1	84.2	7992	91.0
1989	6663.0	901.0	86.0	86.8	84.7	85.6	84.4	84.2	7728	88.2
1990	6919.0	901.0	88.5	87.1	88.0	85.9	87.7	84.7	7827	89.3
1991	6850.0	901.0	88.4	87.2	87.7	86.1	86.8	85.0	7790	88.9
1992	6746.0	901.0	89.7	87.5	86.9	86.2	85.2	85.0	7912	90.1
1993	6555.0	901.0	86.4	87.4	83.6	86.0	83.1	84.8	7507	85.7
1994	7585.0	894.0	98.3	88.4	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	85.8	7697	87.9
1996	7253.0	943.0	88.6	88.5	87.0	86.8	87.6	86.0	7810	88.9
1997	6854.0	960.0	82.3	88.1	81.3	86.4	81.5	85.6	7241	82.7
1998	7664.0	960.0	91.0	88.3	90.6	86.7	91.1	86.0	8015	91.5
1999	8111.0	960.0	95.5	88.8	95.5	87.2	96.4	86.7	8380	95.7
2000	7481.0	960.0	89.4	88.8	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	88.4	87.9	87.0	88.7	86.7	7821	89.3
2003	7601.0	1008.0	86.3	88.3	85.6	86.9	86.1	86.7	7589	86.6

**BE-6 TIHANGE-2****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
20 May	122.0	123.4	PF	D15	PLANNED SHUT DOWN FOR INSPECTION OF PRIMARY PIPES.
10 Jun	13.0	13.8	UF2	A15	UNPLANNED SHUTDOWN TO CHECK A PRIMARY VALVE.
25 Jun	93.0	11.4	UP2	A32	UNPLANNED LOAD REDUCTION (100 MW) DUE TO AUTOMATIC SHUTDOWN OF A DRAINS TRANSFER PUMP.
23 Jul	53.0	66.4	UF2	A31	UNPLANNED SHUTDOWN DUE TO STEAM LEAK IN THE HP CASING OF THE TURBINE.
06 Aug	258.0	43.2	XP	N33	POWER LIMITATION DUE TO DRY WEATHER AND LACK OF COOLING WATER.
19 Oct	951.0	958.9	PF	C	INSPECTION AND MAINTENANCE COMBINED WITH REFUELLING.
26 Nov	32.0	32.1	UF3	A41	EXTENSION OF THE PLANNED OUTAGE FOR REFUELLING (DUE TO ABNORMAL VIBRATION ON THE BRUSHLESS).

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

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		98			113	
B. Refuelling without a maintenanc					17	
C. Inspection, maintenance or repai combined with refuelling	951			722		
D. Inspection, maintenance or repai without refuelling	122			99		
E. Testing of plant systems or component					3	
G. Major back-fitting, refurbishment o upgrading activities without refuellin						19
K. Load-following (frequency contro reserve shutdown due to reduced energ demand)				17	33	
Subtotal	1073	98	0	838	166	19
Total		1171			1023	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		7
14. Safety Systems		3
15. Reactor Cooling System:	13	18
16. Steam generation system:		34
31. Turbine and auxiliaries:	53	9
32. Feedwater and Main Steam System		10
41. Main Generator System:	32	0
42. Electrical Power Supply System:		0
Total	98	87

# BE-8 TIHANGE-3

**Operator:** ELECTRAB (ELECTRABEL M. V. NUCLEAIRE PRODUKTIE)  
**Contractor:** ACECOWEN (ACECOWEN ( ACEC-COCKERILL-WESTINGHOUSE ))

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1015.0 MW(e)  
**Design Net Capacity:** 1006.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7661.5 GW(e).h  
**Energy Availability Factor:** 86.5%  
**Load Factor:** 86.2%  
**Operating Factor:** 89.6%  
**Energy Unavailability Factor:** 13.5%  
**Total Off-line Time:** 915 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	767.5	675.5	653.8	178.4	314.4	714.9	722.6	686.0	715.2	751.4	730.1	751.7	7661.5
<b>EAF (%)</b>	99.9	98.5	86.7	24.4	41.4	99.6	98.0	92.4	99.4	99.4	99.8	99.0	86.5
<b>UCF (%)</b>	100.0	100.0	100.0	33.4	41.5	100.0	98.7	100.0	99.8	100.0	100.0	100.0	89.4
<b>LF (%)</b>	101.6	99.0	86.6	24.4	41.6	97.8	95.7	90.8	97.9	99.4	99.9	99.5	86.2
<b>OF (%)</b>	100.0	100.0	99.9	30.1	44.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.6
<b>EUf (%)</b>	0.1	1.5	13.3	75.6	58.6	0.4	2.0	7.6	0.6	0.6	0.2	1.0	13.5
<b>PUF (%)</b>	0.0	0.0	0.0	66.6	58.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.2	0.0	0.0	0.0	0.1
<b>XUF (%)</b>	0.1	1.5	13.3	9.0	0.0	0.4	0.7	7.6	0.4	0.6	0.2	1.0	2.9

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1978  
**Date of First Criticality:** 05 Jun 1985  
**Date of Grid Connection:** 15 Jun 1985  
**Date of Commercial Operation:** 01 Sep 1985

**Lifetime Generation:** 139735.0 GW(e).h  
**Cumulative Energy Availability Factor:** 87.3%  
**Cumulative Load Factor:** 87.1%  
**Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
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	89.0	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



**BE-8 TIHANGE-3****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
12 Feb	1391.0	176.4	XP	S	STRETCH-OUT.
10 Apr	915.0	928.9	PF	C	INSPECTION, MAINTENANCE AND REFUELLING.
06 Aug	259.0	49.7	XP	N33	POWER LIMITATION DUE TO DRY WEATHER AND LACK OF COOLING WATER.

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

Outage Cause	2003 Hours Lost			1986 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					150	
B. Refuelling without a maintenance					5	
C. Inspection, maintenance or repair combined with refuelling	915			637		
D. Inspection, maintenance or repair without refuelling				6		
E. Testing of plant systems or component				1		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				29		21
H. Nuclear regulatory requirement					3	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				8		
Subtotal	915	0	0	681	158	21
Total		915			860	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1986 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		8
15. Reactor Cooling System:		23
16. Steam generation system:		58
31. Turbine and auxiliaries:		38
32. Feedwater and Main Steam System		3
33. Circulating Water System		11
41. Main Generator System:		2
42. Electrical Power Supply System:		3
Total	0	146

# BR-1 ANGRA-1

**Operator:** ELETRONU (ELETROBRAS TERMONUCLEAR SA - ELETRONUCLEAR)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 626.0 MW(e)  
**Design Net Capacity:** 626.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3137.1 GW(e).h  
**Energy Availability Factor:** 57.2%  
**Load Factor:** 57.2%  
**Operating Factor:** 74.8%  
**Energy Unavailability Factor:** 42.8%  
**Total Off-line Time:** 2209 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	345.2	321.3	354.4	353.1	364.3	333.5	364.9	74.8	0.0	0.0	261.0	364.5	3137.1
<b>EAF (%)</b>	74.1	76.4	76.1	78.3	78.2	74.0	78.3	16.1	0.0	0.0	57.9	78.3	57.2
<b>UCF (%)</b>	100.0	98.9	97.5	100.0	99.7	96.7	100.0	21.9	0.0	0.0	81.5	100.0	74.5
<b>LF (%)</b>	74.1	76.4	76.1	78.5	78.2	74.0	78.3	16.1	0.0	0.0	57.9	78.3	57.2
<b>OF (%)</b>	100.0	99.0	100.0	100.1	100.0	96.7	100.0	21.9	0.0	0.0	81.5	100.0	74.8
<b>EUAF (%)</b>	25.9	23.6	23.9	21.7	21.8	26.0	21.7	83.9	100.0	100.0	42.1	21.7	42.8
<b>PUF (%)</b>	0.0	0.0	2.5	0.0	0.3	3.3	0.0	0.0	86.7	100.0	15.7	0.0	17.4
<b>UCLF (%)</b>	0.0	1.1	0.0	0.0	0.0	0.0	0.0	78.1	13.3	0.0	2.8	0.0	8.0
<b>XUF (%)</b>	25.9	22.5	21.4	21.7	21.5	22.7	21.7	5.8	0.0	0.0	23.6	21.7	17.3

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1971      **Lifetime Generation:** 38410.6 GW(e).h  
**Date of First Criticality:** 13 Mar 1982      **Cumulative Energy Availability Factor:** 48.7%  
**Date of Grid Connection:** 01 Apr 1982      **Cumulative Load Factor:** 38.2%  
**Date of Commercial Operation:** 01 Jan 1985      **Cumulative Unit Capability Factor:** 77.8%  
**Cumulative Energy Unavailability Factor:** 51.3%

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 (%)
1982	51.7	626.0	0.0	0.0	27.2	100.0	0.9	0.0	413	4.7
1983	162.5	626.0	0.0	0.0	3.0	100.0	3.0	0.0	1127	12.9
1984	1545.5	626.0	0.0	0.0	28.1	100.0	28.1	0.0	3771	42.9
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	30.8	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	60.6	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

# BR-1 ANGRA-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	2160.0	315.1	XP1	K42	LOAD FOLLOWING
18 Feb	7.0	4.4	UF4	A32	GRID DISTURBANCES CAUSED THE PLANT OUTPUT BREAKERS TO OPEN, LEADING THE UNIT TO A FULL LOAD REJECTION EVENT AND DURING THE PLANT RECONNECTION TO THE SYSTEM A SMALL DISTURBANCE HAPPENED IN THE CONDENSATE SYSTEM AND A MALFUNCTION OF CONDENSATE PUMPS RECIRCULATION VALVE CAUSED THE CONDENSATE PUMPS TRIP RESULTING IN THE REACTOR SCRAM DUE TO STEAM GENERATOR LOW-LOW LEVEL.
08 Mar	18.0	11.6	PP	D16	POWER REDUCTION TO REPAIR IN THE SG SLUDGE LANCING
01 Apr	2184.0	299.9	XP1	K	LOAD FOLLOWING
14 Jun	24.0	15.0	PF	D16	UNIT WAS TAKEN OUT FROM THE GRID AS PREVIOUSLY SCHEDULED, IN ORDER TO REMAKE THE REPAIR AT THE FLANGE OF THE STEAM GENERATOR 2 SLUDGE LANCING ACCESS DOOR AND TO REPAIR THE LEAKING CONNECTION OF THE REACTOR COOLANT FLOW INSTRUMENT (FT-416) ROOT VALVE
01 Jul	1488.0	128.1	XP1	K	LOAD FOLLOWING
07 Aug	581.0	363.7	UF2	A16	DUE TO THE PRIMARY-TO-SECONDARY LEAK RATE, THE BEGINNING OF REFUELLING OUTAGE (P-12) WAS ANTICIPATED 53 DAYS FROM THE ORIGINAL SCHEDULE
01 Sep	96.0	60.1	UF	A16	UNPLANNED SHUTDOWN FOR REFUELLING DUE INCREASE SG LEAKAGE RATE
04 Sep	624.0	390.6	PF	C	REFUELLING
01 Oct	857.0	536.5	PF	C	REFUELLING
01 Nov	720.0	106.3	XP1	K	LOAD FOLLOWING
06 Nov	20.0	12.5	UF1	A16	REACTOR SHUTDOWN DUE SG LEVEL LOW
01 Dec	744.0	101.3	XP1	K	LOAD FOLLOWING

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1982 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		704			1698	0
B. Refuelling without a maintenance				46	6	
C. Inspection, maintenance or repair combined with refuelling	1481			1006		
D. Inspection, maintenance or repair without refuelling	24			192	14	
E. Testing of plant systems or components				85	0	
H. Nuclear regulatory requirements				67	0	13
J. Grid failure or grid unavailability					6	3
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					31	14
L. Human factor related						375
Subtotal	1505	704	0	1396	1755	405
Total		2209			3556	

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

System	2003 Hours Lost	1982 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		35
13. Reactor Auxiliary Systems		111
15. Reactor Cooling Systems		6
16. Steam generation systems	697	7
21. Fuel Handling and Storage Facilities		392
31. Turbine and auxiliaries		136
32. Feedwater and Main Steam System	7	65
33. Circulating Water System		9
41. Main Generator Systems		556
42. Electrical Power Supply Systems		310
Total	704	1627

## BR-2 ANGRA-2

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

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

### 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1275.0 MW(e)  
**Design Net Capacity:** 1245.0 MW(e)  
**Design Discharge Burnup:** 34000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 9419.0 GW(e).h  
**Energy Availability Factor:** 84.3%  
**Load Factor:** 84.3%  
**Operating Factor:** 91.5%  
**Energy Unavailability Factor:** 15.7%  
**Total Off-line Time:** 741 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	752.1	679.3	750.8	337.2	559.7	915.6	933.1	952.9	924.3	778.0	893.5	942.6	9419.0
<b>EAF (%)</b>	79.3	79.3	79.1	36.6	59.0	99.7	98.4	100.0	100.0	82.0	97.3	100.0	84.3
<b>UCF (%)</b>	100.0	100.0	100.0	46.6	66.1	99.7	100.0	100.0	100.0	82.0	97.3	100.0	91.0
<b>LF (%)</b>	79.3	79.3	79.1	36.8	59.0	99.7	98.4	100.5	100.7	81.9	97.3	99.4	84.3
<b>OF (%)</b>	100.0	100.0	100.0	46.7	68.7	100.0	100.0	100.0	100.0	83.2	100.0	100.0	91.5
<b>EUf (%)</b>	20.7	20.7	20.9	63.4	41.0	0.3	1.6	0.0	0.0	18.0	2.7	0.0	15.7
<b>PUF (%)</b>	0.0	0.0	0.0	53.4	33.9	0.0	0.0	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	0.3	0.0	0.0	0.0	18.0	2.7	0.0	1.8
<b>XUF (%)</b>	20.7	20.7	20.9	10.0	7.1	0.0	1.6	0.0	0.0	0.0	0.0	0.0	6.7

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Jan 1976  
**Date of First Criticality:** 14 Jul 2000  
**Date of Grid Connection:** 21 Jul 2000  
**Date of Commercial Operation:** 01 Feb 2001

**Lifetime Generation:** 30983.4 GW(e).h  
**Cumulative Energy Availability Factor:** 83.8%  
**Cumulative Load Factor:** 83.5%  
**Cumulative Unit Capability Factor:** 83.0%  
**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 (%)
2000	2421.2	1350.0	0.0	0.0	79.6	100.0	45.8	0.0	2914	74.5
2001	9905.0	1350.0	0.0	0.0	92.1	100.0	83.8	0.0	8315	94.9
2002	9238.2	1275.0	91.3	91.3	83.3	83.3	82.7	82.7	8060	92.0
2003	9419.0	1275.0	91.0	91.1	84.3	83.8	84.3	83.5	8019	91.5

## BR-2 ANGRA-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	2496.0	663.1	XP1	K42	LOAD FOLLOWING
15 Apr	617.0	810.9	PF	C21	REFUELING
11 May	53.0	67.6	XP1	K42	LOAD FOLLOWING
10 Jun	35.0	2.4	UP1	A33	LOSS OF THE CIRCULATING WATER PUMP
12 Jul	52.0	15.5	XP1	K42	LOAD FOLLOWING
13 Oct	124.0	170.6	UF4	A42	LOSS OF THE MAIN TRANSFORMER PHASE C
27 Nov	71.0	24.5	UP1	A33	LOSS OF THE CIRCULATING WATER PUMP

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			2000 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		124			24	
C. Inspection, maintenance or repair combined with refuelling	617			168		
D. Inspection, maintenance or repair without refuelling				282		
E. Testing of plant systems or components				14		
J. Grid failure or grid unavailability						7
Subtotal	617	124	0	464	24	7
Total		741			495	

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

System	2003 Hours Lost	2000 to 2003 Average Hours Lost Per Year
15. Reactor Cooling Systems		0
16. Steam generation systems		1
31. Turbine and auxiliaries		3
41. Main Generator Systems		2
42. Electrical Power Supply Systems	124	17
Total	124	23

## BG-3 KOZLODUY-3

**Operator:** NEC (NATIONAL ELECTRICITY COMPANY, BRANCH NPP-KOZLODUY)  
**Contractor:** AEE (ATOMENERGOEXPORT)

### 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 408.0 MW(e)  
**Design Net Capacity:** 408.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 2477.9 GW(e).h  
**Energy Availability Factor:** 82.9%  
**Load Factor:** 69.3%  
**Operating Factor:** 84.4%  
**Energy Unavailability Factor:** 17.1%  
**Total Off-line Time:** 1368 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	254.8	282.4	306.0	153.6	116.4	104.1	0.0	77.8	268.3	303.7	300.0	310.7	2477.9
<b>EAF (%)</b>	83.3	100.0	99.8	100.0	99.9	66.8	0.0	52.9	94.7	99.7	99.9	100.0	82.9
<b>UCF (%)</b>	83.3	100.0	99.8	100.0	99.9	66.8	0.0	52.9	94.7	99.7	99.9	100.0	82.9
<b>LF (%)</b>	83.9	103.0	100.8	52.4	38.3	35.4	0.0	25.6	91.3	99.9	102.1	102.4	69.3
<b>OF (%)</b>	85.6	100.0	99.9	100.1	100.0	83.6	0.0	50.5	95.7	100.0	100.0	100.0	84.4
<b>EUf (%)</b>	16.7	0.0	0.2	0.0	0.1	33.2	100.0	47.1	5.3	0.3	0.1	0.0	17.1
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	33.2	100.0	47.1	5.3	0.2	0.0	0.0	15.7
<b>UCLF (%)</b>	16.7	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	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. 2003 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Jun 1976  
**Date of First Criticality:** 04 Dec 1980  
**Date of Grid Connection:** 17 Dec 1980  
**Date of Commercial Operation:** 27 Jan 1981

**Lifetime Generation:** 54260.6 GW(e).h  
**Cumulative Energy Availability Factor:** 74.1%  
**Cumulative Load Factor:** 65.8%  
**Cumulative Unit Capability Factor:** 77.4%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	2652.3	408.0	88.5	87.4	88.5	87.4	74.2	77.6	7743	88.4
1983	2748.9	408.0	83.6	86.2	83.6	86.2	76.9	77.4	7324	83.6
1984	3135.4	408.0	93.4	88.0	93.4	88.0	87.5	79.9	8206	93.4
1985	3204.8	408.0	94.2	89.2	94.2	89.2	89.7	81.9	8253	94.2
1986	2688.1	408.0	77.4	87.3	77.4	87.3	75.2	80.8	8173	93.3
1987	2752.6	408.0	82.6	86.6	82.4	86.6	77.0	80.2	7239	82.6
1988	3119.0	408.0	92.7	87.4	92.3	87.3	87.0	81.1	8181	93.1
1989	2429.0	408.0	72.8	85.8	72.6	85.7	68.0	79.6	6520	74.4
1990	2606.9	408.0	78.2	85.0	78.2	84.9	72.9	79.0	7715	88.1
1991	2171.9	408.0	61.7	82.9	61.7	82.8	60.8	77.3	5607	64.0
1992	2336.5	408.0	73.0	82.0	73.0	82.0	65.2	76.3	7727	88.0
1993	1933.0	408.0	78.6	81.8	52.2	79.7	54.1	74.6	7416	84.7
1994	1082.7	408.0	40.3	78.8	40.3	76.9	30.3	71.4	4255	48.6
1995	2747.2	408.0	97.3	80.0	86.9	77.5	76.9	71.8	8682	99.1
1996	1021.0	408.0	82.2	80.2	82.2	77.8	28.5	69.1	3193	36.4
1997	2225.4	408.0	80.1	80.2	80.1	78.0	62.3	68.7	7020	80.1
1998	2150.0	408.0	80.8	80.2	59.3	76.9	60.2	68.2	8584	98.0
1999	1684.7	408.0	49.2	78.6	48.8	75.5	47.1	67.1	4656	53.2
2000	2166.9	440.0	75.5	78.4	62.9	74.8	56.2	66.5	6736	76.9
2001	2249.8	408.0	98.8	79.4	62.5	74.2	62.9	66.3	8712	99.5
2002	1779.7	408.0	63.4	78.7	63.4	73.7	49.8	65.6	5574	63.6
2003	2477.9	408.0	82.9	78.8	82.9	74.1	69.3	65.8	7392	84.4

## BG-3 KOZLODUY-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
20 Jan	124.0	50.6	UF4	A13	UNPLANNED UNIT TRIP DUE TO RUPTURE OF PIPELINE FROM PRIMARY CIRCUIT MAKE-UP SYSTEM
26 Jun	1206.0	543.2	PF	C	REFUELLING
19 Sep	38.0	15.7	PF	D32	REPLACEMENT OF SG#4 SAFETY RELIEF CONTROL VALVE
08 Oct	3.0	0.2	UP2	A17	CONNECTION FAILURE IN THE MCP BREAKER TERMINAL BLOCK
22 Oct	11.0	0.6	PP	D31	REPAIR OF LEAKAGE IN MOISTURE SEPARATOR/REHEATER
12 Nov	2.0	0.2	UP2	A32	CLOSURE OF MAIN STEAM ISOLATION VALVE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		124			24	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	1206			962		
D. Inspection, maintenance or repair without refuelling	38			87		
E. Testing of plant systems or components				18	0	
J. Grid failure or grid unavailability					0	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					0	
Subtotal	1244	124	0	1067	24	0
Total		1368			1091	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems	124	
15. Reactor Cooling Systems		4
16. Steam generation systems		9
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		4
41. Main Generator Systems		0
42. Electrical Power Supply Systems		0
Total	124	20

# BG-4 KOZLODUY-4

**Operator:** NEC (NATIONAL ELECTRICITY COMPANY, BRANCH NPP-KOZLODUY)  
**Contractor:** AEE (ATOMENERGOEXPORT)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 408.0 MW(e)  
**Design Net Capacity:** 408.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 2527.0 GW(e).h  
**Energy Availability Factor:** 76.6%  
**Load Factor:** 70.7%  
**Operating Factor:** 76.9%  
**Energy Unavailability Factor:** 23.4%  
**Total Off-line Time:** 2025 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	303.3	275.1	291.4	0.0	0.0	25.3	175.6	265.8	285.5	303.0	296.7	305.3	2527.0
<b>EAF (%)</b>	100.0	100.0	100.0	0.0	0.0	19.4	99.9	100.0	99.9	99.8	99.9	100.0	76.6
<b>UCF (%)</b>	100.0	100.0	100.0	0.0	0.0	19.4	99.9	100.0	99.9	99.8	99.9	100.0	76.6
<b>LF (%)</b>	99.9	100.3	96.0	0.0	0.0	8.6	57.8	87.6	97.2	99.7	101.0	100.6	70.7
<b>OF (%)</b>	100.0	100.0	100.0	0.0	0.0	21.9	100.0	100.0	100.0	100.0	100.0	100.0	76.9
<b>EUf (%)</b>	0.0	0.0	0.0	100.0	100.0	80.6	0.1	0.0	0.1	0.2	0.1	0.0	23.4
<b>PUF (%)</b>	0.0	0.0	0.0	100.0	100.0	80.6	0.1	0.0	0.1	0.0	0.1	0.0	23.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1976      **Lifetime Generation:** 52182.7 GW(e).h  
**Date of First Criticality:** 25 Apr 1982      **Cumulative Energy Availability Factor:** 72.7%  
**Date of Grid Connection:** 17 May 1982      **Cumulative Load Factor:** 66.8%  
**Date of Commercial Operation:** 30 Jun 1982      **Cumulative Unit Capability Factor:** 77.6%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	1802.8	408.0	0.0	0.0	83.3	100.0	50.4	0.0	5527	63.1
1983	2867.2	408.0	92.7	92.7	92.7	92.7	80.2	80.2	8116	92.6
1984	3252.6	408.0	93.8	93.2	93.8	93.2	90.8	85.5	8238	93.8
1985	3031.0	408.0	86.3	90.9	86.3	90.9	84.8	85.3	7812	89.2
1986	3168.0	408.0	92.5	91.3	92.3	91.3	88.6	86.1	8154	93.1
1987	3026.3	408.0	91.2	91.3	91.2	91.2	84.7	85.8	8080	92.2
1988	2902.0	408.0	87.8	90.7	87.8	90.7	81.0	85.0	8139	92.7
1989	2842.1	408.0	86.5	90.1	86.4	90.1	79.5	84.2	8129	92.8
1990	2569.1	408.0	78.7	88.7	78.7	88.6	71.9	82.7	7223	82.5
1991	2170.6	408.0	64.4	86.0	64.4	85.9	60.7	80.2	5661	64.6
1992	2316.9	408.0	70.2	84.4	70.2	84.4	64.6	78.7	6997	79.7
1993	2081.3	408.0	71.6	83.2	65.9	82.7	58.2	76.8	6277	71.7
1994	1094.4	408.0	31.4	78.9	31.4	78.4	30.6	73.0	4112	46.9
1995	2516.4	408.0	84.8	79.4	81.5	78.7	70.4	72.8	7424	84.7
1996	2401.1	408.0	71.3	78.8	71.2	78.1	67.0	72.4	8743	99.5
1997	1524.4	408.0	49.5	76.8	49.5	76.2	42.7	70.4	4338	49.5
1998	1929.2	408.0	57.9	75.7	57.4	75.0	54.0	69.4	6633	75.7
1999	1938.5	408.0	92.9	76.7	55.7	73.9	54.2	68.5	8736	99.7
2000	2418.4	440.0	78.0	76.8	69.7	73.7	62.7	68.1	6922	79.0
2001	1777.9	408.0	64.9	76.1	49.7	72.4	49.7	67.2	5777	65.9
2002	2025.6	408.0	82.5	76.5	74.9	72.5	56.7	66.6	6589	75.2
2003	2527.0	408.0	76.6	76.5	76.6	72.7	70.7	66.8	6735	76.9



## BG-4 KOZLODUY-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Apr	2024.0	833.5	PF	C	REFUELLING
03 Jul	3.0	0.2	PP	E31	POWER REDUCTION FOR TESTING TG#8
14 Sep	25.0	0.2	PP	D31	TG#7 VIBRATIONS
03 Oct	6.0	0.6	UP2	A12	CONTROL ASSEMBLY 6 DROP
06 Nov	9.0	0.3	PP	D31	REPAIR OF MOISTURE STEAM SEPARATOR/REHEATER
31 Dec	2.0	0.1	PP	D41	CHECKING OF THE BRUSHER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					29	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	2024			1006		
D. Inspection, maintenance or repair without refuelling				83		
E. Testing of plant systems or components				5		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					0	
Subtotal	2024	0	0	1094	29	0
Total		2024			1123	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
14. Safety Systems		0
15. Reactor Cooling Systems		16
16. Steam generation systems		2
32. Feedwater and Main Steam System		8
41. Main Generator Systems		1
42. Electrical Power Supply Systems		0
Total	0	27

**BG-5 KOZLODUY-5**

Operator: NEC (NATIONAL ELECTRICITY COMPANY, BRANCH NPP-KOZLODUY)

Contractor: AEE (ATOMENERGOEXPORT)

**1. Station Details**

Type: WWER  
 Maximum Net Capacity  
 at the beginning of 2003: 953.0 MW(e)  
 Design Net Capacity: 953.0 MW(e)  
 Design Discharge Burnup: 27000 MW.d/t

**2. Production Summary 2003**

Energy Production: 5596.7 GW(e).h  
 Energy Availability Factor: 98.6%  
 Load Factor: 67.0%  
 Operating Factor: 97.9%  
 Energy Unavailability Factor: 1.4%  
 Total Off-line Time: 181 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	504.4	442.4	489.9	474.4	450.1	421.3	436.8	324.9	471.2	493.6	524.1	563.7	5596.7
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	83.5	100.0	100.0	100.0	100.0	98.6
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	83.5	100.0	100.0	100.0	100.0	98.6
LF (%)	71.1	69.1	69.1	69.2	63.5	61.4	61.6	45.8	68.7	69.5	76.4	79.5	67.0
OF (%)	100.0	100.0	99.9	100.0	100.0	100.0	100.0	75.8	100.0	100.0	100.0	100.0	97.9
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.5	0.0	0.0	0.0	0.0	1.4
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.5	0.0	0.0	0.0	0.0	1.4
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. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Jul 1980      Lifetime Generation: 63532.7 GW(e).h  
 Date of First Criticality: 05 Nov 1987      Cumulative Energy Availability Factor: 59.1%  
 Date of Grid Connection: 29 Nov 1987      Cumulative Load Factor: 47.3%  
 Date of Commercial Operation: 23 Dec 1988      Cumulative Unit Capability Factor: 78.4%  
    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 (%)
1987	137.0	947.0	0.0	0.0	1.7	100.0	1.7	0.0	667	7.6
1988	3933.2	887.0	0.0	0.0	99.4	100.0	50.5	0.0	7027	80.0
1989	3355.1	953.0	51.5	51.5	51.5	51.5	40.2	40.2	4663	53.2
1990	3380.9	953.0	58.1	54.8	41.8	46.6	40.5	40.3	5592	63.8
1991	1950.4	953.0	31.7	47.1	31.7	41.7	23.4	34.7	2777	31.7
1992	3540.7	953.0	56.6	49.5	47.0	43.0	42.3	36.6	4982	56.7
1993	3278.0	953.0	50.5	49.7	47.5	43.9	39.3	37.1	4675	53.4
1994	2880.4	953.0	52.6	50.2	48.1	44.6	34.5	36.7	4350	49.7
1995	4699.3	953.0	68.1	52.8	59.4	46.7	56.3	39.5	5988	68.4
1996	4720.3	953.0	73.8	55.4	73.8	50.1	56.4	41.6	6468	73.6
1997	4410.2	953.0	68.7	56.9	68.7	52.2	52.8	42.9	6034	68.9
1998	3741.0	953.0	73.3	58.5	73.3	54.3	44.8	43.0	6467	73.8
1999	3423.2	953.0	54.8	58.2	50.4	53.9	41.0	42.9	4838	55.2
2000	4340.8	1000.0	63.4	58.6	54.3	54.0	49.6	43.4	5406	61.7
2001	5049.6	953.0	66.6	59.2	61.5	54.5	60.5	44.7	5940	67.8
2002	5095.8	953.0	79.8	60.7	79.4	56.3	61.0	45.9	7003	79.9
2003	5596.7	953.0	98.6	63.2	98.6	59.1	67.0	47.3	8579	97.9

## BG-5 KOZLODUY-5

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
14 Aug	123.0	116.8	PF	D13	PLANNED SHUT DOWN TO REPAIR OF LEAKAGE FROM PIPELINE TO FILTER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					213	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling				1809		
D. Inspection, maintenance or repair without refuelling	123			240		
H. Nuclear regulatory requirements				39		
J. Grid failure or grid unavailability						3
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					0	
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)						0
Subtotal	123	0	0	2088	216	3
Total		123			2307	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
13. Reactor Auxiliary Systems		1
15. Reactor Cooling Systems		12
16. Steam generation systems		15
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		23
32. Feedwater and Main Steam System		23
35. All other I&C Systems		3
41. Main Generator Systems		128
42. Electrical Power Supply Systems		3
Total	0	211

## BG-6 KOZLODUY-6

**Operator:** NEC (NATIONAL ELECTRICITY COMPANY, BRANCH NPP-KOZLODUY)

**Contractor:** AEE (ATOMENERGOEXPORT)

### 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 953.0 MW(e)  
**Design Net Capacity:** 953.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 5480.6 GW(e).h  
**Energy Availability Factor:** 72.9%  
**Load Factor:** 65.6%  
**Operating Factor:** 73.9%  
**Energy Unavailability Factor:** 27.1%  
**Total Off-line Time:** 2286 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	716.2	628.4	659.0	668.8	443.6	579.0	588.5	607.4	19.2	0.0	0.0	570.5	5480.6
<b>EAF (%)</b>	100.0	98.3	93.0	100.0	99.0	99.6	96.5	98.8	4.1	0.0	0.0	85.0	72.9
<b>UCF (%)</b>	100.0	98.3	93.0	100.0	99.0	99.6	96.5	98.9	4.1	0.0	0.0	85.0	72.9
<b>LF (%)</b>	101.0	98.1	92.9	97.6	62.6	84.4	83.0	85.7	2.8	0.0	0.0	80.5	65.6
<b>OF (%)</b>	100.0	100.0	97.6	100.1	100.0	100.0	98.8	100.0	5.0	0.0	0.0	85.1	73.9
<b>EUAF (%)</b>	0.0	1.7	7.0	0.0	1.0	0.4	3.5	1.2	95.9	100.0	100.0	15.0	27.1
<b>PUF (%)</b>	0.0	1.7	7.0	0.0	1.0	0.0	2.5	1.2	95.9	100.0	100.0	15.0	27.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.4	1.0	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. 2003 Summary of Operation

### 5. Historical Summary

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

**Lifetime Generation:** 52996.2 GW(e).h  
**Cumulative Energy Availability Factor:** 67.0%  
**Cumulative Load Factor:** 55.4%  
**Cumulative Unit Capability Factor:** 80.8%  
**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 (%)
1991	1312.7	953.0	0.0	0.0	100.0	100.0	15.7	0.0	2415	27.6
1992	2431.0	953.0	0.0	0.0	29.9	100.0	29.0	0.0	3472	39.5
1993	2799.6	953.0	0.0	0.0	41.6	100.0	33.5	0.0	4032	46.0
1994	4862.6	953.0	88.7	88.7	87.6	87.6	58.2	58.2	7817	89.2
1995	3831.9	953.0	63.6	76.1	63.6	75.6	45.9	52.1	5568	63.6
1996	5495.9	953.0	76.3	76.2	76.2	75.8	65.7	56.6	6698	76.3
1997	4825.4	953.0	72.8	75.3	72.8	75.1	57.8	56.9	6380	72.8
1998	3970.0	953.0	63.7	73.0	63.7	72.8	47.6	55.0	6079	69.4
1999	4407.8	953.0	69.6	72.4	60.7	70.8	52.8	54.7	6194	70.7
2000	4064.3	1000.0	66.7	71.6	51.1	67.8	46.4	53.4	5772	65.9
2001	4189.4	953.0	63.4	70.6	50.4	65.7	50.2	53.0	5441	62.1
2002	5324.9	953.0	71.5	70.7	71.5	66.3	63.8	54.2	6256	71.4
2003	5480.6	953.0	72.9	70.9	72.9	67.0	65.6	55.4	6474	73.9

## BG-6 KOZLODUY-6

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Feb	67.0	4.6	PP	D31	REPAIR OF MAIN CONDENSER LEAKAGE
08 Feb	56.0	6.4	PP	D31	REPAIR OF MAIN CONDENSER LEAKAGE
07 Mar	66.0	7.4	PP	D31	REPAIR OF MAIN CONDENSER LEAKAGE
25 Mar	102.0	42.5	PP	D31	REPAIR OF STEM LEAKAGE FROM HPT OUTLET
10 May	43.0	6.9	PP	D32	REPAIR OF THE TURBINE DRIVEN SGFWP#1
06 Jun	19.0	2.6	UP2	A32	TRIP OF CONDESATE PUMPS
01 Jul	17.0	16.6	PF	D42	REPAIR OF UNIT TRANSFORMER
19 Jul	35.0	1.0	PP	D31	REPAIR OF MAIN CONDENSER LEAKAGE
21 Jul	18.0	0.6	UP2	A33	REPAIR OF FILTER OF CIRCULATION COOLING WATER PUMP
24 Jul	21.0	6.4	UP2	A31	TG TRIP BY SPURIOUS SIGNAL
23 Aug	57.0	7.4	PP	D31	REPAIR OF MAIN CONDENSER LEAKAGE
26 Aug	20.0	0.7	PP	D33	REPAIR OF CIRCULATION WATER FILTER
03 Sep	2148.0	2052.9	PF	C	REFUELLING
01 Dec	111.0	106.4	PF	E	TESTING AFTER REFUELLING

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1992 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					274	
C. Inspection, maintenance or repair combined with refuelling	2148			1532		
D. Inspection, maintenance or repair without refuelling	17			187		
E. Testing of plant systems or components	111			5	0	
J. Grid failure or grid unavailability						6
Subtotal	2276	0	0	1724	274	6
Total	2276			2004		

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

System	2003 Hours Lost	1992 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		8
14. Safety Systems		43
41. Main Generator Systems		12
42. Electrical Power Supply Systems		210
Total	0	273

# CA-22 DARLINGTON-1

**Operator:** OPG (ONTARIO POWER GENERATION)

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

## 1. Station Details

**Type:** PHWR  
**Maximum Net Capacity at the beginning of 2003:** 881.0 MW(e)  
**Design Net Capacity:** 881.0 MW(e)  
**Design Discharge Burnup:** 7790 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6562.4 GW(e).h  
**Energy Availability Factor:** 85.1%  
**Load Factor:** 85.0%  
**Operating Factor:** 89.6%  
**Energy Unavailability Factor:** 14.9%  
**Total Off-line Time:** 914 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	626.0	541.6	627.2	597.7	629.1	622.2	637.4	532.3	602.9	39.7	595.4	510.8	6562.4
<b>EAF (%)</b>	95.5	91.5	95.7	94.2	96.1	98.1	97.2	81.3	95.3	6.0	93.9	78.2	85.1
<b>UCF (%)</b>	95.5	93.7	95.7	94.2	96.1	98.3	99.4	99.2	99.4	6.0	95.6	78.5	87.5
<b>LF (%)</b>	95.5	91.5	95.7	94.2	96.0	98.1	97.2	81.2	95.0	6.0	93.9	77.9	85.0
<b>OF (%)</b>	100.0	99.0	100.0	100.0	100.0	100.0	100.0	88.8	100.0	7.0	100.0	82.3	89.6
<b>EUf (%)</b>	4.5	8.5	4.3	5.8	3.9	1.9	2.8	18.7	4.7	94.0	6.1	21.8	14.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	89.1	2.7	0.0	7.8
<b>UCLF (%)</b>	4.5	6.3	4.3	5.8	3.9	1.7	0.6	0.8	0.6	4.9	1.7	21.5	4.7
<b>XUF (%)</b>	0.0	2.2	0.0	0.0	0.0	0.2	2.1	17.9	4.0	0.0	1.7	0.2	2.4

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1982      **Lifetime Generation:** 72786.5 GW(e).h  
**Date of First Criticality:** 29 Oct 1990      **Cumulative Energy Availability Factor:** 82.4%  
**Date of Grid Connection:** 19 Dec 1990      **Cumulative Load Factor:** 82.0%  
**Date of Commercial Operation:** 14 Nov 1992      **Cumulative Unit Capability Factor:** 80.4%  
**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	2146.8	881.0	0.0	0.0	27.9	100.0	27.8	0.0	2703	30.9
1992	974.0	881.0	0.0	0.0	99.5	100.0	12.6	0.0	1152	13.1
1993	6016.2	881.0	79.2	79.2	78.7	78.7	78.0	78.0	7213	82.3
1994	6326.6	881.0	83.5	81.3	83.1	80.9	82.0	80.0	7446	85.0
1995	6853.3	881.0	90.7	84.4	89.7	83.9	88.8	82.9	8046	91.8
1996	5745.3	881.0	75.7	82.2	75.0	81.6	74.2	80.7	6827	77.7
1997	4765.1	881.0	63.0	78.4	62.3	77.8	61.7	76.9	7236	82.6
1998	6427.5	881.0	84.3	79.4	83.3	78.7	83.3	78.0	7717	88.1
1999	7175.1	881.0	94.3	81.5	93.0	80.7	93.0	80.1	8705	99.4
2000	6280.6	881.0	82.0	81.6	81.2	80.8	81.2	80.3	7615	86.7
2001	6980.8	881.0	91.2	82.6	90.5	81.9	90.5	81.4	8502	97.1
2002	6532.9	881.0	85.5	82.9	84.7	82.1	84.6	81.7	7887	90.0
2003	6562.4	881.0	87.5	83.3	85.1	82.4	85.0	82.0	7846	89.6

# CA-22 DARLINGTON-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	903.0	17.2	UP3	M	PHI LIMITED TO 98% F.P. FOR MCP LICENSE COMPLIANCE
01 Jan	903.0	14.9	UP3	A31	TURBINE EFFICIENCY LOSSES AND MISCELLANEOUS SECONDARY SIDE LOSSES
13 Jan	244.0	2.4	UP3	A34	CONDENSER COOLING WATER PUMP MAINTENANCE
31 Jan	109.0	1.0	UP3	A34	CD2E ISOLATED FOR MAINTENANCE
04 Feb	37.0	12.9	XP	J42	MW REDUCTION DUE TO LOSS OF TRANSMISSION LINES
07 Feb	7.0	6.3	UF2	A42	FORCED OUTAGE DUE TO HIGH GENERATOR TEMPERATURE ALARMS.
07 Feb	20.0	7.1	UP3	A35	RUN-UP FOLLOWING FORCED OUTAGE DUE TO HIGH GENERATOR TEMPERATURE ALARMS.
07 Feb	2600.0	49.4	UP3	M	PHI LIMITED TO 98% F.P. FOR MCP LICENSE COMPLIANCE
07 Feb	4276.0	64.2	UP3	A31	TURBINE EFFICIENCY LOSSES AND MISCELLANEOUS SECONDARY SIDE LOSSES
28 Feb	77.0	1.1	UP3	A31	SECOND STAGE REHEATER PUMP 41890-P4 MAINTENANCE
05 Apr	278.0	17.8	UP3	A12	LOW NOP MARGINS TO TRIP FOLLOWING FUELLING
28 May	46.0	0.4	UP3	A35	SYSTEM TESTING DURING RUN-UP OF UNIT TO 100% FP.
25 Jun	1394.0	22.8	XP	J42	UNIT SUPPLYING STATION STEAM LOADS
10 Jul	1231.0	37.9	XP	A15	UNIT DERATED DUE TO HIGH CONDENSER COOLING WATER TEMPERATURE
14 Aug	83.0	73.2	XF	J42	LOSS OF BULK ELECTRICAL SYSTEM - 2003 BLACKOUT
18 Aug	73.0	23.9	XP	J42	SYNC BREAKER CLOSED - RUN-UP FROM LOSS OF CLASS IV POWER (LOBES TRIP)
02 Oct	36.0	31.8	UF2	A32	TRANSIENT - BOILER FEEDWATER LEAK AT 1-43000-V252
03 Oct	656.0	577.9	PF	D14	STATION CONTAINMENT OUTAGE
31 Oct	71.0	23.2	PP	D14	RUN-UP FOLLOWING STATION CONTAINMENT OUTAGE
03 Nov	839.0	12.6	UP3	A31	TURBINE EFFICIENCY LOSSES MISCELLANEOUS SECONDARY SIDE LOSSES
03 Nov	803.0	12.7	XP	J42	UNIT SUPPLYING BUILDING/HEATING STEAM
04 Nov	48.0	1.2	UP3	A12	NOPS DUE TO FUELLING
13 Nov	41.0	0.1	UP3	A32	48200-P2 FEEDWATER HEATER DRAINS OFF (STR2 GASKET LEAK)
16 Dec	132.0	116.3	UF2	A12	FORCED OUTAGE TO REPAIR VALVE ON THE LIQUID INJECTION SHUTDOWN SYSTEM
22 Dec	164.0	20.0	UP3	A12	RUN-UP FOLLOWING FORCED OUTAGE
24 Dec	189.0	1.8	UP3	A31	TURBINE EFFICIENCY LOSSES MISCELLANEOUS SECONDARY SIDE LOSSES
29 Dec	11.0	0.1	UP3	A12	NOPS

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1991 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		175			671	
D. Inspection, maintenance or repair without refuelling	656			594		
J. Grid failure or grid unavailability			83			
Subtotal	656	175	83	594	671	0
Total		914			1265	

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

System	2003 Hours Lost	1991 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		21
12. Reactor I&C Systems	132	48
14. Safety Systems		29
15. Reactor Cooling Systems		376
31. Turbine and auxiliaries		18
32. Feedwater and Main Steam System	36	
35. All other I&C Systems		50
41. Main Generator Systems		90
42. Electrical Power Supply Systems	7	16
XX. Miscellaneous Systems		10
Total	175	658

# CA-23 DARLINGTON-2

**Operator:** OPG (ONTARIO POWER GENERATION)

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

## 1. Station Details

**Type:** PHWR  
**Maximum Net Capacity at the beginning of 2003:** 881.0 MW(e)  
**Design Net Capacity:** 881.0 MW(e)  
**Design Discharge Burnup:** 7790 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6084.1 GW(e).h  
**Energy Availability Factor:** 79.3%  
**Load Factor:** 78.8%  
**Operating Factor:** 82.7%  
**Energy Unavailability Factor:** 20.7%  
**Total Off-line Time:** 1515 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	627.2	555.0	632.5	616.1	632.4	622.8	641.0	533.3	516.3	38.4	23.5	645.7	6084.1
<b>EAF (%)</b>	95.7	93.7	96.6	97.1	96.7	98.2	98.3	81.5	81.8	5.9	6.8	99.6	79.3
<b>UCF (%)</b>	97.4	97.2	97.7	97.6	97.5	98.5	99.1	97.2	84.8	5.9	6.8	99.6	81.6
<b>LF (%)</b>	95.7	93.7	96.5	97.1	96.5	98.2	97.8	81.4	81.4	5.9	3.7	98.5	78.8
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.8	89.7	6.6	6.9	100.0	82.7
<b>EUf (%)</b>	4.3	6.3	3.4	2.9	3.3	1.8	1.7	18.5	18.2	94.1	93.2	0.4	20.7
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	93.9	66.8	0.0	13.5
<b>UCLF (%)</b>	2.6	2.8	2.3	2.4	2.5	1.5	0.9	2.8	15.2	0.2	26.4	0.4	4.9
<b>XUF (%)</b>	1.7	3.4	1.2	0.5	0.9	0.4	0.8	15.7	3.0	0.0	0.0	0.0	2.3

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1981      **Lifetime Generation:** 72747.2 GW(e).h  
**Date of First Criticality:** 05 Nov 1989      **Cumulative Energy Availability Factor:** 71.6%  
**Date of Grid Connection:** 15 Jan 1990      **Cumulative Load Factor:** 71.3%  
**Date of Commercial Operation:** 09 Oct 1990      **Cumulative Unit Capability Factor:** 79.3%  
**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 (%)
1990	1153.5	881.0	0.0	0.0	91.8	100.0	15.3	0.0	1608	18.8
1991	51.5	881.0	0.7	0.7	0.7	0.7	0.7	0.7	102	1.2
1992	1290.2	881.0	16.7	8.7	16.7	8.7	16.7	8.7	2418	27.5
1993	6370.2	881.0	83.3	33.5	82.7	33.3	82.5	33.3	7594	86.7
1994	6750.8	881.0	88.9	47.4	88.5	47.1	87.5	46.8	8069	92.1
1995	6953.0	881.0	91.3	56.1	90.7	55.8	90.1	55.5	8104	92.5
1996	6705.7	881.0	87.8	61.4	87.2	61.1	86.7	60.7	7752	88.3
1997	4710.4	881.0	61.7	61.5	61.5	61.1	61.0	60.7	7069	80.7
1998	6227.9	881.0	81.9	64.0	80.7	63.6	80.7	63.2	7492	85.5
1999	6469.1	881.0	85.1	66.4	83.8	65.8	83.8	65.5	7824	89.3
2000	6885.4	881.0	90.1	68.8	89.0	68.1	89.0	67.9	8221	93.6
2001	5826.4	881.0	76.3	69.4	75.5	68.8	75.5	68.6	7030	80.3
2002	7268.9	881.0	95.4	71.6	94.2	70.9	94.2	70.7	8627	98.5
2003	6084.1	881.0	81.6	72.4	79.3	71.6	78.8	71.3	7245	82.7



## CA-23 DARLINGTON-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	3224.0	29.6	UP3	A31	TURBINE EFFICIENCY LOSSES AND MISCELLANEOUS SECONDARY SIDE LOSSES
01 Jan	3260.0	61.9	UP3	M	PHI LIMITED TO 98% F.P. FOR MCP LICENSE COMPLIANCE
01 Jan	3767.0	36.9	XP	J42	UNIT SUPPLYING T.R.F. AND STATION STEAM LOADS
04 Feb	148.0	37.1	XP	J42	MW REDUCTION DUE TO LOSS OF TRANSMISSION LINES
18 Mar	1930.0	20.7	UP3	A34	CCW P2 MAINTENANCE AND PUMP WELL CLEANING
04 Apr	340.0	2.5	UP3	A32	MSR DRAINS 41890-P1&P3 SHUTDOWN FOR MAINTENANCE
15 May	10.0	0.5	UP3	A31	TRANSIENT AS A RESULT OF FAILURE OF THE TURBINE GENERATOR SPEED PROBE
21 May	109.0	2.1	UP3	A12	LOW NOP MARGINS TO TRIP
10 Jul	680.0	17.7	XP	A15	UNIT DERATED DUE TO HIGH CONDENSER COOLING WATER TEMPERATURE
14 Aug	75.0	67.4	XF	J42	LOSS OF BULK ELECTRICAL SYSTEM - 2003 BLACKOUT
05 Sep	21.0	18.2	UF2	A41	GENERATOR TRIP ON MOT DIFFERENTIAL PROTECTION - SYNC BREAKER OPENED
06 Sep	17.0	1.5	UP3	A35	SYNC BREAKER CLOSED - RUN-UP FOLLOWING FORCED OUTAGE
06 Sep	901.0	7.6	UP3	A31	TURBINE EFFICIENCY LOSSES MISCELLANEOUS SECONDARY SIDE LOSSES
06 Sep	852.0	0.0	UP3	A34	71100-P2 O/S
06 Sep	852.0	17.0	XP	A15	UNIT DERATED DUE TO HIGH CONDENSER COOLING WATER TEMPERATURE
24 Sep	53.0	46.8	UF2	A32	FORCED OUTAGE DUE TO SDS2 LEVEL 1 IMPAIRMENT
26 Sep	44.0	12.5	UP3	A35	SYNC BREAKER CLOSED - RUN-UP FOLLOWING FORCED OUTAGE
01 Oct	45.0	0.3	UP3	A34	CCW P2 O/S
01 Oct	45.0	0.6	UP3	A31	1ST & 2ND REHEAT O/S FOR PRE-OUTAGE WORK
03 Oct	695.0	612.6	PF	D11	UNIT WAS RESYNCHRONIZED BRIEFLY TO ACCOMMODATE SDS2 AND TURBINE TRIP TESTING
01 Nov	481.0	423.5	PF	D15	MAJOR PLANNED OUTAGE - PHT MAINTENANCE
21 Nov	52.0	45.6	UF3	A21	FEPO - FUEL CHANNEL INSPECTIONS
23 Nov	7.0	5.0	PP	D15	RUN-UP FOLLOWING PLANNED OUTAGE
23 Nov	138.0	121.4	UF2	A31	TURBINE TRIP DUE TO A VERY HIGH LEVEL INDICATION ON MOISTURE SEPARATOR RE-HEATER TANK 1.
29 Nov	43.0	15.4	UP3	A35	RUN-UP FOLLOWING FORCED OUTAGE
01 Dec	46.0	1.0	UP3	A31	TURBINE EFFICIENCY LOSSES MISCELLANEOUS SECONDARY SIDE LOSSES
02 Dec	46.0	1.4	UP3	A12	NOPS

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1990 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		264			930	
D. Inspection, maintenance or repair without refuelling	1176			404		
J. Grid failure or grid unavailability			75			
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					468	
Subtotal	1176	264	75	404	1398	0
Total		1515			1802	

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

System	2003 Hours Lost	1990 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		45
12. Reactor I&C Systems		50
13. Reactor Auxiliary Systems		2
14. Safety Systems		16
15. Reactor Cooling Systems		606
16. Steam generation system		88
17. Safety I&C Systems (excluding reactor I&C)		3
21. Fuel Handling and Storage Facilities	52	
31. Turbine and auxiliaries	138	20
32. Feedwater and Main Steam System	53	7
35. All other I&C Systems		23
41. Main Generator System	21	12
42. Electrical Power Supply System		7
XX. Miscellaneous Systems		12
Total	264	891

# CA-24 DARLINGTON-3

**Operator:** OPG (ONTARIO POWER GENERATION)

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

## 1. Station Details

**Type:** PHWR  
**Maximum Net Capacity at the beginning of 2003:** 881.0 MW(e)  
**Design Net Capacity:** 881.0 MW(e)  
**Design Discharge Burnup:** 6833 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6827.2 GW(e).h  
**Energy Availability Factor:** 88.6%  
**Load Factor:** 88.5%  
**Operating Factor:** 91.4%  
**Energy Unavailability Factor:** 11.4%  
**Total Off-line Time:** 756 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	619.8	566.6	635.9	619.5	635.8	627.8	645.1	597.9	605.5	92.3	533.5	647.3	6827.2
<b>EAF (%)</b>	94.6	95.7	97.0	97.7	97.4	99.2	99.0	91.6	95.6	14.1	84.1	98.9	88.6
<b>UCF (%)</b>	94.6	97.3	97.0	97.7	97.4	99.2	99.7	95.3	98.5	14.1	84.1	100.0	89.5
<b>LF (%)</b>	94.6	95.7	97.0	97.7	97.0	99.0	98.4	91.2	95.5	14.1	84.1	98.8	88.5
<b>OF (%)</b>	99.2	100.0	100.0	100.0	100.0	100.0	100.0	97.3	100.0	14.2	87.2	100.0	91.4
<b>EUf (%)</b>	5.4	4.3	3.0	2.3	2.6	0.8	1.0	8.4	4.4	85.9	15.9	1.1	11.4
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	85.9	15.1	0.0	8.5
<b>UCLF (%)</b>	5.4	2.7	3.0	2.3	2.7	0.8	0.3	4.7	1.5	0.0	0.8	0.0	2.0
<b>XUF (%)</b>	0.0	1.6	0.0	0.0	0.0	0.0	0.7	3.7	2.9	0.0	0.0	1.1	0.8

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1984  
**Date of First Criticality:** 09 Nov 1992  
**Date of Grid Connection:** 07 Dec 1992  
**Date of Commercial Operation:** 14 Feb 1993

**Lifetime Generation:** 70163.7 GW(e).h  
**Cumulative Energy Availability Factor:** 83.4%  
**Cumulative Load Factor:** 83.1%  
**Cumulative Unit Capability Factor:** 80.8%  
**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 (%)
1993	6003.4	881.0	0.0	0.0	90.2	100.0	77.8	0.0	7141	81.5
1994	6528.5	881.0	85.6	85.6	85.3	85.3	84.6	84.6	7642	87.2
1995	7061.5	881.0	92.9	89.3	92.2	88.7	91.5	88.0	8219	93.8
1996	7391.6	881.0	97.3	92.0	96.7	91.4	95.5	90.5	8574	97.6
1997	4010.8	881.0	52.4	82.1	52.1	81.6	52.0	80.9	6314	72.1
1998	7244.9	881.0	94.7	84.6	93.9	84.0	93.9	83.5	8593	98.1
1999	5629.1	881.0	75.1	83.0	72.9	82.2	72.9	81.7	6929	79.1
2000	6517.0	881.0	85.1	83.3	84.2	82.5	84.2	82.1	7822	89.0
2001	6578.0	881.0	86.3	83.7	85.2	82.8	85.2	82.5	7901	90.2
2002	6371.8	881.0	83.7	83.7	82.6	82.8	82.6	82.5	7595	86.7
2003	6827.2	881.0	89.5	84.3	88.6	83.4	88.5	83.1	8004	91.4

## CA-24 DARLINGTON-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	3413.0	68.9	UP3	M	PHI LIMITED TO 98% F.P. FOR MCP LICENSE COMPLIANCE
01 Jan	35.0	12.2	UP3	A31	RUN-UP FOLLOWING LIQUID CONTROL VALVE MAINTENANCE OUTAGE
01 Jan	6.0	5.6	UF2	A31	LIQUID ZONE LEVEL CONTROL VALVE MAINTENANCE
01 Feb	2210.0	19.4	UP3	A31	TURBINE EFFICIENCY LOSSES AND MISCELLANEOUS SECONDARY SIDE LOSSES
04 Feb	36.0	9.4	XP	J42	MW REDUCTION DUE TO LOSS OF TRANSMISSION LINES
11 Feb	276.0	4.7	UP3	A12	LOW NOP MARGINS TO TRIP FOLLOWING FUELLING
08 Mar	157.0	1.6	UP3	A32	2ND STAGE REHEATER DRAINS 41890-P4 O/S FOR PUMP MOTOR MAINTENANCE
08 Jul	14.0	0.8	UP3	A32	1ST STAGE REHEAT STEAM SUPPLY VALVES 3-41870-MV1 AND MV2 CLOSED
10 Jul	307.0	8.2	XP	A15	UNIT DERATED DUE TO HIGH CONDENSER COOLING WATER TEMPERATURE
06 Aug	14.0	12.5	UF2	A42	FORCED OUTAGE DUE TO MOT BLUE PHASE GAS IN OIL ALARM (FAULTY PROBE)
07 Aug	24.0	5.9	UP3	A42	MOT BLUE PHASE GAS IN OIL ALARM (FAULTY PROBE)
14 Aug	31.0	10.4	XP	J42	RUN-UP FOLLOWING LOSS OF CLASS IV POWER (LOBES) TRIP
14 Aug	6.0	5.1	XP	J42	LOSS OF BULK ELECTRICAL SYSTEM - 2003 BLACKOUT
16 Aug	767.0	23.6	XP	A15	UNIT DERATED DUE TO HIGH CONDENSER COOLING WATER TEMPERATURE
01 Sep	576.0	9.1	UP3	A31	TURBINE EFFICIENCY LOSSES MISCELLANEOUS SECONDARY SIDE LOSSES
03 Sep	21.0	0.3	UP3	A12	LOW NOP MARGINS TO TRIP
05 Oct	1.0	0.5	PP	D14	RUN-DOWN - STATION CONTAINMENT OUTAGE
05 Oct	730.0	643.0	PF	D14	STATION CONTAINMENT OUTAGE
04 Nov	43.0	14.9	PP	D14	RUN-UP FOLLOWING STATION CONTAINMENT OUTAGE
06 Nov	586.0	4.9	UP3	A31	TURBINE EFFICIENCY LOSSES MISCELLANEOUS SECONDARY SIDE LOSSES
09 Nov	23.0	0.3	UP3	A12	NOPS DUE TO FUELLING
08 Dec	561.0	7.4	XP	J42	UNIT SUPPLYING BUILDING HEAT

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1993 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		20			306	
B. Refuelling without a maintenance					8	
D. Inspection, maintenance or repair without refuelling	730			578		
Subtotal	730	20	0	578	314	0
Total		750			892	

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

System	2003 Hours Lost	1993 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		33
13. Reactor Auxiliary Systems		16
14. Safety Systems		6
15. Reactor Cooling Systems		75
16. Steam generation systems		30
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries	6	68
35. All other I&C Systems		48
42. Electrical Power Supply Systems	14	14
XX. Miscellaneous Systems		8
Total	20	301

# CA-25 DARLINGTON-4

**Operator:** OPG (ONTARIO POWER GENERATION)

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

## 1. Station Details

**Type:** PHWR  
**Maximum Net Capacity at the beginning of 2003:** 881.0 MW(e)  
**Design Net Capacity:** 881.0 MW(e)  
**Design Discharge Burnup:** 6833 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5428.9 GW(e).h  
**Energy Availability Factor:** 70.6%  
**Load Factor:** 70.3%  
**Operating Factor:** 72.1%  
**Energy Unavailability Factor:** 29.4%  
**Total Off-line Time:** 2440 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	643.2	578.9	642.4	230.0	0.0	493.1	644.5	546.2	607.4	81.4	306.6	655.3	5428.9
<b>EAF (%)</b>	98.1	97.8	98.0	36.2	0.0	79.6	99.0	83.6	96.0	12.5	48.6	100.0	70.6
<b>UCF (%)</b>	98.1	97.8	98.0	36.2	0.0	79.6	100.0	99.5	98.6	12.6	48.6	100.0	72.3
<b>LF (%)</b>	98.1	97.8	98.0	36.3	0.0	77.7	98.3	83.3	95.8	12.4	48.3	100.0	70.3
<b>OF (%)</b>	100.0	100.0	100.0	37.1	0.0	80.4	100.0	87.6	100.0	12.5	50.1	100.0	72.1
<b>EUF (%)</b>	1.9	2.2	2.0	63.8	100.0	20.4	1.0	16.4	4.0	87.5	51.4	0.0	29.4
<b>PUF (%)</b>	0.0	0.0	0.0	63.0	100.0	18.6	0.0	0.0	0.0	87.5	7.8	0.0	23.3
<b>UCLF (%)</b>	1.9	2.2	2.0	0.8	0.0	1.8	0.0	0.5	1.4	0.0	43.6	0.0	4.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.9	15.9	2.5	0.0	0.0	0.0	1.6

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jul 1985      **Lifetime Generation:** 67920.1 GW(e).h  
**Date of First Criticality:** 13 Mar 1993      **Cumulative Energy Availability Factor:** 83.5%  
**Date of Grid Connection:** 17 Apr 1993      **Cumulative Load Factor:** 83.4%  
**Date of Commercial Operation:** 14 Jun 1993      **Cumulative Unit Capability Factor:** 80.8%  
**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 (%)
1993	3528.8	881.0	0.0	0.0	78.6	100.0	45.7	0.0	4447	50.8
1994	7038.7	881.0	92.2	92.2	91.8	91.8	91.2	91.2	8143	93.0
1995	6750.6	881.0	88.1	90.2	87.7	89.8	87.5	89.3	7751	88.5
1996	6105.4	881.0	79.4	86.6	79.1	86.2	78.9	85.8	7023	80.0
1997	5069.6	881.0	66.0	81.4	65.7	81.1	65.7	80.8	7428	84.8
1998	6520.9	881.0	85.3	82.2	84.5	81.8	84.5	81.5	7699	87.9
1999	6216.1	881.0	81.6	82.1	80.5	81.6	80.5	81.4	7431	84.8
2000	6975.0	881.0	90.8	83.3	90.1	82.8	90.1	82.6	8219	93.6
2001	6836.3	881.0	89.6	84.1	88.6	83.5	88.6	83.4	8037	91.7
2002	7449.8	881.0	97.3	85.6	96.5	85.0	96.5	84.8	8760	100.0
2003	5428.9	881.0	72.3	84.3	70.6	83.5	70.3	83.4	6320	72.1

# CA-25 DARLINGTON-4

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	2427.0	41.1	UP3	M	PHI LIMITED TO 98% F.P. FOR MCP LICENSE COMPLIANCE
14 Jan	538.0	2.4	UP3	A34	CD3W ISOLATED TO MAINTAIN DISCHARGE PRESSURE (LOW FOREBAY TEMPERATURE).
12 Apr	452.0	399.4	PF	D	MAJOR PLANNED OUTAGE
01 May	240.0	211.4	PF	D13	MAJOR PLANNED OUTAGE
11 May	240.0	211.4	PF	D16	MAJOR PLANNED OUTAGE
21 May	264.0	232.6	PF	D31	MAJOR PLANNED OUTAGE
01 Jun	123.0	108.1	PF	D	MAJOR PLANNED OUTAGE
06 Jun	36.0	9.0	PP	D31	RUN-UP FOLLOWING PLANNED OUTAGE
06 Jun	13.0	11.4	UF3	A32	FEPO CAUSED DUE TO REWORK ON SDS #1
06 Jun	6.0	5.2	UF2	A31	TURBINE TRIP DURING RUN-UP FROM PLANNED OUTAGE
08 Jun	72.0	1.3	UP3	M	PHI LIMITED TO 98% F.P. FOR MCP LICENSE COMPLIANCE
11 Jun	99.0	2.4	UP3	A35	SYSTEM TESTING DURING RUN-UP OF UNIT TO 100% FULL POWER
15 Jun	239.0	2.5	UP3	A34	48200-P3 O/S FOR MAINTENANCE
18 Jun	50.0	0.2	UP3	A32	2ND STAGE REHEATER DRAINS 41890-P2 SEAL MAINTENANCE
10 Jul	1162.0	42.3	XP	A15	UNIT DERATED DUE TO HIGH CONDENSER COOLING WATER TEMPERATURE
16 Jul	32.0	1.6	UP3	A12	LOW NOP MARGINS TO TRIP
14 Aug	92.0	81.1	XF	J42	LOSS OF BULK ELECTRICAL SYSTEM - 2003 BLACKOUT
18 Aug	25.0	3.1	XP	J42	SYNC BREAKER CLOSED - RUN-UP FROM LOSS OF CLASS IV POWER (LOBES) TRIP
19 Aug	662.0	11.0	UP3	A31	TURBINE EFFICIENCY LOSSES MISCELLANEOUS SECONDARY SIDE LOSSES AND BOILER POWER ERROR
04 Oct	696.0	613.2	PF	D14	STATION CONTAINMENT OUTAGE - SDS1 - TURBINE MANUALLY TRIPPED AT 22:47
02 Nov	285.0	250.7	UF3	Z34	FORCED EXTENSION TO STATION CONTAINMENT OUTAGE - DISCOVERY WORK
14 Nov	7.0	4.3	PP	D14	RUN-UP FOLLOWING STATION CONTAINMENT OUTAGE
15 Nov	29.0	25.2	UF2	A42	FORCED OUTAGE DUE TO LG4 CVT WHITE PHASE FAILURE
16 Nov	32.0	5.3	PP	D35	RUN-UP FOLLOWING FORCED OUTAGE
17 Nov	323.0	2.1	UP3	A31	TURBINE EFFICIENCY LOSSES MISCELLANEOUS SECONDARY SIDE LOSSES AND BOILER POWER ERROR
24 Nov	4.0	0.1	UP3	A12	NOPS DUE TO FUELLING
27 Nov	25.0	0.2	UP3	A34	CD3W O/S

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1993 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		48			360	
D. Inspection, maintenance or repair without refuelling	2015			489		
E. Testing of plant systems or components				31	5	
J. Grid failure or grid unavailability			92			
Z. Others		285				
Subtotal	2015	333	92	520	365	0
Total		2440			885	

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

System	2003 Hours Lost	1993 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		55
13. Reactor Auxiliary Systems		18
14. Safety Systems		14
15. Reactor Cooling Systems		154
16. Steam generation systems		7
31. Turbine and auxiliaries	6	54
32. Feedwater and Main Steam System	13	7
42. Electrical Power Supply Systems	29	34
XX. Miscellaneous Systems		13
Total	48	356

# CA-12 GENTILLY-2

**Operator:** HQ (HYDRO QUEBEC)  
**Contractor:** BBC (BROWN BOVERI ET CIE)

## 1. Station Details

**Type:** PHWR  
**Maximum Net Capacity at the beginning of 2003:** 635.0 MW(e)  
**Design Net Capacity:** 645.0 MW(e)  
**Design Discharge Burnup:** 8000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3567.1 GW(e).h  
**Energy Availability Factor:** 65.2%  
**Load Factor:** 64.1%  
**Operating Factor:** 66.6%  
**Energy Unavailability Factor:** 34.8%  
**Total Off-line Time:** 2927 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	457.2	418.1	462.8	443.4	462.7	358.0	460.3	450.6	0.0	0.0	0.0	53.8	3567.1
<b>EAF (%)</b>	98.3	100.0	100.0	99.3	100.0	78.8	100.0	98.2	0.0	0.0	0.0	8.6	65.2
<b>UCF (%)</b>	98.3	100.0	100.0	99.3	100.0	78.8	100.0	98.2	0.0	0.0	0.0	8.6	65.2
<b>LF (%)</b>	96.8	98.0	98.0	97.1	97.9	78.3	97.4	95.4	0.0	0.0	0.0	11.4	64.1
<b>OF (%)</b>	99.5	100.0	100.0	100.0	100.0	100.0	100.0	98.5	0.0	0.0	0.0	2.3	66.6
<b>EUf (%)</b>	1.7	0.0	0.0	0.7	0.0	21.2	0.0	1.8	100.0	100.0	100.0	91.4	34.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	21.2	0.0	1.8	100.0	100.0	89.4	0.0	26.0
<b>UCLF (%)</b>	1.7	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	10.6	91.4	8.8
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1974  
**Date of First Criticality:** 11 Sep 1982  
**Date of Grid Connection:** 04 Dec 1982  
**Date of Commercial Operation:** 01 Oct 1983

**Lifetime Generation:** 51860.4 GW(e).h  
**Cumulative Energy Availability Factor:** 81.0%  
**Cumulative Load Factor:** 77.9%  
**Cumulative Unit Capability Factor:** 77.7%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1983	937.7	645.0	0.0	0.0	91.4	100.0	16.6	0.0	1580	18.0
1984	3426.0	645.0	76.5	76.5	67.8	67.8	60.5	60.5	6742	76.8
1985	3189.4	645.0	72.7	74.6	71.1	69.5	56.4	58.5	6347	72.5
1986	3792.1	645.0	85.8	78.3	85.8	74.9	67.1	61.3	7488	85.5
1987	4658.5	640.0	86.3	80.3	85.5	77.5	83.1	66.7	7654	87.4
1988	5283.6	640.0	96.0	83.5	95.3	81.1	94.0	72.2	8372	95.3
1989	4870.3	640.0	90.0	84.5	89.5	82.5	86.9	74.6	7722	88.2
1990	4080.6	640.0	90.4	85.4	72.9	81.1	72.8	74.4	7748	88.4
1991	3925.5	640.0	71.4	83.6	69.9	79.7	70.0	73.8	6317	72.1
1993	5154.9	685.0	88.3	84.2	87.8	80.7	85.9	75.2	7731	88.3
1994	5405.5	635.0	98.3	85.6	98.3	82.4	97.2	77.4	8634	98.6
1995	4519.0	635.0	81.7	85.2	81.7	82.3	81.2	77.7	7229	82.5
1996	5242.0	635.0	93.7	85.9	93.7	83.3	94.0	79.1	8289	94.4
1997	4217.5	635.0	76.2	85.2	76.2	82.7	75.8	78.8	6901	78.8
1998	3825.1	635.0	69.2	84.1	69.2	81.7	68.8	78.1	6258	71.4
1999	3793.3	635.0	87.7	84.3	69.0	80.9	68.2	77.5	6132	70.0
2000	4886.2	635.0	89.5	84.6	89.5	81.4	87.6	78.1	7879	89.7
2001	4711.2	635.0	88.3	84.8	88.3	81.8	84.7	78.5	7766	88.7
2002	4532.3	635.0	83.3	84.8	83.3	81.9	81.5	78.6	7366	84.1
2003	3567.1	635.0	65.2	83.7	65.2	81.0	64.1	77.9	5833	66.6

## CA-12 GENTILLY-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
02 Jun	435.0	97.0	PP	D31	TURBINE MAINTENANCE
31 Aug	1475.0	996.5	PF	D11	INSPECTION AND ANNUAL MAINTENANCE
01 Nov	1446.0	918.0	UF3	Z11	OUTAGE EXTENSION

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					206	
B. Refuelling without a maintenance					26	
D. Inspection, maintenance or repair without refuelling	1475			825		
E. Testing of plant systems or components				0	5	
H. Nuclear regulatory requirements					25	
J. Grid failure or grid unavailability				1	1	4
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						85
Z. Others		1446				
Subtotal	1475	1446	0	826	263	89
Total		2921			1178	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		31
12. Reactor I&C Systems		7
13. Reactor Auxiliary Systems		5
15. Reactor Cooling Systems		33
16. Steam generation systems		2
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		44
32. Feedwater and Main Steam System		9
41. Main Generator Systems		34
42. Electrical Power Supply Systems		4
XX. Miscellaneous Systems		9
Total	0	180

# CA-7 PICKERING-4

**Operator:** OPG (ONTARIO POWER GENERATION)

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

## 1. Station Details

**Type:** PHWR  
**Maximum Net Capacity at the beginning of 2003:** 515.0 MW(e)  
**Design Net Capacity:** 508.0 MW(e)  
**Design Discharge Burnup:** 8080 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 844.8 GW(e).h  
**Energy Availability Factor:** 69.7%  
**Load Factor:** 69.7%  
**Operating Factor:** 79.9%  
**Energy Unavailability Factor:** 30.3%  
**Total Off-line Time:** 472 hours

## 3. 2003 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	23.0	282.9	183.0	355.9	844.8
<b>EAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.1	73.8	49.4	92.9	69.7
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	31.1	73.8	49.4	92.9	69.8
<b>LF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.1	73.8	49.4	92.9	69.7
<b>OF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.5	88.8	58.5	100.0	79.9
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	68.9	26.2	50.6	7.1	30.3
<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	0.0	0.0	68.9	26.2	50.7	7.1	30.3
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1968  
**Date of First Criticality:** 16 May 1973  
**Date of Grid Connection:** 21 May 1973  
**Date of Commercial Operation:** 17 Jun 1973

**Lifetime Generation:** 74383.8 GW(e).h  
**Cumulative Energy Availability Factor:** 66.1%  
**Cumulative Load Factor:** 65.9%  
**Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 33.9%

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	4107.2	514.0	90.6	69.3	90.6	69.3	91.5	69.7	7975	91.3
1978	4033.9	515.0	89.9	73.5	89.9	73.5	89.7	73.7	7876	90.2
1979	4102.2	515.0	91.0	76.4	91.0	76.4	89.9	76.4	8059	91.0
1980	3700.5	515.0	81.8	77.2	81.7	77.2	81.8	77.2	7321	83.3
1981	4142.0	515.0	91.7	79.0	91.7	79.0	91.8	79.0	8078	92.2
1982	4137.9	515.0	91.8	80.4	91.7	80.4	91.7	80.4	8087	92.3
1983	4170.2	515.0	92.3	81.6	92.3	81.6	92.4	81.6	8183	93.4
1984	3733.3	515.0	82.8	81.7	82.7	81.7	82.5	81.7	7425	84.5
1985	3438.9	515.0	83.5	81.9	77.5	81.4	76.2	81.3	6824	77.9
1986	3687.4	515.0	83.2	82.0	83.2	81.5	81.7	81.3	7410	84.6
1987	3770.4	515.0	84.3	82.1	84.0	81.7	83.6	81.5	7495	85.6
1988	3166.2	515.0	70.1	81.3	70.1	80.9	70.0	80.7	6525	74.3
1989	2255.5	515.0	50.0	79.4	50.0	79.0	50.0	78.8	5468	62.4
1990	1070.8	515.0	23.7	76.1	23.7	75.7	23.7	75.5	2851	32.5
1991	2130.8	515.0	47.3	74.5	47.3	74.1	47.2	74.0	5185	59.2
1992	0.0	515.0	0.0	70.6	0.0	70.2	0.0	70.1	0	0.0
1993	3309.6	515.0	74.2	70.8	73.8	70.4	73.4	70.2	6711	76.6
1994	4009.6	515.0	89.7	71.7	89.5	71.3	88.9	71.1	7915	90.4
1995	2807.0	515.0	63.8	71.3	63.3	71.0	62.2	70.7	5684	64.9
1996	1134.9	515.0	25.1	69.3	25.1	69.0	25.1	68.7	2230	25.4
1997	0.0	515.0	0.0	66.4	0.0	66.1	0.0	65.9	0	0.0
2003	844.8	515.0	69.8	66.4	69.7	66.1	69.7	65.9	1880	79.9



## CA-7 PICKERING-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
25 Sep	54.0	4.7	UP3	A12	UNIT IS NOW COMMERCIALY AVAILABLE.
27 Sep	174.0	89.4	UF2	A14	UNIT SHUTDOWN DUE TO SHUTDOWN COOLING (SDC) VALVE FAILURES.
04 Oct	59.0	11.7	UP3	A42	UNIT SYNCHRONIZED TO THE GRID
04 Oct	256.0	28.7	UP3	A12	RAMP-UP
12 Oct	1510.0	63.2	UP3	A12	RAMP-UP - FUEL CORE NOT @ EQUILIBRIUM
13 Nov	298.0	154.2	UF2	A15	SUDDEN OUTAGE - U4 REACTOR SETBACK AND TRIP
01 Dec	744.0	14.6	UP3	A31	MW LOSSES DUE TO CONDENSER INEFFICIENCY

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1973 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		472			825	
B. Refuelling without a maintenance					4	
D. Inspection, maintenance or repair without refuelling	1223					
E. Testing of plant systems or components	72					
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					8	16
Subtotal	0	472	0	1295	837	16
Total		472			2148	

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

System	2003 Hours Lost	1973 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		47
12. Reactor I&C Systems		26
13. Reactor Auxiliary Systems		203
14. Safety Systems	174	10
15. Reactor Cooling Systems	298	406
31. Turbine and auxiliaries		31
32. Feedwater and Main Steam System		23
35. All other I&C Systems		3
41. Main Generator Systems		61
42. Electrical Power Supply Systems		3
Total	472	813

**CA-13 PICKERING-5**

Operator: OPG (ONTARIO POWER GENERATION)

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

**1. Station Details**

Type: PHWR  
 Maximum Net Capacity  
 at the beginning of 2003: 516.0 MW(e)  
 Design Net Capacity: 516.0 MW(e)  
 Design Discharge Burnup: 8420 MW.d/t

**2. Production Summary 2003**

Energy Production: 3295.0 GW(e).h  
 Energy Availability Factor: 69.1%  
 Load Factor: 72.9%  
 Operating Factor: 75.0%  
 Energy Unavailability Factor: 30.9%  
 Total Off-line Time: 2194 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	330.1	177.1	143.3	108.4	334.3	133.6	382.1	249.9	309.3	372.0	371.0	383.9	3295.0
EAF (%)	77.8	51.1	37.3	29.2	87.1	36.0	99.5	65.1	83.3	60.7	100.0	100.0	69.1
UCF (%)	77.8	51.4	37.3	29.2	87.1	36.0	99.5	87.2	84.4	60.7	100.0	100.0	71.1
LF (%)	86.0	51.1	37.3	29.2	87.1	36.0	99.5	65.1	83.3	96.8	99.9	100.0	72.9
OF (%)	92.1	58.5	38.7	32.7	92.1	42.1	100.0	90.2	86.4	63.9	100.0	100.0	75.0
EUf (%)	22.2	48.9	62.7	70.8	12.9	64.0	0.5	34.9	16.7	39.3	0.0	0.0	30.9
PUF (%)	9.3	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 (%)	13.0	48.6	62.7	70.8	12.9	64.0	0.5	12.8	15.6	39.3	0.0	0.0	28.1
XUF (%)	0.0	0.3	0.0	0.0	0.0	0.0	0.0	22.1	1.1	0.0	0.0	0.0	2.0

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Nov 1974      Lifetime Generation: 68502.7 GW(e).h  
 Date of First Criticality: 23 Oct 1982      Cumulative Energy Availability Factor: 72.3%  
 Date of Grid Connection: 19 Dec 1982      Cumulative Load Factor: 72.2%  
 Date of Commercial Operation: 10 May 1983      Cumulative Unit Capability Factor: 77.7%  
    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 (%)
1982	11.2	516.0	0.0	0.0	96.8	100.0	0.3	0.0	240	2.9
1983	3202.4	516.0	0.0	0.0	71.3	100.0	70.8	0.0	6968	79.5
1984	3517.5	516.0	77.8	77.8	77.8	77.8	77.6	77.6	7035	80.1
1985	3366.5	516.0	83.1	80.4	77.7	77.7	74.5	76.0	6989	79.8
1986	4068.6	516.0	91.2	84.0	90.7	82.1	90.0	80.7	8057	92.0
1987	3600.1	516.0	80.3	83.1	79.6	81.4	79.6	80.4	7148	81.6
1988	4397.2	516.0	97.5	86.0	97.5	84.7	97.0	83.8	8683	98.9
1989	3400.8	516.0	75.7	84.3	75.4	83.1	75.2	82.3	6862	78.3
1990	3885.0	516.0	86.4	84.6	86.4	83.6	85.9	82.9	7821	89.3
1991	2887.1	516.0	64.6	82.1	64.4	81.2	63.9	80.5	5724	65.3
1992	1345.2	516.0	29.8	76.3	29.8	75.5	29.7	74.8	2621	29.8
1993	3841.8	516.0	85.6	77.2	85.4	76.5	85.0	75.8	8307	94.8
1994	3074.4	516.0	68.5	76.4	68.5	75.7	68.0	75.1	6196	70.7
1995	3372.9	516.0	75.0	76.3	74.8	75.7	74.6	75.1	7008	80.0
1996	3042.6	516.0	67.1	75.6	67.1	75.0	67.1	74.5	6429	73.2
1997	3924.9	516.0	86.8	76.4	86.8	75.8	86.8	75.4	7908	90.3
1998	3490.6	516.0	77.2	76.4	77.2	75.9	77.2	75.5	7296	83.3
1999	2511.6	516.0	55.6	75.1	55.6	74.7	55.6	74.2	5302	60.5
2000	2631.5	516.0	58.1	74.1	58.0	73.7	58.1	73.3	5457	62.1
2001	2980.2	516.0	66.6	73.7	65.9	73.2	65.9	72.9	5986	68.3
2002	2655.7	516.0	59.2	73.0	58.8	72.5	58.8	72.1	5565	63.5
2003	3295.0	516.0	71.1	72.9	69.1	72.3	72.9	72.2	6566	75.0

# CA-13 PICKERING-5

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	358.0	35.6	PP	D11	UNIT RAMP UP TO 84% REACTOR POWER.
15 Jan	178.0	5.7	UP3	A12	ROP TRIP MARGIN DURING FUELLING.
24 Jan	55.0	19.3	PP	D15	UNIT DERATED FOR WORK ON HT MAIN CIRCUIT PUMP NO. 8 INTERGASKET REPAIR.
27 Jan	314.0	161.9	UF2	A41	TURBINE TRIP DUE TO GENERATOR SEAL OIL SYSTEM FAILURE.
09 Feb	107.0	31.3	UP3	A41	UNIT RECOVERY AFTER SUDDEN OUTAGE.
13 Feb	145.0	1.1	XP	J	BUILDING HEATING STEAM.
12 Mar	394.0	203.5	UF2	A42	FORCED OUTAGE TO REPAIR CRACK IN LINE OF DEMINERALIZED WATER HEADER.
29 Mar	186.0	96.2	UF2	Z41	FORCED OUTAGE CONTINUES DUE TO GENERATOR HYDROGEN SEAL U-CUP FAILURE.
05 Apr	370.0	190.7	UF2	Z15	FORCED OUTAGE CONTINUES DUE TO PHT PUMP VIBRATIONS.
21 Apr	85.0	21.8	UP3	A15	UNIT RAMP-UP AFTER FORCED OUTAGE.
01 May	59.0	30.5	UF2	A31	TURBINE TRIP FOLLOWING AN SDS1 TRIP ON PHT HIGH PRESSURE
03 May	73.0	15.6	UP3	A12	POWER RAMP UP AFTER SUDDEN OUTAGE.
06 May	21.0	0.6	UP3	A31	BLCV AND GV OPENING WITHOUT LIVE STEAM REHEAT IN SERVICE.
17 May	136.0	2.9	UP3	A33	TPM ABSOLUTE HIGH TEMPERATURE ALARM ON COT P-12.
06 Jun	410.0	215.3	UF2	A12	UNIT FORCED OUT TO REPAIR A VALVE IN THE LIQUID ZONE CONTROL SYSTEM.
24 Jun	154.0	22.6	UP3	A12	UNIT RAMP-UP AFTER FORCED OUTAGE.
09 Jul	55.0	1.3	UP3	L16	AUXILIARY STEAM DRAIN SYSTEM VALVE MV1 INDICATION FOUND OPEN
01 Aug	327.0	5.3	XP	A15	UNIT DERATED DUE TO HIGH CONDENSER COOLING WATER TEMPERATURE
08 Aug	15.0	0.3	UP3	A31	REACTOR POWER LOWERED TO CLEAR EHG/TURBINE VIBRATION ALARMS.
14 Aug	120.0	61.9	XP	J42	LOSS OF BULK ELECTRICAL SYSTEM - 2003 BLACKOUT
19 Aug	94.0	48.7	UF2	A42	FORCED OUTAGE TO REPLACE UPS-A DEFECTIVE FIRING BOARD.
23 Aug	68.0	17.8	XP	J	UNIT RAMP-UP AFTER LOSS OF BES AND EQUIPMENT OUTAGES.
05 Sep	215.0	7.1	UP3	A12	REACTOR POWER LIMITED DUE TO SET POINT MAX.
05 Sep	448.0	3.3	XP	A15	UNIT DERATED DUE TO HIGH CONDENSER COOLING WATER TEMPERATURE
27 Sep	74.0	38.2	UF2	A31	UNIT FORCED OUT ON SDS1 TRIP DURING ON LINE VALVE TESTING.
30 Sep	293.0	151.0	UF2	A41	UNIT FORCED OUT DUE TO FAILURE OF TURBINE END GENERATOR H2 SEAL U-CUP.
12 Oct	67.0	8.5	UP3	A41	UNIT RAMP-UP AFTER FORCED OUTAGE.
17 Oct	167.0	2.5	UP3	A31	REACTOR POWER LOWERED DUE TO TURBINE EHG GOVERNOR VALVE ALARMS.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1982 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		1638			893	
B. Refuelling without a maintenance					86	
D. Inspection, maintenance or repair without refuelling				834		
E. Testing of plant systems or components				0	2	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				43	13	21
Z. Others		556				
Subtotal	0	2194	0	877	994	21
Total		2194			1892	

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

System	2003 Hours Lost	1982 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		4
12. Reactor I&C Systems	410	83
13. Reactor Auxiliary Systems		81
14. Safety Systems		29
15. Reactor Cooling Systems		79
16. Steam generation systems		447
31. Turbine and auxiliaries	133	27
32. Feedwater and Main Steam System		11
33. Circulating Water System		4
35. All other I&C Systems		8
41. Main Generator Systems	607	85
42. Electrical Power Supply Systems	488	23
Total	1638	881

# CA-14 PICKERING-6

**Operator:** OPG (ONTARIO POWER GENERATION)

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

## 1. Station Details

**Type:** PHWR  
**Maximum Net Capacity at the beginning of 2003:** 516.0 MW(e)  
**Design Net Capacity:** 516.0 MW(e)  
**Design Discharge Burnup:** 8420 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3267.4 GW(e).h  
**Energy Availability Factor:** 72.5%  
**Load Factor:** 72.3%  
**Operating Factor:** 75.0%  
**Energy Unavailability Factor:** 27.5%  
**Total Off-line Time:** 2194 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	317.1	305.8	227.2	326.9	378.4	368.9	348.6	182.5	351.9	383.4	76.7	0.0	3267.4
<b>EAF (%)</b>	82.4	88.2	59.2	88.5	99.0	99.7	91.4	47.6	94.8	99.9	20.6	0.0	72.5
<b>UCF (%)</b>	82.8	88.6	59.2	88.5	99.1	99.7	91.6	66.2	96.7	99.9	20.6	0.0	74.3
<b>LF (%)</b>	82.6	88.2	59.2	88.0	98.6	99.3	90.8	47.5	94.7	99.9	20.6	0.0	72.3
<b>OF (%)</b>	80.6	96.1	66.4	90.6	100.0	100.0	92.1	53.8	100.0	100.0	22.4	0.0	75.0
<b>EUf (%)</b>	17.6	11.8	40.8	11.5	1.0	0.3	8.6	52.4	5.2	0.1	79.4	100.0	27.5
<b>PUF (%)</b>	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.6	100.0	14.9
<b>UCLF (%)</b>	16.7	11.4	40.8	11.5	1.0	0.3	8.4	33.8	3.3	0.1	1.8	0.0	10.8
<b>XUF (%)</b>	0.4	0.4	0.0	0.0	0.0	0.0	0.2	18.6	1.9	0.0	0.0	0.0	1.8

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1975      **Lifetime Generation:** 70442.3 GW(e).h  
**Date of First Criticality:** 15 Oct 1983      **Cumulative Energy Availability Factor:** 77.3%  
**Date of Grid Connection:** 08 Nov 1983      **Cumulative Load Factor:** 77.2%  
**Date of Commercial Operation:** 01 Feb 1984      **Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1983	257.7	516.0	0.0	0.0	90.8	100.0	5.8	0.0	856	10.0
1984	3816.1	516.0	0.0	0.0	84.4	100.0	84.2	0.0	7636	86.9
1985	3289.1	516.0	79.5	79.5	73.1	73.1	72.8	72.8	6540	74.7
1986	3395.2	516.0	76.1	77.8	75.8	74.5	75.1	73.9	6763	77.2
1987	3949.9	516.0	88.5	81.4	86.6	78.5	87.4	78.4	7791	88.9
1988	4496.8	516.0	98.5	85.7	98.4	83.5	99.2	83.6	8775	99.9
1989	3950.2	516.0	87.9	86.1	87.6	84.3	87.4	84.4	7794	89.0
1990	3473.5	516.0	77.7	84.7	76.9	83.1	76.8	83.1	7017	80.1
1991	4469.7	516.0	99.2	86.8	99.0	85.4	98.9	85.4	8721	99.6
1992	4050.5	516.0	89.3	87.1	89.3	85.8	89.4	85.9	7936	90.3
1993	2689.2	516.0	60.4	84.1	59.9	83.0	59.5	82.9	5506	62.9
1994	4043.0	516.0	90.2	84.7	90.1	83.7	89.4	83.6	8036	91.7
1995	3493.3	516.0	77.5	84.1	77.2	83.1	77.3	83.0	6962	79.5
1996	2591.7	516.0	57.2	81.8	57.2	80.9	57.2	80.9	5707	65.0
1997	3386.2	516.0	74.9	81.3	74.9	80.5	74.9	80.4	6841	78.1
1998	3130.1	516.0	69.7	80.5	69.2	79.7	69.2	79.6	6384	72.9
1999	3353.7	516.0	74.4	80.1	74.2	79.3	74.2	79.2	6863	78.3
2000	2738.7	516.0	60.6	78.8	60.5	78.1	60.4	78.1	6449	73.4
2001	2618.1	516.0	57.7	77.6	57.7	76.9	57.9	76.9	5286	60.3
2002	3982.3	516.0	88.9	78.2	88.3	77.5	88.1	77.5	7985	91.2
2003	3267.4	516.0	74.3	78.0	72.5	77.3	72.3	77.2	6566	75.0

# CA-14 PICKERING-6

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
18 Jan	230.0	2.5	XP	J42	FRAZIL ICE.
18 Jan	373.0	3.0	UP3	A12	ROP TRIP MARGIN DURING FUELLING.
23 Jan	72.0	2.1	PP	D31	REHEAT OUTAGE.
26 Jan	170.0	87.6	UF2	A31	AUTO TURBINE RUNBACK DUE TO FREEZING OF TRAVELLING SCREEN PT SENSING LINE.
26 Jan	66.0	8.1	UP3	A33	FROZEN BUBBLER LINE CAUSES CCW PUMP TRIP. MANUAL REACTOR SET-BACK.
05 Feb	74.0	1.7	UP3	A31	UNIT DERATED. REHEAT NOT IN SERVICE.
09 Feb	738.0	10.3	UP3	A12	UNIT DERATED DUE TO T1G (SDS) MARGIN TO TRIP.
10 Mar	9.0	0.1	UP3	A12	REACTOR POWER LIMITED DUE TO ROP TRIP MARGIN DURING FUELLING.
12 Mar	250.0	128.8	UF2	A31	FORCED OUTAGE TO REPAIR CRACK IN DEMINERALIZED WATER LINE.
22 Mar	56.0	16.5	UP3	A31	UNIT RAMP-UP AFTER FORCED OUTAGE.
25 Mar	36.0	1.3	UP3	A31	REACTOR POWER LIMITED DUE TO REHEAT OUTAGE.
26 Mar	149.0	3.6	UP3	A12	REACTOR POWER LIMITED DUE TO ROPS.
09 Apr	68.0	35.3	UF2	A21	FORCED OUTAGE TO REPAIR EAST FUELLING MACHINE STUCK ON CHANNEL M-05.
12 Apr	38.0	6.9	UP3	A21	UNIT RAMP-UP AFTER FORCED OUTAGE.
06 May	365.0	12.9	UP3	A12	REACTOR POWER LIMITED DUE TO ROP TRIP MARGIN < 6% DURING FUELLING.
13 May	204.0	2.8	UP3	A21	AVERT POSSIBLE HIGH TEMPERATURE ALARM ON CHANNEL M12.
03 Jul	339.0	2.7	XP	N	HIGH LAKE WATER TEMPERATURE LIMITATIONS.
29 Jul	134.0	69.1	UF2	A12	SDS2 TRIP
11 Aug	69.0	1.9	UP3	A31	PRODUCTION LOSSES DUE TO CONDENSER INEFFICIENCIES.
14 Aug	120.0	61.9	XF	J42	LOSS OF BULK ELECTRICAL SYSTEM - 2003 BLACKOUT
19 Aug	149.0	77.1	UF2	A12	TO REMOVE O-RING BLOCKING PIPE IN THE LIQUID ZONE CONTROL SYSTEM.
25 Aug	39.0	6.6	XP	J42	UNIT RAMP-UP AFTER FORCED OUTAGE.
27 Aug	556.0	11.1	UP3	A12	REACTOR POWER LIMITED BY ROP MARGINS DURING FUELLING.
27 Aug	787.0	7.9	XP	A15	UNIT DERATED DUE TO HIGH CONDENSER COOLING TEMPERATURE
07 Sep	55.0	0.8	UP3	A21	REACTOR POWER LOWERED DUE TO HIGH TEMPERATURE ALARM ON CHANNEL K-16.
18 Sep	90.0	2.7	UP3	A33	CONDENSER COOLING WATER (CCW) PUMP 1 SHUTDOWN DUE TO SCREENHOUSE ALGAE RUN.
05 Nov	43.0	5.9	UP3	Z11	REACTOR POWER REDUCED FOR PRE-SHUTDOWN ACTIVITIES.
07 Nov	127.0	65.4	PF	D21	PLANNED OUTAGE BEGINS. REACTOR DEFUELLING IN PROGRESS.
13 Nov	120.0	61.9	PF	D11	PLANNED OUTAGE CONTINUES. CRITICAL PATH IS CIGAR PROGRAM.
18 Nov	120.0	61.9	PF	D42	PLANNED OUTAGE CONTINUES. CRITICAL PATH IS CLASS II BUS MAINTENANCE
23 Nov	120.0	61.9	PF	D13	PLANNED OUTAGE CONTINUES. MODERATOR DRAIN IN PROGRESS.
28 Nov	816.0	421.1	PF	D11	PLANNED OUTAGE CONTINUES. CRITICAL PATH IS SLAR PROGRAM.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		771			574	
B. Refuelling without a maintenance					63	
D. Inspection, maintenance or repair without refuelling	1303			820		
E. Testing of plant systems or component				0	5	
J. Grid failure or grid unavailability			120			24
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					3	28
Subtotal	1303	771	120	820	645	52
Total		2194			1517	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		77
12. Reactor I&C Systems	283	46
13. Reactor Auxiliary System:		49
14. Safety Systems		59
15. Reactor Cooling System:		56
16. Steam generation system:		122
21. Fuel Handling and Storage Facilities	68	
31. Turbine and auxiliaries:	420	28
32. Feedwater and Main Steam System		47
33. Circulating Water System		3
35. All other I&C Systems		5
41. Main Generator System:		34
42. Electrical Power Supply System:		12
XX. Miscellaneous Systems		20
Total	771	558

# CA-15 PICKERING-7

**Operator:** OPG (ONTARIO POWER GENERATION)

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

## 1. Station Details

**Type:** PHWR  
**Maximum Net Capacity at the beginning of 2003:** 516.0 MW(e)  
**Design Net Capacity:** 516.0 MW(e)  
**Design Discharge Burnup:** 8420 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 1790.7 GW(e).h  
**Energy Availability Factor:** 39.7%  
**Load Factor:** 39.6%  
**Operating Factor:** 43.5%  
**Energy Unavailability Factor:** 60.3%  
**Total Off-line Time:** 4949 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	367.5	68.8	0.0	0.0	0.0	0.0	0.0	5.7	300.5	330.2	350.3	367.8	1790.7
<b>EAF (%)</b>	96.0	19.8	0.0	0.0	0.0	0.0	0.0	1.5	80.9	86.1	94.3	95.8	39.7
<b>UCF (%)</b>	96.8	19.8	0.0	0.0	0.0	0.0	0.0	1.5	81.2	86.3	94.3	96.4	39.8
<b>LF (%)</b>	95.7	19.8	0.0	0.0	0.0	0.0	0.0	1.5	80.9	86.0	94.3	95.8	39.6
<b>OF (%)</b>	100.0	21.4	0.0	0.0	0.0	0.0	0.0	7.0	92.1	100.0	100.0	100.0	43.5
<b>EUF (%)</b>	4.0	80.2	100.0	100.0	100.0	100.0	100.0	98.5	19.1	13.9	5.7	4.2	60.3
<b>PUF (%)</b>	0.0	79.8	100.0	100.0	100.0	3.3	0.0	5.5	7.3	0.0	0.0	0.0	32.7
<b>UCLF (%)</b>	3.2	0.4	0.0	0.0	0.0	96.7	100.0	93.0	11.5	13.8	5.7	3.6	27.5
<b>XUF (%)</b>	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.6	0.1

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Mar 1976      **Lifetime Generation:** 68201.4 GW(e).h  
**Date of First Criticality:** 22 Oct 1984      **Cumulative Energy Availability Factor:** 79.3%  
**Date of Grid Connection:** 17 Nov 1984      **Cumulative Load Factor:** 79.0%  
**Date of Commercial Operation:** 01 Jan 1985      **Cumulative Unit Capability Factor:** 77.8%  
**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	312.7	516.0	0.0	0.0	94.7	100.0	7.2	0.0	861	10.3
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	78.3	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	94.5	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

# CA-15 PICKERING-7

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	1461.0	12.6	UP3	A12	RP LIMITATIONS DUE TO THERMAL POWER ERROR.
14 Jan	203.0	3.0	XP	J	SMALL SRVS OPENED 25% FOR FRAZIL ICE PROTECTION.
22 Jan	19.0	0.4	UP3	A15	UNIT DERATED DUE TO HTS MAIN CIRCUIT PUMP SWAP.
01 Feb	144.0	0.4	UP3	A16	BOILER BLOWDOWN.
04 Feb	50.0	4.1	PP	E11	RP LOWERED FOR PLANNED OUTAGE PREPARATION AND TESTING.
06 Feb	1992.0	1028.0	PF	D11	PLANNED OUTAGE. CRITICAL PATH IS FUEL CHANNEL AND BOILER INSPECTIONS.
01 May	744.0	383.9	PF	D13	PLANNED OUTAGE CONTINUES.
01 Jun	24.0	12.4	PF	D11	PLANNED OUTAGE CONTINUES.
02 Jun	161.0	83.1	UF3	Z11	CRITICAL PATH IS PHT PRE WARM-UP TESTING AND ALIGNMENTS.
08 Jun	631.0	325.8	UF3	Z16	CRITICAL PATH IS HOT BOILER CHEMICAL CLEANING (HBCC) (USI IS 36300).
05 Jul	120.0	61.9	UF3	A12	MAINTENANCE ON LIQUID ZONE CONTROL PUMPS 1 AND 3.
10 Jul	264.0	136.2	UF3	A13	CRITICAL PATH IS INVESTIGATION INTO MODERATOR SYSTEM FILTER (FR2) PLUGGING AND REPAIRS.
21 Jul	96.0	49.5	UF3	A15	CRITICAL PATH INCLUDES REPAIRS TO SHUTDOWN COOLING PUMPS 1 AND 3.
25 Jul	408.0	210.5	UF3	A15	BECS VALVE ACTUATOR DIAPHRAGM AND VALVE SEATING REPAIRS.
11 Aug	87.0	44.9	UF3	A15	HEAT TRANSPORT PUMP 7 SEAL REPLACEMENT.
16 Aug	95.4	49.3	UF3	A12	CHANNEL J MODERATOR LEVEL FAILURE. EQ TRANSMITTER REPLACEMENT.
20 Aug	236.0	121.8	UF3	A15	INSPECTION OF SHUTDOWN COOLING SYSTEM COMPONENTS P2
25 Aug	435.0	48.2	PP	D11	UNIT RAMP-UP AFTER PLANNED OUTAGE.
16 Sep	52.0	0.4	XP	N	PRODUCTION LIMITED DUE TO HIGH LAKE WATER TEMPERATURE.
16 Sep	52.0	1.8	UP3	A12	REACTOR POWER LIMITED ON SDS HT HIGH TEMPERATURE TRIP MARGINS.
19 Sep	57.0	29.4	UF2	A33	DETERIORATING CONDITIONS IN THE SCREENHOUSE (HEAVY ALGAE RUN) 8 AND 5.
21 Sep	154.0	9.1	UP3	A33	UNIT RAMP-UP AFTER FORCED OUTAGE.
27 Sep	1584.0	3.3	XP	A15	UNIT DERATED DUE TO HIGH CONDENSER COOLING WATER TEMPERATURE
27 Sep	463.0	7.0	UP3	A12	REACTOR POWER LIMITED DUE TO ROP TRIP MARGINS < 6% DURING FUELLING.
01 Oct	2019.0	26.6	UP3	A14	PRODUCTION LOSSES DUE TO INACCURATE FEEDWATER FLOW MEASUREMENTS.
01 Oct	1609.0	16.8	UP3	A12	REACTOR POWER LIMITED DUE TO SET POINT MAX. SIX ADJUSTER RODS OUT OF CORE.
17 Oct	328.0	36.2	UP3	A21	FUELLING UNAVAILABLE. SNOOT CLAMP FAULT ON WEST FUELLING MACHINE.
16 Dec	146.0	3.5	UP3	A31	REACTOR POWER DECREASED TO REMOVE REHEAT FROM SERVICE TO REPLACE PUMP 2 AND MOTOR.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		1363			320	
B. Refuelling without a maintenance					212	
D. Inspection, maintenance or repair without refuelling	2760			627		
E. Testing of plant systems or components				1	15	
J. Grid failure or grid unavailability						4
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					10	23
Z. Others		792				
Subtotal	2760	2155	0	628	557	27
Total		4915			1212	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems	215	17
13. Reactor Auxiliary Systems	264	7
14. Safety Systems		50
15. Reactor Cooling Systems	827	14
16. Steam generation systems		30
31. Turbine and auxiliaries		33
32. Feedwater and Main Steam System		14
33. Circulating Water System	57	14
41. Main Generator Systems		117
42. Electrical Power Supply Systems		11
Total	1363	308

# CA-16 PICKERING-8

**Operator:** OPG (ONTARIO POWER GENERATION)

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

## 1. Station Details

**Type:** PHWR  
**Maximum Net Capacity at the beginning of 2003:** 516.0 MW(e)  
**Design Net Capacity:** 516.0 MW(e)  
**Design Discharge Burnup:** 8420 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3921.3 GW(e).h  
**Energy Availability Factor:** 86.9%  
**Load Factor:** 86.8%  
**Operating Factor:** 91.6%  
**Energy Unavailability Factor:** 13.1%  
**Total Off-line Time:** 734 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	360.3	334.7	202.9	358.9	373.2	319.1	310.9	263.9	306.8	370.1	357.7	362.8	3921.3
<b>EAF (%)</b>	93.9	97.9	53.3	96.6	97.2	85.9	81.0	68.8	82.6	96.4	96.3	94.5	86.9
<b>UCF (%)</b>	95.9	98.9	53.7	98.2	99.5	87.8	81.7	89.2	83.8	97.0	96.3	95.3	89.7
<b>LF (%)</b>	93.9	96.5	52.8	96.6	97.2	85.9	81.0	68.7	82.6	96.4	96.3	94.5	86.8
<b>OF (%)</b>	100.0	100.0	57.9	100.0	100.0	89.7	86.6	75.5	91.0	100.0	100.0	100.0	91.6
<b>EU (%)</b>	6.1	2.1	46.7	3.4	2.8	14.1	19.0	31.2	17.4	3.6	3.7	5.5	13.1
<b>PU (%)</b>	0.0	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>	4.1	1.1	46.3	1.8	0.5	12.2	18.3	10.8	16.2	3.0	3.7	4.7	10.3
<b>XUF (%)</b>	2.1	1.0	0.4	1.6	2.3	1.9	0.7	20.4	1.2	0.6	0.0	0.8	2.8

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1976      **Lifetime Generation:** 61697.2 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:** 78.1%  
**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	3792.3	516.0	0.0	0.0	89.8	100.0	89.0	0.0	8086	97.9
1987	3759.4	516.0	84.7	84.7	83.3	83.3	83.2	83.2	7585	86.6
1988	3710.4	516.0	82.5	83.6	82.3	82.8	81.9	82.5	7296	83.1
1989	4295.2	516.0	96.6	87.9	95.4	87.0	95.0	86.7	8569	97.8
1990	3014.7	516.0	66.7	82.6	66.6	81.9	66.7	81.7	6743	77.0
1991	4485.0	516.0	99.5	86.0	98.9	85.3	99.2	85.2	8759	100.0
1992	4212.0	516.0	93.0	87.2	92.9	86.6	92.9	86.5	8280	94.3
1993	3670.5	516.0	82.2	86.5	81.7	85.9	81.2	85.7	7233	82.6
1994	4341.9	516.0	96.8	87.8	96.8	87.2	96.1	87.0	8579	97.9
1995	4012.1	516.0	89.4	87.9	89.0	87.4	88.8	87.2	8066	92.1
1996	1300.3	516.0	28.7	82.0	28.7	81.6	28.7	81.3	2597	29.6
1997	360.8	516.0	8.0	75.3	8.0	74.9	8.0	74.7	995	11.3
1998	3493.6	516.0	78.0	75.5	77.3	75.1	77.3	74.9	7009	80.0
1999	3509.1	516.0	78.4	75.7	77.6	75.3	77.6	75.1	7077	80.8
2000	2711.2	516.0	60.8	74.7	59.9	74.2	59.8	74.0	5508	62.7
2001	3502.2	516.0	78.2	74.9	77.5	74.4	77.5	74.2	6999	79.9
2002	3605.4	516.0	81.1	75.3	80.0	74.7	79.8	74.6	7244	82.7
2003	3921.3	516.0	89.7	76.1	86.9	75.5	86.8	75.3	8026	91.6



# CA-16 PICKERING-8

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	2500.0	28.9	XP	J	BUILDING HEATING.
09 Jan	156.0	11.0	UP3	A31	REACTOR POWER LOWERED DUE TO LOSS OF REHEAT RETURN FLOW.
14 Jan	223.0	5.1	XP	J	SMALL SRVS OPENED TO HEAT UP FRAZIL ICE.
14 Jan	662.0	11.9	UP3	A12	REACTOR POWER LOWERED TO 99% DUE TO ROP TRIP MARGIN.
27 Jan	11.0	0.1	XP	J	QUIET MODE DECLARED DUE TO UNIT 5 GENERATOR H2 SEAL FAILURE.
27 Jan	99.0	7.5	UP3	A34	POWERHOUSE EMERGENCY VENTILATION SYSTEM FREEZING PROBLEMS.
04 Mar	191.0	5.7	UP3	A12	REACTOR POWER LIMITED DUE TO HIGH ROP DURING AA21 WITHDRAWAL.
11 Mar	313.0	161.7	UF2	A32	UNIT TRANSIENT CAUSED BY TEMPORARY LOSS OF FEEDWATER TO BOILER
24 Mar	58.0	12.4	UP3	A35	UNIT RAMP UP AFTER SUDDEN OUTAGE.
28 Apr	68.0	2.3	UP3	A32	UNIT DERATED FOR HEATER BANK A OUTAGE.
27 Jun	174.0	89.7	UF2	A21	UNIT FORCED OUT TO REPAIR STUCK FUELLING MACHINE.
05 Jul	89.0	10.8	UP3	A21	UNIT RAMP-UP AFTER FORCED OUTAGE.
08 Jul	454.0	7.1	UP3	A12	REACTOR POWER LIMITED DUE TO ROP MARGIN TO TRIP.
08 Jul	883.0	8.0	XP	A15	UNIT DERATED DUE TO HIGH CONDENSER COOLING WATER TEMPERATURE
21 Jul	46.0	0.6	UP3	A12	REACTOR POWER RESTRICTED DUE TO REGULATING ICFD STEPBACK IMPENDING ALARMS.
27 Jul	57.0	0.7	UP3	A21	REACTOR POWER LIMITED DUE TO HIGH TEMPERATURE ON CHANNEL K-10.
30 Jul	40.0	0.3	UP3	A16	BOILER BLOWDOWNS.
07 Aug	183.0	5.8	UP3	A31	PRODUCTION LOSSES DUE TO HIGH CONDENSER BACKPRESSURE.
14 Aug	120.0	61.9	XF	J	LOSS OF BULK ELECTRICAL SYSTEM - 2003 BLACKOUT
19 Aug	62.0	32.0	UF2	A14	SHUTDOWN CONTINUES TO REPAIR FAILED ECI DRAIN LINE (L69).
22 Aug	71.0	9.9	XP	J	UNIT RAMP-UP AFTER SHUTDOWN.
25 Aug	544.0	9.2	UP3	A12	REACTOR POWER LIMITED DUE TO ROP TRIP MARGINS.
25 Aug	2080.0	11.2	XP	N	PRODUCTION LIMITED DUE TO HIGH LAKE WATER TEMPERATURE.
29 Aug	1214.0	8.7	UP3	A12	THERMAL POWER ERROR.
08 Sep	65.0	33.7	UF2	A31	TURBINE TRIP DURING T-3 TEST (OVERSPEED OF BOLT FREEDOM OF MOVEMENT TEST).
10 Sep	27.0	7.9	UP3	A31	UNIT RAMP-UP AFTER SUDDEN OUTAGE.
11 Sep	140.0	5.7	UP3	A31	REACTOR POWER LIMITED DUE TO REQUIRED REHEAT SYSTEM REPAIRS.
19 Sep	17.0	0.9	UP3	A33	CONDENSER COOLING WATER (CCW) PUMP 1 TRIPPED ON SCREEN DP VHN.
19 Sep	126.0	3.1	UP3	A31	PRODUCTION LOSSES DUE TO CONDENSER INEFFICIENCIES
20 Oct	1752.0	27.2	UP3	A32	PRODUCTION LOSSES DUE TO INACCURATE FEEDWATER FLOW MEASUREMENTS.
04 Nov	22.0	0.5	UP3	A33	CCW PUMP 1 SHUTDOWN DUE TO ALGAE RUN. MW OUTPUT REDUCED.
01 Dec	98.0	9.3	UP3	A12	REACTOR POWER LOWERED DUE TO IRRATIONAL ZONE 10 LEVEL ANNUNCIATION.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1986 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		614			320	
B. Refuelling without a maintenance				297	289	
D. Inspection, maintenance or repair without refuelling				855		
E. Testing of plant systems or components				1		
J. Grid failure or grid unavailability			120			0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					5	
Subtotal	0	614	120	1153	614	0
Total		734			1767	

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

System	2003 Hours Lost	1986 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		33
13. Reactor Auxiliary Systems		4
14. Safety Systems	62	24
15. Reactor Cooling Systems		53
16. Steam generation systems		28
21. Fuel Handling and Storage Facilities	174	
31. Turbine and auxiliaries	65	44
32. Feedwater and Main Steam System	313	9
33. Circulating Water System		13
35. All other I&C Systems		2
41. Main Generator Systems		15
42. Electrical Power Supply Systems		2
Total	614	227

# CA-17 POINT LEPREAU

**Operator:** NBEP (NEW BRUNSWICK ELECTRIC POWER COMMISSION)  
**Contractor:** AECL (ATOMIC ENERGY OF CANADA LTD.)

## 1. Station Details

**Type:** PHWR  
**Maximum Net Capacity at the beginning of 2003:** 635.0 MW(e)  
**Design Net Capacity:** 630.0 MW(e)  
**Design Discharge Burnup:** 7500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4739.5 GW(e).h  
**Energy Availability Factor:** 84.4%  
**Load Factor:** 85.2%  
**Operating Factor:** 89.8%  
**Energy Unavailability Factor:** 15.6%  
**Total Off-line Time:** 891 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	454.0	375.0	450.4	434.4	448.2	431.5	444.5	446.7	168.2	204.6	433.7	448.4	4739.5
<b>EAF (%)</b>	95.6	87.3	94.8	94.9	94.3	93.9	93.9	94.4	33.1	40.6	94.8	94.6	84.4
<b>UCF (%)</b>	100.0	91.6	100.0	100.0	100.0	100.0	100.0	100.0	38.7	46.5	100.0	100.0	89.8
<b>LF (%)</b>	96.1	87.9	95.3	95.0	94.9	94.4	94.1	94.5	36.8	43.3	94.9	94.9	85.2
<b>OF (%)</b>	100.0	90.3	100.0	100.0	100.0	100.0	100.0	100.0	37.5	49.5	100.0	100.0	89.8
<b>EUf (%)</b>	4.4	12.7	5.2	5.1	5.7	6.1	6.1	5.6	66.9	59.4	5.2	5.4	15.6
<b>PUF (%)</b>	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	61.3	11.8	0.0	0.0	6.0
<b>UCLF (%)</b>	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.7	0.0	0.0	4.2
<b>XUF (%)</b>	4.4	4.3	5.2	5.1	5.7	6.1	6.1	5.6	5.6	5.8	5.2	5.4	5.4

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1975  
**Date of First Criticality:** 25 Jul 1982  
**Date of Grid Connection:** 11 Sep 1982  
**Date of Commercial Operation:** 01 Feb 1983

**Lifetime Generation:** 97381.5 GW(e).h  
**Cumulative Energy Availability Factor:** 81.8%  
**Cumulative Load Factor:** 82.6%  
**Cumulative Unit Capability Factor:** 77.7%  
**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 (%)		
1982	0.0	635.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0	0.0
1983	4742.9	640.0	0.0	0.0	84.8	100.0	84.6	0.0	7875	89.9		
1984	5000.9	635.0	89.0	89.0	88.9	88.9	89.7	89.7	7927	90.2		
1985	5421.9	635.0	96.9	93.0	96.9	92.9	97.5	93.6	8547	97.6		
1986	5223.1	635.0	94.0	93.3	93.4	93.1	93.9	93.7	8257	94.3		
1987	5107.7	635.0	91.3	92.8	91.2	92.6	91.8	93.2	8110	92.6		
1988	5338.3	635.0	94.8	93.2	94.9	93.1	95.7	93.7	8383	95.4		
1989	5266.7	635.0	93.8	93.3	93.6	93.2	94.7	93.9	8271	94.4		
1990	5333.7	635.0	95.0	93.5	94.7	93.4	95.9	94.2	8384	95.7		
1991	5437.2	635.0	96.7	93.9	96.7	93.8	97.7	94.6	8500	97.0		
1992	4829.8	635.0	85.8	93.0	85.8	92.9	86.6	93.7	7748	88.2		
1993	5320.0	635.0	95.1	93.2	95.1	93.1	95.6	93.9	8391	95.8		
1994	5230.1	635.0	93.5	93.3	93.5	93.1	94.0	93.9	8270	94.4		
1995	1611.4	635.0	29.0	87.9	29.0	87.8	29.0	88.5	2615	29.9		
1996	4587.8	635.0	81.4	87.4	81.4	87.3	82.3	88.0	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	84.4	66.0	84.2	68.0	85.0	6111	69.8		
1999	4082.7	635.0	75.5	83.8	72.0	83.4	73.4	84.2	6797	77.6		
2000	3966.9	635.0	77.6	83.5	70.5	82.7	71.1	83.5	6792	77.3		
2001	4451.3	635.0	84.6	83.5	79.1	82.5	80.0	83.3	7418	84.7		
2002	3760.6	635.0	71.6	82.9	67.6	81.7	67.6	82.5	6107	69.7		
2003	4739.5	635.0	89.8	83.2	84.4	81.8	85.2	82.6	7869	89.8		

## CA-17 POINT LEPREAU

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
13 Feb	56.0	35.8	UF4	L14	SDSI TRIP
10 Sep	528.0	335.6	PF	D	PLANNED ANNUAL OUTAGE
03 Oct	307.0	197.2	UF3	Z	OUTAGE EXTENSION

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					246	1
B. Refuelling without a maintenance					96	
D. Inspection, maintenance or repair without refuelling	528			516		
E. Testing of plant systems or components				0	2	
H. Nuclear regulatory requirements					2	
J. Grid failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						2
L. Human factor related		56				
Z. Others		307			28	
Subtotal	528	363	0	516	374	4
Total		891			894	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		13
13. Reactor Auxiliary Systems		4
14. Safety Systems		5
15. Reactor Cooling Systems		87
16. Steam generation systems		73
31. Turbine and auxiliaries		16
32. Feedwater and Main Steam System		26
41. Main Generator Systems		10
42. Electrical Power Supply Systems		5
Total	0	239

# 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  
**Maximum Net Capacity at the beginning of 2003:** 944.0 MW(e)  
**Design Net Capacity:** 930.0 MW(e)  
**Design Discharge Burnup:** 39000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7400.8 GW(e).h  
**Energy Availability Factor:** 90.4%  
**Load Factor:** 89.5%  
**Operating Factor:** 90.8%  
**Energy Unavailability Factor:** 9.6%  
**Total Off-line Time:** 802 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	693.6	609.6	450.5	157.8	701.9	678.1	695.0	652.4	670.1	703.1	682.2	706.4	7400.8
<b>EAF (%)</b>	99.5	94.2	63.5	35.0	99.9	100.0	99.6	93.6	99.1	100.0	100.0	100.0	90.4
<b>UCF (%)</b>	99.5	100.0	63.5	35.1	99.9	100.0	100.0	93.6	99.8	100.0	100.0	100.0	91.0
<b>LF (%)</b>	98.8	96.1	64.1	23.2	99.9	99.8	99.0	92.9	98.6	100.0	100.4	100.6	89.5
<b>OF (%)</b>	100.0	94.2	65.6	35.0	100.0	100.0	100.0	94.8	100.0	99.9	100.0	100.0	90.8
<b>EUf (%)</b>	0.5	5.8	36.5	65.0	0.1	0.0	0.4	6.4	0.9	0.0	0.0	0.0	9.6
<b>PUF (%)</b>	0.2	0.0	36.4	65.0	0.1	0.0	0.0	6.4	0.0	0.0	0.0	0.0	9.0
<b>UCLF (%)</b>	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.3	0.0	0.0	0.0	0.1
<b>XUF (%)</b>	0.0	5.8	0.0	0.0	0.0	0.0	0.4	0.0	0.7	0.0	0.0	0.0	0.5

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 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:** 56946.4 GW(e).h  
**Cumulative Energy Availability Factor:** 77.0%  
**Cumulative Load Factor:** 77.1%  
**Cumulative Unit Capability Factor:** 81.2%  
**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 (%)
1994	5917.4	944.0	0.0	0.0	78.3	100.0	71.6	0.0	6539	74.6
1995	3723.6	944.0	84.6	84.6	46.2	46.2	45.0	45.0	4088	46.7
1996	6252.7	944.0	76.8	80.7	76.0	61.1	75.4	60.2	6847	77.9
1997	6491.2	944.0	82.0	81.1	74.6	65.6	78.5	66.3	7272	83.0
1998	6040.5	944.0	79.6	80.8	72.0	67.2	73.0	68.0	7344	83.8
1999	6723.7	944.0	87.7	82.1	82.7	70.3	81.3	70.7	7680	87.7
2001	7009.3	944.0	87.5	83.0	84.8	72.7	84.8	73.0	7619	87.0
2002	7387.2	944.0	89.6	84.0	89.5	75.1	89.3	75.3	7924	90.5
2003	7400.8	944.0	91.0	84.8	90.4	77.0	89.5	77.1	7958	90.8

## CN-2 GUANGDONG-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
21 Mar	723.0	682.5	PF	C21	THE PLANT WAS BEARING ITS 9TH REFUELING OUTAGES FORCED MAINTENANCE DUE TO THE SOFT CONNECTION OVERHEATING OF THE MAIN TRANSFORMER PHASE A BY THE REQUEST OF THE GRID SYSTEM.
21 Aug	39.0	36.8	UF	A42	

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1994 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		39			175	
C. Inspection, maintenance or repair combined with refuelling	723			874		
D. Inspection, maintenance or repair without refuelling				28		
E. Testing of plant systems or components					0	
J. Grid failure or grid unavailability						27
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						308
Subtotal	723	39	0	902	175	335
Total		762			1412	

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

System	2003 Hours Lost	1994 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		10
13. Reactor Auxiliary Systems		9
15. Reactor Cooling Systems		1
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		31
41. Main Generator Systems		96
42. Electrical Power Supply Systems	39	24
Total	39	172

**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  
Maximum Net Capacity  
at the beginning of 2003: 944.0 MW(e)  
Design Net Capacity: 930.0 MW(e)  
Design Discharge Burnup: 39000 MW.d/t

**2. Production Summary 2003**

Energy Production: 6983.1 GW(e).h  
Energy Availability Factor: 84.5%  
Load Factor: 84.4%  
Operating Factor: 85.7%  
Energy Unavailability Factor: 15.5%  
Total Off-line Time: 1257 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	572.0	0.0	247.4	666.7	697.2	674.3	691.2	690.0	665.1	696.0	678.5	704.6	6983.1
EAF (%)	79.7	0.0	34.9	99.0	99.8	99.6	99.0	99.1	98.3	99.3	99.7	99.7	84.5
UCF (%)	79.7	0.0	34.9	99.0	99.8	99.6	99.4	99.1	99.0	99.3	99.7	99.7	84.6
LF (%)	81.4	0.0	35.2	98.2	99.3	99.2	98.4	98.2	97.9	99.0	99.8	100.3	84.4
OF (%)	81.3	0.0	43.4	100.0	100.0	100.0	100.0	96.8	100.0	99.9	100.0	100.0	85.7
EUF (%)	20.3	100.0	65.1	1.0	0.2	0.4	1.0	0.9	1.7	0.7	0.3	0.3	15.5
PUF (%)	20.3	100.0	56.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.2
UCLF (%)	0.0	0.0	8.5	1.0	0.2	0.4	0.7	0.9	1.0	0.7	0.3	0.3	1.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.7	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****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: 57392.2 GW(e).h  
Cumulative Energy Availability Factor: 77.8%  
Cumulative Load Factor: 78.0%  
Cumulative Unit Capability Factor: 81.2%  
Cumulative Energy Unavailability Factor: 22.2%

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 (%)
1994	5741.2	944.0	0.0	0.0	94.8	100.0	69.4	0.0	6889	78.6
1995	6343.3	944.0	81.1	81.1	77.5	77.5	76.7	76.7	7146	81.6
1996	5276.9	944.0	67.4	74.3	63.9	70.7	63.6	70.2	5740	65.3
1997	5914.8	944.0	70.1	72.9	67.4	69.6	71.5	70.6	6194	70.7
1998	6259.1	944.0	82.9	75.4	74.7	70.9	75.7	71.9	7302	83.4
1999	6789.5	944.0	86.2	77.5	83.3	73.4	82.1	73.9	7594	86.7
2001	7355.5	944.0	91.1	79.8	89.5	76.0	88.9	76.4	7986	91.2
2002	6728.9	944.0	82.2	80.1	81.6	76.8	81.4	77.1	7224	82.5
2003	6983.1	944.0	84.6	80.7	84.5	77.8	84.4	78.0	7503	85.7

## CN-3 GUANGDONG-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
26 Jan	1234.0	1164.5	PF	C21	REFUELING OUTAGE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1994 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					104	
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling	1234			859		
D. Inspection, maintenance or repair without refuelling				22		
J. Grid failure or grid unavailability						33
Subtotal	1234	0	0	881	110	33
Total		1234			1024	

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

System	2003 Hours Lost	1994 to 2003 Average Hours Lost Per Year
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		6
32. Feedwater and Main Steam System		3
35. All other I&C Systems		3
41. Main Generator Systems		88
42. Electrical Power Supply Systems		0
Total	0	101

# CN-6 LINGAO 1

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

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 938.0 MW(e)  
**Design Net Capacity:** 0.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 6375.0 GW(e).h  
**Energy Availability Factor:** 80.4%  
**Load Factor:** 77.6%  
**Operating Factor:** 82.4%  
**Energy Unavailability Factor:** 19.6%  
**Total Off-line Time:** 1545 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	635.7	557.3	688.1	374.1	0.0	412.8	682.5	693.1	666.8	698.7	679.4	286.4	6375.0
<b>EAF (%)</b>	89.4	88.2	99.4	68.3	0.0	84.0	96.8	100.0	99.2	100.0	100.0	40.9	80.4
<b>UCF (%)</b>	100.0	100.0	99.4	68.3	0.0	84.0	96.8	100.0	100.0	100.0	100.0	41.5	82.3
<b>LF (%)</b>	91.1	88.4	98.6	55.5	0.0	61.1	97.8	99.3	98.7	100.0	100.6	41.0	77.6
<b>OF (%)</b>	100.0	100.0	100.0	64.0	0.0	85.3	100.0	100.0	100.0	99.9	100.0	41.5	82.4
<b>EUf (%)</b>	10.6	11.8	0.6	31.7	100.0	16.0	3.2	0.0	0.8	0.0	0.0	59.1	19.6
<b>PUF (%)</b>	0.0	0.0	0.0	31.7	100.0	14.6	0.0	0.0	0.0	0.0	0.0	0.0	12.3
<b>UCLF (%)</b>	0.0	0.0	0.6	0.0	0.0	1.4	3.2	0.0	0.0	0.0	0.0	58.5	5.4
<b>XUF (%)</b>	10.6	11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.7	1.9

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 15 May 1997  
**Date of First Criticality:** 04 Feb 2002  
**Date of Grid Connection:** 26 Feb 2002  
**Date of Commercial Operation:** 28 May 2002

**Lifetime Generation:** 10958.9 GW(e).h  
**Cumulative Energy Availability Factor:** 80.4%  
**Cumulative Load Factor:** 77.6%  
**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 (%)
2002	4583.8	938.0	0.0	0.0	95.7	100.0	83.1	0.0	5184	88.1
2003	6375.0	938.0	82.3	82.3	80.4	80.4	77.6	77.6	7215	82.4



# CN-6 LINGAO 1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
21 Apr	1111.0	1042.3	PF	C21	THE PLANT WAS BEARING ITS REFUELING OUTAGE
12 Dec	434.4	407.5	UF	A42	ACETYLENE IN THE MAIN TRANSFORMER PHASE C.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			2003 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		434				
C. Inspection, maintenance or repair combined with refuelling	1111					
Subtotal	1111	434	0	0	0	0
Total		1545			0	

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

System	2003 Hours Lost	2003 to 2003 Average Hours Lost Per Year
42. Electrical Power Supply Systems	434	
Total	434	0

## CN-7 LINGAO 2

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

### 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 938.0 MW(e)  
**Design Net Capacity:** 0.0 MW(e)  
**Design Discharge Burnup:** —

### 2. Production Summary 2003

**Energy Production:** 6934.9 GW(e).h  
**Energy Availability Factor:** 89.9%  
**Load Factor:** 84.4%  
**Operating Factor:** 85.5%  
**Energy Unavailability Factor:** 10.1%  
**Total Off-line Time:** 1266 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	431.8	417.2	708.9	681.5	699.8	671.2	699.5	699.6	669.0	692.9	563.6	0.0	6934.9
<b>EAF (%)</b>	96.8	98.8	99.7	99.7	99.9	99.0	100.0	100.0	98.4	99.1	89.6	0.0	89.9
<b>UCF (%)</b>	100.0	100.0	99.7	99.7	99.9	99.9	100.0	100.0	100.0	99.9	89.6	0.0	90.6
<b>LF (%)</b>	61.9	66.2	101.6	101.1	100.3	99.4	100.2	100.2	99.1	99.1	83.4	0.0	84.4
<b>OF (%)</b>	64.9	71.4	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	90.4	0.0	85.5
<b>EUf (%)</b>	3.2	1.2	0.3	0.3	0.1	1.0	0.0	0.0	1.6	0.9	10.4	100.0	10.1
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.4	100.0	9.3
<b>UCLF (%)</b>	0.0	0.0	0.3	0.3	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1
<b>XUF (%)</b>	3.2	1.2	0.0	0.0	0.0	0.9	0.0	0.0	1.6	0.8	0.0	0.0	0.6

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

THE PLANT WAS PUT INTO COMMERCIAL OPERATION ON 8TH OF JANUARY, 2003.

### 5. Historical Summary

**Date of Construction Start:** 28 Nov 1997  
**Date of First Criticality:** 27 Aug 2002  
**Date of Grid Connection:** 15 Dec 2002  
**Date of Commercial Operation:** 08 Jan 2003

**Lifetime Generation:** 6934.9 GW(e).h  
**Cumulative Energy Availability Factor:** 89.9%  
**Cumulative Load Factor:** 84.4%  
**Cumulative Unit Capability Factor:** 81.5%  
**Cumulative Energy Unavailability Factor:** 10.1%

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 (%)
2003	6934.9	938.0	90.6	90.6	89.9	89.9	84.4	84.4	7494	85.5

## CN-7 LINGAO 2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
28 Nov	793.0	767.9	PF	C21	FIRST REFUELING OUTAGE

### 7. Full Outages, Analysis by Cause

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

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

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

System	2003 Hours Lost	2003 to 2003 Average Hours Lost Per Year

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

## CN-4 QINSHAN 2 - 1

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

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

### 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 610.0 MW(e)  
**Design Net Capacity:** 0.0 MW(e)  
**Design Discharge Burnup:** —

### 2. Production Summary 2003

**Energy Production:** 4327.3 GW(e).h  
**Energy Availability Factor:** 80.9%  
**Load Factor:** 81.0%  
**Operating Factor:** 81.3%  
**Energy Unavailability Factor:** 19.1%  
**Total Off-line Time:** 1637 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	388.9	382.2	459.8	46.0	0.0	323.5	455.4	454.7	443.7	446.3	454.3	472.5	4327.3
<b>EAF (%)</b>	84.6	94.0	99.0	10.1	0.0	87.8	100.0	100.0	100.0	95.9	100.0	99.9	80.9
<b>UCF (%)</b>	84.6	94.6	99.0	10.1	0.0	87.8	100.0	100.0	100.0	95.9	100.0	99.9	81.0
<b>LF (%)</b>	85.7	93.2	101.3	10.5	0.0	73.7	100.3	100.2	101.0	98.2	103.4	104.1	81.0
<b>OF (%)</b>	85.2	94.6	100.0	10.6	0.0	87.8	100.0	100.0	100.0	97.9	100.0	100.0	81.3
<b>EUf (%)</b>	15.4	6.0	1.0	89.9	100.0	12.2	0.0	0.0	0.0	4.1	0.0	0.1	19.1
<b>PUF (%)</b>	0.0	0.0	0.0	89.9	100.0	12.2	0.0	0.0	0.0	0.0	0.0	0.0	16.9
<b>UCLF (%)</b>	15.4	5.4	1.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1	0.0	0.1	2.2
<b>XUF (%)</b>	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 replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 02 Jun 1996  
**Date of First Criticality:** 15 Nov 2001  
**Date of Grid Connection:** 06 Feb 2002  
**Date of Commercial Operation:** 18 Apr 2002

**Lifetime Generation:** 7292.6 GW(e).h  
**Cumulative Energy Availability Factor:** 80.9%  
**Cumulative Load Factor:** 81.0%  
**Cumulative Unit Capability Factor:** 81.5%  
**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 (%)
2002	2965.3	610.0	0.0	0.0	81.6	100.0	73.6	0.0	4631	70.2
2003	4327.3	610.0	81.0	81.0	80.9	80.9	81.0	81.0	7123	81.3

## CN-4 QINSHAN 2 - 1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
25 Jan	110.0	67.1	UF	Z	UNRELIABLE OPERATIONS OF THE SECOND PLANT SYSTEMS
27 Feb	36.0	22.0	UF	Z42	UNRELIABLE OPERATION OF THE NON EMERGENCY ELECTRICAL SYSTEMS.
04 Apr	1488.0	907.7	PF	C21	REFUELLING

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			2003 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling	1488					
Z. Others		146				
Subtotal	1488	146	0	0	0	0
Total		1634			0	

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

System	2003 Hours Lost	2003 to 2003 Average Hours Lost Per Year

**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  
 Maximum Net Capacity  
 at the beginning of 2003: 650.0 MW(e)  
 Design Net Capacity: 0.0 MW(e)  
 Design Discharge Burnup: —

**2. Production Summary 2003**

Energy Production: 5174.7 GW(e).h  
 Energy Availability Factor: 86.6%  
 Load Factor: 90.9%  
 Operating Factor: 91.1%  
 Energy Unavailability Factor: 13.4%  
 Total Off-line Time: 783 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	491.7	418.7	497.0	358.7	257.5	388.3	477.5	470.4	455.5	493.7	377.0	488.8	5174.7
EAF (%)	62.9	100.0	100.0	74.8	47.9	81.3	100.0	99.3	99.1	99.9	76.6	98.1	86.6
UCF (%)	99.0	100.0	100.0	74.8	47.9	81.3	100.0	99.3	99.1	99.9	76.6	98.1	89.7
LF (%)	101.7	95.9	102.8	76.7	53.3	83.0	98.7	97.3	97.3	101.9	80.6	101.1	90.9
OF (%)	99.3	100.0	100.0	75.9	53.1	82.9	100.0	100.0	100.0	100.0	81.5	100.0	91.1
EUF (%)	37.1	0.0	0.0	25.2	52.1	18.7	0.0	0.7	0.9	0.1	23.4	1.9	13.4
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 (%)	1.0	0.0	0.0	25.2	52.1	18.7	0.0	0.7	0.9	0.1	23.4	1.9	10.4
XUF (%)	36.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 08 Jun 1998      Lifetime Generation: 5174.7 GW(e).h  
 Date of First Criticality: 21 Sep 2002      Cumulative Energy Availability Factor: 86.6%  
 Date of Grid Connection: 19 Nov 2002      Cumulative Load Factor: 90.9%  
 Date of Commercial Operation: 31 Dec 2002      Cumulative Unit Capability Factor: 81.5%  
    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 (%)
2003	5174.7	650.0	89.7	89.7	86.6	86.6	90.9	90.9	7977	91.1

## CN-8 QINSHAN 3 - 1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
16 Apr	173.0	117.6	UF5	A15	THE REACTOR WAS MANUALLY SHUTDOWN FOR RESETTING THE SEALING PLUG AND UNLOADING THE SPENT FUEL.
15 May	349.0	252.0	UF4	A42	THE OUTPUT BREAKER OF THE MAIN TRANSFORMER TRIP AUTOMATICALLY, AND THE UNIT LOST TWO LOOPS OFFSITE POWER SUPPLY
17 Jun	123.0	87.7	UF5	A15	THE REACTOR WAS MANUALLY SHUTDOWN TO DISPOSE THE HEAVY WATER LEAKAGE OCCURED ON THE NOZZLE THAT CONNECTED THE DEGASSER-CONDENSER BOX AND THE DOUSING PIPELINE.
24 Nov	133.0	109.4	UF4	A12	UNIT TRIP BY SYSTEM2 DUE TO SIGNAL EXCURSION

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			2003 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		778				
Subtotal	0	778	0	0	0	0
Total		778			0	

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

System	2003 Hours Lost	2003 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	133	
15. Reactor Cooling Systems	296	
42. Electrical Power Supply Systems	349	
Total	778	0

**CN-1 QINSHAN-1**

**Operator:** QNPC (QINSHAN NUCLEAR POWER COMPANY)  
**Contractor:** CNNC (CHINA NATIONAL NUCLEAR CORPORATION)

**1. Station Details**

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 288.0 MW(e)  
**Design Net Capacity:** 288.0 MW(e)  
**Design Discharge Burnup:** 30000 MW.d/t

**2. Production Summary 2003**

**Energy Production:** 2256.6 GW(e).h  
**Energy Availability Factor:** 88.4%  
**Load Factor:** 89.4%  
**Operating Factor:** 89.0%  
**Energy Unavailability Factor:** 11.6%  
**Total Off-line Time:** 962 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	213.4	176.9	219.9	212.8	219.7	212.6	214.8	213.6	207.9	145.1	0.0	219.8	2256.6
<b>EAF (%)</b>	99.9	99.9	99.9	99.9	99.8	99.9	99.3	99.8	99.9	63.1	0.0	99.3	88.4
<b>UCF (%)</b>	100.0	100.0	99.9	99.9	99.8	99.9	99.3	99.8	99.9	63.1	0.0	99.3	88.5
<b>LF (%)</b>	99.6	91.4	102.6	102.8	102.5	102.5	100.2	99.7	100.3	67.6	0.0	102.6	89.4
<b>OF (%)</b>	100.0	100.0	100.0	100.1	100.0	100.0	100.0	100.0	100.0	67.4	0.0	100.0	89.0
<b>EUf (%)</b>	0.1	0.1	0.1	0.1	0.2	0.1	0.7	0.2	0.1	36.9	100.0	0.7	11.6
<b>PUF (%)</b>	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.1	35.2	100.0	0.6	11.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.1	0.0	0.5	0.0	0.0	1.8	0.0	0.1	0.2
<b>XUF (%)</b>	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 20 Mar 1985  
**Date of First Criticality:** 31 Oct 1991  
**Date of Grid Connection:** 15 Dec 1991  
**Date of Commercial Operation:** 01 Apr 1994

**Lifetime Generation:** 19763.4 GW(e).h  
**Cumulative Energy Availability Factor:** 70.8%  
**Cumulative Load Factor:** 72.3%  
**Cumulative Unit Capability Factor:** 81.2%  
**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 (%)
1993	1740.5	288.0	0.0	0.0	64.8	100.0	69.0	0.0	6185	70.6
1994	1648.6	279.0	0.0	0.0	66.4	100.0	67.5	0.0	6439	73.5
1995	2063.9	300.0	86.8	86.8	82.3	82.3	78.5	78.5	7886	90.0
1996	2073.7	279.0	81.2	84.1	81.2	81.8	84.6	81.5	7479	85.1
1997	2011.7	300.0	81.8	83.3	76.1	79.8	76.5	79.8	7185	82.0
1998	1149.5	279.0	48.8	75.0	42.6	70.9	47.0	71.9	4331	49.4
1999	680.9	279.0	27.8	65.8	27.8	62.5	27.9	63.4	2519	28.8
2000	2035.5	300.0	77.6	67.9	77.6	65.1	77.2	65.8	6840	77.9
2001	2319.4	279.0	93.5	71.4	92.8	69.0	94.9	69.8	8370	95.5
2002	1783.2	279.0	69.2	71.1	66.3	68.6	73.0	70.2	5989	68.4
2003	2256.6	288.0	88.5	73.1	88.4	70.8	89.4	72.3	7798	89.0



# CN-1 QINSHAN-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
29 Jan	288.0	0.4	XP1	K	200MWE OPERATION FOR LOAD FOLLOWING. THE UNIT WAS IN REFUELING OUTAGE.
22 Oct	962.0	282.9	PF	C21	

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1993 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					55	
B. Refuelling without a maintenance					10	
C. Inspection, maintenance or repair combined with refuelling	962			1185		
D. Inspection, maintenance or repair without refuelling				113		
E. Testing of plant systems or components					4	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					563	3
Subtotal	962	0	0	1298	632	3
Total		962			1933	

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

System	2003 Hours Lost	1993 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		3
13. Reactor Auxiliary Systems		8
15. Reactor Cooling Systems		1
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		21
33. Circulating Water System		7
35. All other I&C Systems		3
41. Main Generator Systems		3
XX. Miscellaneous Systems		3
Total	0	51

# TW-1 CHIN SHAN-1

Operator: TPC (TAI POWER CO.)

Contractor: WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: BWR  
 Maximum Net Capacity at the beginning of 2003: 604.0 MW(e)  
 Design Net Capacity: 604.0 MW(e)  
 Design Discharge Burnup: —

## 2. Production Summary 2003

Energy Production: 5240.0 GW(e).h  
 Energy Availability Factor: 99.4%  
 Load Factor: 99.0%  
 Operating Factor: 100.0%  
 Energy Unavailability Factor: 0.6%  
 Total Off-line Time: 0 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	453.7	406.8	452.3	435.7	446.7	418.0	436.5	438.7	425.5	444.1	431.8	450.2	5240.0
EAF (%)	99.7	99.1	99.9	100.0	99.7	96.7	99.1	99.8	99.9	99.7	99.7	100.0	99.4
UCF (%)	99.7	99.1	99.9	100.0	99.7	97.8	99.1	99.8	100.0	100.0	99.7	100.0	99.6
LF (%)	101.0	100.2	100.6	100.2	99.4	96.1	97.1	97.6	97.8	98.8	99.3	100.2	99.0
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUf (%)	0.3	0.9	0.1	0.0	0.3	3.3	0.9	0.2	0.1	0.3	0.3	0.0	0.6
PUF (%)	0.0	0.9	0.1	0.0	0.2	0.1	0.0	0.2	0.1	0.0	0.3	0.0	0.1
UCLF (%)	0.3	0.0	0.0	0.0	0.2	2.1	0.9	0.0	0.0	0.0	0.0	0.0	0.3
XUF (%)	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.3	0.0	0.0	0.1

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 12 Jun 1972      Lifetime Generation: 101771.7 GW(e).h  
 Date of First Criticality: 16 Oct 1977      Cumulative Energy Availability Factor: 79.8%  
 Date of Grid Connection: 16 Nov 1977      Cumulative Load Factor: 79.2%  
 Date of Commercial Operation: 10 Dec 1978      Cumulative Unit Capability Factor: 77.2%  
    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 (%)
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
2003	5240.0	604.0	99.6	81.1	99.4	79.8	99.0	79.2	8760	100.0

## TW-1 CHIN SHAN-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
09 Feb	40.0	6.1	UP1	A32	LOAD REDUCTION FOR FEEDWATER CONTROL VALVE C31-F001B REPAIR.
08 Jun	30.0	9.2	UP2	A33	LOAD REDUCTION FOR RECIRCULATION PUMP B-MOTOR COOLER LEAKAGE REPAIR.
12 Jun	17.0	4.8	XP2	N33	LOAD REDUCTION FOR WATER A/B/C/D CLEANING RESULTED FROM MASSIVE FISH INTRUSION.
06 Jul	14.0	3.8	UP1	A31	LOAD REDUCTION FOR LOWER PLACE OF HIGH PRESSURE TURBINE LEAKAGE REPAIR.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1989 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					226	
C. Inspection, maintenance or repair combined with refuelling				1058		
D. Inspection, maintenance or repair without refuelling				47		
E. Testing of plant systems or components				0	13	
H. Nuclear regulatory requirements						1
J. Grid failure or grid unavailability						9
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						21
Subtotal	0	0	0	1105	239	31
Total		0			1375	

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

System	2003 Hours Lost	1989 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		2
14. Safety Systems		75
15. Reactor Cooling Systems		56
31. Turbine and auxiliaries		39
32. Feedwater and Main Steam System		4
41. Main Generator Systems		0
42. Electrical Power Supply Systems		48
Total	0	224

## TW-2 CHIN SHAN-2

Operator: TPC (TAI POWER CO.)

Contractor: WEST (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: BWR  
 Maximum Net Capacity at the beginning of 2003: 604.0 MW(e)  
 Design Net Capacity: 604.0 MW(e)  
 Design Discharge Burnup: —

### 2. Production Summary 2003

Energy Production: 4574.5 GW(e).h  
 Energy Availability Factor: 86.0%  
 Load Factor: 86.5%  
 Operating Factor: 86.7%  
 Energy Unavailability Factor: 14.0%  
 Total Off-line Time: 1165 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	458.4	411.2	453.3	434.8	448.0	432.9	440.3	426.6	87.1	80.5	443.1	458.3	4574.5
EAF (%)	99.8	100.0	99.7	99.5	99.8	99.9	99.8	96.7	20.4	17.6	100.0	100.0	86.0
UCF (%)	99.8	100.0	99.7	99.5	99.8	99.9	99.8	100.0	22.5	17.6	100.0	100.0	86.5
LF (%)	102.0	101.3	100.9	100.1	99.7	99.5	98.0	94.9	20.0	17.9	101.9	102.0	86.5
OF (%)	100.0	100.0	100.0	100.1	100.0	100.0	100.0	100.0	20.4	20.4	100.0	100.0	86.7
EUf (%)	0.2	0.0	0.3	0.5	0.2	0.1	0.2	3.3	79.6	82.4	0.0	0.0	14.0
PUF (%)	0.2	0.0	0.3	0.2	0.0	0.1	0.2	0.0	77.5	75.4	0.0	0.0	12.9
UCLF (%)	0.0	0.0	0.0	0.4	0.2	0.0	0.0	0.0	0.0	7.0	0.0	0.0	0.7
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	2.1	0.0	0.0	0.0	0.5

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 07 Dec 1973      Lifetime Generation: 99412.5 GW(e).h  
 Date of First Criticality: 09 Nov 1978      Cumulative Energy Availability Factor: 78.3%  
 Date of Grid Connection: 19 Dec 1978      Cumulative Load Factor: 78.2%  
 Date of Commercial Operation: 15 Jul 1979      Cumulative Unit Capability Factor: 77.3%  
    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	3059.8	604.0	59.3	59.3	59.3	59.3	57.8	57.8	57.8	57.8	6010	68.6
1990	3436.8	593.0	65.4	62.3	64.8	62.1	66.2	62.0	62.0	62.0	6242	71.3
1991	3783.5	604.0	72.5	65.8	70.1	64.8	71.5	65.2	65.2	65.2	6847	78.2
1992	4129.2	604.0	79.1	69.1	78.5	68.2	77.8	68.3	68.3	68.3	7326	83.4
1993	3934.9	604.0	76.7	70.6	73.1	69.2	74.4	69.6	69.6	69.6	6992	79.8
1994	3979.5	604.0	78.8	72.0	76.6	70.4	75.2	70.5	70.5	70.5	7001	79.9
1995	3885.7	604.0	77.5	72.8	75.9	71.2	73.4	70.9	70.9	70.9	6808	77.7
1996	4001.5	604.0	78.0	73.4	77.5	72.0	75.4	71.5	71.5	71.5	6897	78.5
1997	4325.5	604.0	80.6	74.2	80.1	72.9	81.8	72.6	72.6	72.6	7168	81.8
1998	4841.5	604.0	96.0	76.4	94.7	75.1	91.5	74.5	74.5	74.5	8422	96.1
1999	4296.3	604.0	82.6	77.0	80.7	75.6	81.2	75.1	75.1	75.1	7274	83.0
2000	4596.5	604.0	85.9	77.7	85.3	76.4	86.6	76.1	76.1	76.1	7584	86.3
2001	5018.1	604.0	95.0	79.0	93.9	77.8	94.8	77.5	77.5	77.5	8515	97.2
2003	4574.5	604.0	86.5	79.6	86.0	78.3	86.5	78.2	78.2	78.2	7595	86.7

## TW-2 CHIN SHAN-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
10 Aug	687.0	22.6	XP	S21	COAST DOWN OPERATION
07 Sep	1114.0	673.4	PF	C21	EOC-19 REFUELLING OUTAGE
23 Oct	51.0	30.8	UF2	A31	UNIT SHUTDOWN FOR MAIN STEAM BYPASS VALVE BPV-1 & 3 REPAIR.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		51			218	
B. Refuelling without a maintenance					11	
C. Inspection, maintenance or repair combined with refuelling	1114			1007		
D. Inspection, maintenance or repair without refuelling				70		
E. Testing of plant systems or components				2		
H. Nuclear regulatory requirements						1
J. Grid failure or grid unavailability						6
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						7
Subtotal	1114	51	0	1079	229	14
Total		1165			1322	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems		2
14. Safety Systems		1
15. Reactor Cooling Systems		77
21. Fuel Handling and Storage Facilities		9
31. Turbine and auxiliaries	51	48
32. Feedwater and Main Steam System		21
33. Circulating Water System		11
41. Main Generator Systems		29
42. Electrical Power Supply Systems		9
Total	51	212

# TW-3 KUOSHENG-1

Operator: TPC (TAI POWER CO.)

Contractor: WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: BWR  
 Maximum Net Capacity at the beginning of 2003: 948.0 MW(e)  
 Design Net Capacity: 951.0 MW(e)  
 Design Discharge Burnup: —

## 2. Production Summary 2003

Energy Production: 6444.9 GW(e).h  
 Energy Availability Factor: 78.3%  
 Load Factor: 77.6%  
 Operating Factor: 79.5%  
 Energy Unavailability Factor: 21.7%  
 Total Off-line Time: 1792 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	692.8	514.2	0.0	0.0	451.7	662.7	681.8	686.2	668.5	703.4	678.4	705.2	6444.9
EAF (%)	99.0	82.4	0.0	0.0	64.5	97.9	98.4	98.9	99.2	100.0	99.3	99.9	78.3
UCF (%)	99.2	83.2	0.0	0.0	64.5	97.9	99.3	99.1	99.2	100.0	99.4	99.9	78.5
LF (%)	98.2	80.7	0.0	0.0	64.0	97.1	96.7	97.3	97.9	99.6	99.4	100.0	77.6
OF (%)	100.0	85.0	0.0	0.0	69.5	100.0	100.0	100.0	100.0	99.9	100.0	100.0	79.5
EUf (%)	1.0	17.6	100.0	100.0	35.5	2.1	1.6	1.1	0.8	0.0	0.7	0.1	21.7
PUF (%)	0.7	16.8	100.0	66.6	10.0	2.1	0.6	0.7	0.8	0.0	0.7	0.1	16.6
UCLF (%)	0.2	0.0	0.0	33.4	25.6	0.0	0.1	0.1	0.0	0.0	0.0	0.0	5.0
XUF (%)	0.2	0.8	0.0	0.0	0.0	0.0	0.9	0.3	0.1	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 19 Nov 1975      Lifetime Generation: 131681.9 GW(e).h  
 Date of First Criticality: 01 Feb 1981      Cumulative Energy Availability Factor: 78.9%  
 Date of Grid Connection: 21 May 1981      Cumulative Load Factor: 77.4%  
 Date of Commercial Operation: 28 Dec 1981      Cumulative Unit Capability Factor: 77.4%  
    Cumulative Energy Unavailability Factor: 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 (%)
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
2003	6444.9	948.0	78.5	79.5	78.3	78.9	77.6	77.4	6968	79.5

## TW-3 KUOSHENG-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
28 Jan	63.0	1.2	UP3	A31	RX POWER REDECUED FROM 100% TO 76% FOR MAINTENANCE OF MAIN TURBINE TV-3 CONTROL SYSTEM.
24 Feb	1755.3	1665.0	PF	C21	EOC-16 REFUELING OUTAGE.
09 May	37.3	70.0	PF	E31	TURBINE OVERSPEED TRIP TEST AFTER REFUELING OUTAGE.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1989 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure				7	165	
B. Refuelling without a maintenance					16	
C. Inspection, maintenance or repair combined with refuelling	1755			1021		
D. Inspection, maintenance or repair without refuelling				87		
E. Testing of plant systems or components	37			6		
J. Grid failure or grid unavailability						3
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						8
Subtotal	1792	0	0	1121	181	11
Total		1792			1313	

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

System	2003 Hours Lost	1989 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		7
13. Reactor Auxiliary Systems		4
15. Reactor Cooling Systems		7
21. Fuel Handling and Storage Facilities		26
31. Turbine and auxiliaries		25
32. Feedwater and Main Steam System		55
33. Circulating Water System		14
35. All other I&C Systems		2
41. Main Generator Systems		12
42. Electrical Power Supply Systems		12
Total	0	167

# TW-4 KUOSHENG-2

Operator: TPC (TAI POWER CO.)

Contractor: WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: BWR  
 Maximum Net Capacity at the beginning of 2003: 948.0 MW(e)  
 Design Net Capacity: 951.0 MW(e)  
 Design Discharge Burnup: —

## 2. Production Summary 2003

Energy Production: 7623.1 GW(e).h  
 Energy Availability Factor: 93.5%  
 Load Factor: 91.8%  
 Operating Factor: 96.2%  
 Energy Unavailability Factor: 6.5%  
 Total Off-line Time: 333 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	577.9	621.0	690.1	668.2	681.8	667.9	673.7	680.3	645.3	681.3	645.9	389.4	7623.1
EAF (%)	82.3	98.4	99.2	99.3	98.2	99.8	98.2	99.7	97.3	99.0	96.4	55.4	93.5
UCF (%)	82.6	99.0	99.2	99.4	98.2	99.8	99.0	99.9	97.4	99.0	96.4	55.4	93.7
LF (%)	81.9	97.5	97.8	98.0	96.7	97.8	95.5	96.5	94.5	96.5	94.6	55.2	91.8
OF (%)	93.3	100.0	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	62.0	96.2
EUF (%)	17.7	1.6	0.8	0.7	1.8	0.2	1.8	0.3	2.7	1.0	3.6	44.6	6.5
PUF (%)	13.4	1.0	0.8	0.7	1.8	0.1	0.8	0.1	0.9	0.9	0.6	0.0	1.8
UCLF (%)	4.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	1.8	0.1	3.0	44.5	4.5
XUF (%)	0.2	0.6	0.0	0.0	0.0	0.0	0.8	0.2	0.1	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 15 Mar 1976      Lifetime Generation: 129707.5 GW(e).h  
 Date of First Criticality: 26 Mar 1982      Cumulative Energy Availability Factor: 79.9%  
 Date of Grid Connection: 29 Jun 1982      Cumulative Load Factor: 78.8%  
 Date of Commercial Operation: 16 Mar 1983      Cumulative Unit Capability Factor: 77.7%  
    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 (%)
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	91.5	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
2003	7623.1	948.0	93.7	81.0	93.5	79.9	91.8	78.8	8427	96.2



## TW-4 KUOSHENG-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	13.9	59.4	PF	C21	EOC-15 REFUELING OUTAGE.
01 Jan	36.1	35.0	PF	E31	TURBINE OVERSPEED TRIP TEST AFTER REFUELING OUTAGE.
12 Jan	120.7	28.1	UP3	A15	MAINTANANCE OF REPT - C HIGH VIBRATION.
16 May	8.8	5.6	PP	E11	SECONDARY CTMT INTEGRITY TEST.
16 Sep	16.2	11.9	UP3	A31	MAINTANANCE OF TURBINE CONTROL SYSTEM
22 Nov	33.5	13.3	UP	A21	FUEL LEAK.
20 Dec	282.6	313.9	UF1	A21	RX IN COLD S/D AND OPEN VESSEL FOR IN CORE SIPPING AND LEAK FUEL REPLACEMENT.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1989 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		282			139	
B. Refuelling without a maintenance					21	
C. Inspection, maintenance or repair combined with refuelling	13			1001		
D. Inspection, maintenance or repair without refuelling				117		
E. Testing of plant systems or components	36			4		
J. Grid failure or grid unavailability					8	5
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					1	18
Subtotal	49	282	0	1122	169	23
Total		331			1314	

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

System	2003 Hours Lost	1989 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		5
13. Reactor Auxiliary Systems		2
14. Safety Systems		7
15. Reactor Cooling Systems		26
21. Fuel Handling and Storage Facilities	282	23
31. Turbine and auxiliaries		19
32. Feedwater and Main Steam System		29
33. Circulating Water System		6
35. All other I&C Systems		13
41. Main Generator Systems		0
42. Electrical Power Supply Systems		5
Total	282	135

# TW-5 MAANSHAN-1

**Operator:** TPC (TAI POWER CO.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 890.0 MW(e)  
**Design Net Capacity:** 892.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 6751.0 GW(e).h  
**Energy Availability Factor:** 86.2%  
**Load Factor:** 86.6%  
**Operating Factor:** 86.5%  
**Energy Unavailability Factor:** 13.8%  
**Total Off-line Time:** 1181 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	671.5	602.9	673.1	458.1	0.0	460.5	668.1	668.3	565.1	669.4	646.4	667.6	6751.0
<b>EAF (%)</b>	99.8	99.1	99.9	74.0	0.0	76.4	99.6	99.9	87.4	99.9	99.9	99.9	86.2
<b>UCF (%)</b>	100.0	99.9	99.9	74.0	0.0	76.4	99.6	99.9	100.0	99.9	99.9	99.9	87.4
<b>LF (%)</b>	101.4	100.8	101.7	71.6	0.0	71.9	100.9	100.9	88.2	101.0	100.9	100.8	86.6
<b>OF (%)</b>	100.0	100.0	100.0	74.0	0.0	76.4	100.0	100.0	89.0	99.9	100.0	100.0	86.5
<b>EUF (%)</b>	0.2	0.9	0.1	26.0	100.0	23.6	0.4	0.1	12.6	0.1	0.1	0.1	13.8
<b>PUF (%)</b>	0.1	0.0	0.1	26.0	100.0	23.6	0.1	0.1	0.0	0.1	0.1	0.1	12.6
<b>UCLF (%)</b>	0.0	0.1	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.2	0.8	0.0	0.0	0.0	0.0	0.0	0.0	12.6	0.0	0.0	0.0	1.1

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 21 Aug 1978  
**Date of First Criticality:** 30 Mar 1984  
**Date of Grid Connection:** 09 May 1984  
**Date of Commercial Operation:** 27 Jul 1984

**Lifetime Generation:** 106055.1 GW(e).h  
**Cumulative Energy Availability Factor:** 79.4%  
**Cumulative Load Factor:** 81.1%  
**Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
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	76.8	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	79.8	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
2003	6751.0	890.0	87.3	81.5	86.2	79.4	86.6	81.1	7579	86.5

## TW-5 MAANSHAN-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
23 Apr	1100.8	979.7	PF	C21	EOC-14 REFUELING OUTAGE.
08 Jun	0.8	0.6	PF	E31	TURBINE OVERSPEED TEST, UNIT OFF-LINE.
01 Sep	78.9	81.0	XF	N42	TYPHOON. 161 KV UNDERVOLTAGE AND P-7, RX TRIP.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1989 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					256	
B. Refuelling without a maintenance					9	
C. Inspection, maintenance or repair combined with refuelling	1100			945	120	
D. Inspection, maintenance or repair without refuelling				2		
E. Testing of plant systems or components	0			8		
H. Nuclear regulatory requirements					0	
J. Grid failure or grid unavailability						111
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						12
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)			78			
Subtotal	1100	0	78	955	385	123
Total		1178			1463	

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

System	2003 Hours Lost	1989 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		14
13. Reactor Auxiliary Systems		2
15. Reactor Cooling Systems		31
16. Steam generation systems		23
31. Turbine and auxiliaries		24
32. Feedwater and Main Steam System		7
41. Main Generator Systems		104
42. Electrical Power Supply Systems		48
Total	0	253

# TW-6 MAANSHAN-2

**Operator:** TPC (TAI POWER CO.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 890.0 MW(e)  
**Design Net Capacity:** 892.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 6737.6 GW(e).h  
**Energy Availability Factor:** 85.2%  
**Load Factor:** 86.4%  
**Operating Factor:** 86.2%  
**Energy Unavailability Factor:** 14.8%  
**Total Off-line Time:** 1211 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	674.3	611.4	680.1	649.1	674.6	587.5	614.1	667.4	538.3	564.2	0.0	476.6	6737.6
<b>EAF (%)</b>	98.8	99.7	99.9	98.9	99.9	90.3	90.7	99.1	82.0	83.9	0.0	77.7	85.2
<b>UCF (%)</b>	98.9	100.0	100.0	98.9	100.0	90.3	90.7	99.1	99.1	83.9	0.0	77.7	86.6
<b>LF (%)</b>	101.8	102.2	102.7	101.4	101.9	91.7	92.7	100.8	84.0	85.1	0.0	72.0	86.4
<b>OF (%)</b>	100.0	100.0	100.0	100.1	100.0	91.3	93.8	100.0	84.7	83.9	0.0	79.4	86.2
<b>EUf (%)</b>	1.2	0.3	0.1	1.1	0.1	9.7	9.3	0.9	18.0	16.1	100.0	22.3	14.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.1	0.0	16.1	100.0	20.6	11.4
<b>UCLF (%)</b>	1.0	0.0	0.0	0.9	0.0	9.6	9.3	0.8	0.9	0.0	0.0	1.7	2.0
<b>XUF (%)</b>	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	17.2	0.0	0.0	0.0	1.4

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 21 Feb 1979  
**Date of First Criticality:** 01 Feb 1985  
**Date of Grid Connection:** 25 Feb 1985  
**Date of Commercial Operation:** 18 May 1985

**Lifetime Generation:** 109563.6 GW(e).h  
**Cumulative Energy Availability Factor:** 81.1%  
**Cumulative Load Factor:** 83.1%  
**Cumulative Unit Capability Factor:** 77.8%  
**Cumulative Energy Unavailability Factor:** 18.9%

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 (%)
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
2003	6737.6	890.0	86.6	83.7	85.2	81.1	86.4	83.1	7549	86.2

## TW-6 MAANSHAN-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
28 Jun	62.3	59.8	UF	A42	MAIN TRANSFORMER PHASE A C2H2 CONCENTRATION HIGH, UNIT OFF-LINE.
01 Sep	109.6	110.1	XF	N42	TYPHOON. 161 KV UNDERVOLTAGE AND P-7, RX TRIP.
27 Oct	978.5	870.9	PF	C21	EOC-14 REFUELING OUTAGE.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1989 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		62			141	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	978			977	4	
D. Inspection, maintenance or repair without refuelling				6		
E. Testing of plant systems or components				0		
J. Grid failure or grid unavailability						68
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					2	3
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)			109			
Subtotal	978	62	109	983	148	71
Total		1149			1202	

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

System	2003 Hours Lost	1989 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		14
15. Reactor Cooling Systems		39
16. Steam generation systems		3
31. Turbine and auxiliaries		29
32. Feedwater and Main Steam System		9
35. All other I&C Systems		8
41. Main Generator Systems		33
42. Electrical Power Supply Systems	62	3
Total	62	138

# CZ-4 DUKOVANY-1

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

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

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 412.0 MW(e)  
**Design Net Capacity:** 420.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3032.0 GW(e).h  
**Energy Availability Factor:** 82.6%  
**Load Factor:** 84.0%  
**Operating Factor:** 82.9%  
**Energy Unavailability Factor:** 17.4%  
**Total Off-line Time:** 1499 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	314.7	284.9	297.3	302.1	310.5	297.9	235.6	0.0	83.3	312.5	281.4	311.8	3032.0
<b>EAF (%)</b>	100.0	100.0	95.4	99.4	100.0	99.9	77.0	0.0	28.1	100.0	93.2	100.0	82.6
<b>UCF (%)</b>	100.0	100.0	95.4	99.4	100.0	100.0	79.7	0.0	28.2	100.0	93.2	100.0	82.9
<b>LF (%)</b>	102.7	102.9	97.0	102.0	101.3	100.4	76.9	0.0	28.1	101.8	94.9	101.7	84.0
<b>OF (%)</b>	100.0	100.0	95.2	100.0	100.0	100.0	76.9	0.0	31.0	100.0	93.1	100.0	82.9
<b>EU (%)</b>	0.0	0.0	4.6	0.6	0.0	0.1	23.0	100.0	71.9	0.0	6.8	0.0	17.4
<b>PU (%)</b>	0.0	0.0	4.6	0.0	0.0	0.0	20.2	100.0	71.8	0.0	6.8	0.0	17.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.6	0.0	0.0	0.1	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	0.1	2.8	0.0	0.1	0.0	0.0	0.0	0.3

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

STABLE OPERATION WITH LONG REFUELLING OUTAGE (EVERY 4 YEARS THE OUTAGE IS EXTENDED FOR DETAIL INSPECTION OF RPV) AND THREE EXTERNALLY CAUSED SHUTDOWNS DUE TO RECONSTRUCTION AND FAILURE IN 400 KV SWITCHING STATION

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1979  
**Date of First Criticality:** 12 Feb 1985  
**Date of Grid Connection:** 24 Feb 1985  
**Date of Commercial Operation:** 03 May 1985

**Lifetime Generation:** 56167.3 GW(e).h  
**Cumulative Energy Availability Factor:** 81.3%  
**Cumulative Load Factor:** 82.4%  
**Cumulative Unit Capability Factor:** 77.8%  
**Cumulative Energy Unavailability Factor:** 18.7%

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	1993.9	396.0	0.0	0.0	84.1	100.0	57.5	0.0	5418	61.9
1986	2658.4	403.0	76.2	76.2	76.1	76.1	75.3	75.3	7094	81.0
1987	2575.9	408.0	74.7	75.4	70.7	73.4	72.1	73.7	6867	78.4
1988	2524.0	408.0	74.2	75.0	71.5	72.8	70.4	72.6	6996	79.6
1989	2940.6	408.0	82.8	77.0	82.0	75.1	82.3	75.0	7579	86.5
1990	2965.6	408.0	84.3	78.4	82.5	76.6	83.0	76.6	7658	87.4
1991	2581.1	408.0	70.7	77.1	70.5	75.6	72.2	75.9	6751	77.1
1992	3172.8	408.0	80.9	77.7	80.5	76.3	88.5	77.7	7537	85.8
1993	3239.7	442.0	83.7	78.5	83.7	77.3	83.7	78.5	7649	87.3
1994	3278.5	442.0	84.6	79.2	84.6	78.1	84.7	79.2	7656	87.4
1995	2966.1	442.0	76.8	79.0	76.8	78.0	76.6	78.9	7022	80.2
1996	3144.6	412.0	86.0	79.6	85.4	78.7	86.9	79.7	7592	86.4
1997	3295.6	440.0	86.8	80.2	85.3	79.2	85.5	80.2	7678	87.6
1998	2973.4	412.0	85.4	80.6	82.6	79.5	82.4	80.3	7518	85.8
1999	2901.1	412.0	79.8	80.5	79.2	79.5	80.4	80.3	7034	80.3
2000	3327.9	412.0	89.8	81.2	89.7	80.1	92.0	81.1	7934	90.3
2001	3328.9	412.0	90.6	81.7	90.2	80.8	92.2	81.8	7996	91.3
2002	3267.5	412.0	89.6	82.2	88.9	81.2	90.5	82.3	7926	90.5
2003	3032.0	412.0	82.9	82.2	82.6	81.3	84.0	82.4	7261	82.9

# CZ-4 DUKOVANY-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	3.3	0.2	XP	K	LOAD FOLLOWING
28 Feb	42.0	16.8	XF	J	PLANNED OUTAGE FOR RECONSTRUCTION OF THE SLAVETICE SWITCHING STATION
17 Mar	2.0	0.0	PP	E42	TESTS OF UNIT OPERATION IN LOAD FOLLOWING
17 Apr	10.5	1.7	UP2	A41	TG11 SHUTDOWN FOR CARBON-BRUSH HOLDER REPAIR ON THE AUXILIARY EXCITER
01 May	1464.0	0.4	XP	N	POWER LIMITATION DUE TO COOLING WATER TEMPERATURE
04 May	3.1	0.2	XP	K	LOAD FOLLOWING
01 Jul	744.0	2.4	XP	N	POWER LIMITATION DUE TO COOLING WATER TEMPERATURE
04 Jul	508.0	6.0	XP	S	FUEL COASTDOWN EFFECT
09 Jul	12.9	1.2	PP	E42	CERTIFICATION OF THE LOAD FOLLOWING SYSTEM
09 Jul	2.8	0.3	UP2	A32	MCP2 SHUTDOWN DUE TO FEEDWATER CONTROL VALVE REPAIR
25 Jul	1407.0	579.6	PF	C	ANNUAL MAINTENANCE AND REFUELLING OUTAGE
23 Sep	50.0	0.3	XP	S	POWER LIMITATION DUE TO FUEL LINEAR POWER EXCESS
23 Oct	4.8	0.0	PP	E42	TESTING OF THE SYSTEM FOR COOPERATION WITH GRID DISPATCHER
24 Oct	2.3	0.1	XP	K	POWER REDUCTION REQUESTED BY A GRID DISPATCHER
29 Oct	8.1	0.1	PP	E42	TESTING OF THE SYSTEM FOR COOPERATION WITH GRID DISPATCHER
04 Nov	2.9	0.1	PP	E42	CERTIFICATION OF THE LOAD FOLLOWING SYSTEM
07 Nov	43.0	17.6	XF	J	UNIT SHUTDOWN FOR SLAVETICE SWITCHING STATION RECONSTRUCTION
10 Nov	3.9	0.1	XP	S	POWER LIMITATION DUE TO FUEL LINEAR POWER EXCESS
12 Nov	7.0	2.9	XF2	J	LOSS OF 400 KV LINE
29 Dec	26.2	2.0	XP	K	LOAD FOLLOWING

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					64	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	1407			1117		
D. Inspection, maintenance or repair without refuelling				114		
J. Grid failure or grid unavailability			92			
L. Human factor related					0	
Subtotal	1407	0	92	1231	64	0
Total		1499			1295	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		5
14. Safety Systems		7
15. Reactor Cooling Systems		25
31. Turbine and auxiliaries		4
41. Main Generator Systems		0
42. Electrical Power Supply Systems		20
Total	0	61

# CZ-5 DUKOVANY-2

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

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

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 412.0 MW(e)  
**Design Net Capacity:** 420.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3252.6 GW(e).h  
**Energy Availability Factor:** 89.2%  
**Load Factor:** 90.1%  
**Operating Factor:** 90.6%  
**Energy Unavailability Factor:** 10.8%  
**Total Off-line Time:** 821 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	310.0	279.9	308.4	298.2	206.1	43.1	293.6	297.7	286.4	313.2	302.0	313.7	3252.6
<b>EAF (%)</b>	100.0	100.0	100.0	99.8	67.5	14.7	95.8	96.5	95.6	100.0	100.0	100.0	89.2
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	74.0	14.9	96.4	96.6	95.7	100.0	100.0	100.0	89.9
<b>LF (%)</b>	101.1	101.1	100.6	100.7	67.3	14.5	95.8	97.1	96.6	102.0	101.8	102.3	90.1
<b>OF (%)</b>	100.0	100.0	100.0	100.0	72.6	14.6	99.7	100.0	100.0	100.0	100.0	100.0	90.6
<b>EUf (%)</b>	0.0	0.0	0.0	0.2	32.5	85.3	4.2	3.5	4.4	0.0	0.0	0.0	10.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	26.0	85.1	0.3	0.0	0.0	0.0	0.0	0.0	9.2
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	3.2	3.4	4.3	0.0	0.0	0.0	0.9
<b>XUF (%)</b>	0.0	0.0	0.0	0.2	6.5	0.2	0.6	0.1	0.1	0.0	0.0	0.0	0.7

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

STABLE OPERATION WITH FOUR UNPLANNED OUTAGES - THREE OF THEM WAS PARTIAL AND ONE FULL WITH MANUAL SCRAM.

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1979  
**Date of First Criticality:** 23 Jan 1986  
**Date of Grid Connection:** 30 Jan 1986  
**Date of Commercial Operation:** 21 Mar 1986

**Lifetime Generation:** 54284.2 GW(e).h  
**Cumulative Energy Availability Factor:** 81.4%  
**Cumulative Load Factor:** 82.8%  
**Cumulative Unit Capability Factor:** 78.1%  
**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	2792.7	408.0	0.0	0.0	94.9	100.0	83.3	0.0	7615	92.7
1987	2668.6	408.0	76.6	76.6	71.6	71.6	74.7	74.7	6997	79.9
1988	2771.3	408.0	74.9	75.7	74.6	73.1	77.3	76.0	6963	79.3
1989	3011.0	408.0	82.7	78.0	82.2	76.1	84.2	78.7	7713	88.0
1990	2822.7	408.0	80.1	78.5	76.5	76.2	79.0	78.8	7566	86.4
1991	2901.4	408.0	81.6	79.2	81.2	77.2	81.2	79.3	7600	86.8
1992	2830.6	408.0	71.6	77.9	71.4	76.2	79.0	79.2	6551	74.6
1993	3256.9	440.0	84.2	78.8	84.2	77.4	84.5	80.0	7496	85.6
1994	3094.3	440.0	80.8	79.1	79.6	77.7	80.3	80.1	7315	83.5
1995	3263.3	440.0	85.5	79.8	84.3	78.5	84.7	80.6	7720	88.1
1996	2831.0	412.0	78.3	79.7	77.3	78.4	78.2	80.4	6917	78.7
1997	3144.8	440.0	81.1	79.8	81.1	78.6	81.6	80.5	7179	82.0
1998	3209.2	412.0	88.2	80.5	87.7	79.4	88.9	81.2	7803	89.1
1999	3198.1	412.0	88.4	81.1	87.8	80.0	88.6	81.7	7812	89.2
2000	2954.1	412.0	81.8	81.2	81.2	80.1	81.6	81.7	7223	82.2
2001	3121.1	412.0	86.9	81.5	86.4	80.5	86.5	82.0	7646	87.3
2002	3159.6	412.0	88.3	82.0	87.8	81.0	87.5	82.4	7716	88.1
2003	3252.6	412.0	89.8	82.4	89.2	81.4	90.1	82.8	7939	90.6



## CZ-5 DUKOVANY-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	6552.0	4.4	XP	N	POWER LIMITATION DUE TO COOLING WATER TEMPERATURE
28 Feb	48.9	0.1	XP	K	POWER REDUCTION DUE TO PLANNED RECONSTRUCTION OF THE SLAVETICE SWITCHING STATION
27 Apr	624.8	18.5	XP	S	FUEL COASTDOWN EFFECT
23 May	806.0	332.2	PF	C21	ANNUAL MAINTENANCE AND REFUELLING OUTAGE
27 Jun	69.7	0.6	XP	S	POWER LIMITATION DUE TO FUEL LINEAR POWER EXCESS
02 Jul	5.3	0.0	PP	E42	LOAD FOLLOWING SERVICE TESTING
08 Jul	13.4	1.0	PP	E42	CERTIFICATION OF THE LOAD FOLLOWING SYSTEM
19 Jul	15.9	4.3	UF5	A12	MANUAL SCRAM ON SPURIOUS DROP OF TWO CONTROL RODS
29 Jul	32.2	5.6	UP2	A33	TG22 TRIP DUE TO CIRCULATION WATER LEAKAGE
08 Aug	56.2	10.4	UP2	A31	TG22 SHUTDOWN DUE TO BREAK OFF OF LOW PRESSURE BLADE HEELPIECE
18 Sep	67.3	12.9	UP1	A31	TG22 SHUTDOWN FOR LOW PRESSURE BLADE REPAIR
24 Dec	7.0	0.2	XP	K	POWER REDUCTION REQUIRED BY GRID DISPATCHER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1986 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		15			54	
B. Refuelling without a maintenance					15	
C. Inspection, maintenance or repair combined with refuelling	806			1105		
D. Inspection, maintenance or repair without refuelling				101		
J. Grid failure or grid unavailability					1	4
L. Human factor related					0	
Subtotal	806	15	0	1206	70	4
Total		821			1280	

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

System	2003 Hours Lost	1986 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	15	9
15. Reactor Cooling Systems		6
16. Steam generation systems		7
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		22
42. Electrical Power Supply Systems		5
XX. Miscellaneous Systems		1
Total	15	52

# CZ-8 DUKOVANY-3

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

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

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 412.0 MW(e)  
**Design Net Capacity:** 420.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3280.1 GW(e).h  
**Energy Availability Factor:** 89.8%  
**Load Factor:** 90.9%  
**Operating Factor:** 90.6%  
**Energy Unavailability Factor:** 10.2%  
**Total Off-line Time:** 826 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	312.5	283.7	303.9	92.8	152.4	294.2	305.3	305.8	300.7	313.7	303.5	311.5	3280.1
<b>EAF (%)</b>	100.0	100.0	98.4	31.5	49.9	99.2	99.3	99.6	100.0	100.0	100.0	100.0	89.8
<b>UCF (%)</b>	100.0	100.0	100.0	36.2	50.4	100.0	99.6	100.0	100.0	100.0	100.0	100.0	90.5
<b>LF (%)</b>	101.9	102.5	99.2	31.3	49.7	99.2	99.6	99.8	101.4	102.2	102.3	101.6	90.9
<b>OF (%)</b>	100.0	100.0	99.9	36.9	50.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.6
<b>EUf (%)</b>	0.0	0.0	1.6	68.5	50.1	0.8	0.7	0.4	0.0	0.0	0.0	0.0	10.2
<b>PUF (%)</b>	0.0	0.0	0.0	63.8	49.4	0.0	0.5	0.0	0.0	0.0	0.0	0.0	9.5
<b>UCLF (%)</b>	0.0	0.0	0.0	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	1.6	4.7	0.4	0.8	0.2	0.4	0.0	0.0	0.0	0.0	0.7

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

VERY STABLE OPERATION ONLY WITH SEVERAL SMALL POWER REDUCTION MAINLY DUE TO LOAD FOLLOWING OD TESTS.

## 5. Historical Summary

**Date of Construction Start:** 01 Mar 1979  
**Date of First Criticality:** 28 Oct 1986  
**Date of Grid Connection:** 14 Nov 1986  
**Date of Commercial Operation:** 20 Dec 1986

**Lifetime Generation:** 52021.0 GW(e).h  
**Cumulative Energy Availability Factor:** 81.2%  
**Cumulative Load Factor:** 82.8%  
**Cumulative Unit Capability Factor:** 78.1%  
**Cumulative Energy Unavailability Factor:** 18.8%

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	280.2	408.0	0.0	0.0	7.9	100.0	7.9	0.0	1356	15.7
1987	3109.9	408.0	86.3	86.3	84.3	84.3	87.0	87.0	7644	87.3
1988	2988.9	408.0	81.4	83.9	80.0	82.1	83.4	85.2	7672	87.3
1989	2685.7	408.0	71.4	79.7	71.0	78.4	75.1	81.9	6678	76.2
1990	2982.0	408.0	85.0	81.0	80.3	78.9	83.4	82.2	7763	88.6
1991	2987.0	408.0	81.6	81.2	81.3	79.4	83.6	82.5	7784	88.9
1992	2917.9	408.0	72.6	79.7	72.3	78.2	81.4	82.3	6678	76.0
1993	3190.5	452.0	80.5	79.8	80.5	78.6	80.6	82.1	7259	82.9
1994	3343.9	452.0	84.5	80.5	84.5	79.4	84.5	82.4	7870	89.8
1995	2689.6	452.0	87.4	81.3	70.2	78.3	67.9	80.7	7788	88.9
1996	2871.2	412.0	80.4	81.2	78.3	78.3	79.3	80.5	7114	81.0
1997	2904.6	440.0	75.5	80.7	74.9	77.9	75.4	80.0	6774	77.3
1998	3090.1	412.0	85.7	81.1	85.0	78.5	85.6	80.5	7564	86.3
1999	3246.2	412.0	89.9	81.7	89.3	79.3	89.9	81.2	7849	89.6
2000	3187.9	412.0	88.8	82.2	87.4	79.9	88.1	81.7	7776	88.5
2001	3006.0	412.0	83.8	82.3	82.7	80.1	83.3	81.8	7309	83.4
2002	3259.4	412.0	89.9	82.8	89.6	80.7	90.3	82.3	7880	90.0
2003	3280.1	412.0	90.5	83.2	89.8	81.2	90.9	82.8	7934	90.6

## CZ-8 DUKOVANY-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	10.3	0.7	XP	K	LOAD FOLLOWING
04 Jan	4.7	0.4	XP	K	LOAD FOLLOWING
13 Mar	694.8	18.9	XP	S	FUEL COASTDOWN EFFECT
11 Apr	826.0	340.2	PF	C21	ANNUAL MAINTENANCE AND REFUELLING OUTAGE
01 May	1464.0	2.5	XP	N	POWER LIMITATION DUE TO COOLING WATER TEMPERATURE
16 May	4.5	0.9	UP2	A12	POWER REDUCTION DUE TO AKNT IONIZING CHAMBER IK17 REPAIR
17 May	107.0	0.7	XP	S	POWER LIMITATION DUE TO FUEL LINEAR POWER EXCESS
22 May	3.3	0.0	PP	E42	TESTS OF UNIT OPERATION IN LOAD FOLLOWING
25 May	23.9	0.1	XP	S	POWER LIMITATION DUE TO FUEL LINEAR POWER EXCESS
26 May	24.1	0.5	XP	K	LOAD FOLLOWING
27 May	232.0	0.3	XP	S	POWER LIMITATION DUE TO FUEL LINEAR POWER EXCESS
26 Jun	5.1	0.0	PP	D	POWER REDUCTION DUE TO UNIT 2 STARTUP
01 Jul	2208.0	1.9	XP	N	POWER LIMITATION DUE TO COOLING WATER TEMPERATURE
07 Jul	13.1	1.2	PP	E42	CERTIFICATION OF THE LOAD FOLLOWING SYSTEM
09 Jul	2.9	0.2	PP	E42	CERTIFICATION OF THE LOAD FOLLOWING SYSTEM
20 Jul	1.2	0.0	XP	K	LOAD FOLLOWING
09 Aug	0.5	0.0	UP2	A12	CONTROL ROD 12-61 DROP
03 Sep	2.2	0.0	PP	E42	LOAD FOLLOWING SERVICE TESTING
23 Oct	3.0	0.0	PP	E42	TESTING OF THE SYSTEM FOR COOPERATION WITH GRID DISPATCHER
24 Oct	2.3	0.1	XP	K	POWER REDUCTION REQUESTED BY A GRID DISPATCHER
30 Oct	8.1	0.1	PP	E42	TESTING OF THE SYSTEM FOR COOPERATION WITH GRID DISPATCHER
04 Nov	2.5	0.1	PP	E42	CERTIFICATION OF THE LOAD FOLLOWING SYSTEM
29 Dec	26.1	1.9	XP	K	LOAD FOLLOWING

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					106	
B. Refuelling without a maintenance					5	
C. Inspection, maintenance or repair combined with refuelling	826			1093		
D. Inspection, maintenance or repair without refuelling				39		
J. Grid failure or grid unavailability						4
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					10	
Subtotal	826	0	0	1132	121	4
Total		826			1257	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
15. Reactor Cooling Systems		44
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		3
35. All other I&C Systems		0
41. Main Generator Systems		47
42. Electrical Power Supply Systems		4
Total	0	102

**CZ-9 DUKOVANY-4**

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

Contractor: SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

**1. Station Details**

Type: WWER  
 Maximum Net Capacity  
 at the beginning of 2003: 412.0 MW(e)  
 Design Net Capacity: 420.0 MW(e)  
 Design Discharge Burnup: 28600 MW.d/t

**2. Production Summary 2003**

Energy Production: 3309.8 GW(e).h  
 Energy Availability Factor: 90.7%  
 Load Factor: 91.7%  
 Operating Factor: 91.4%  
 Energy Unavailability Factor: 9.3%  
 Total Off-line Time: 751 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	313.3	284.5	313.7	303.0	307.7	293.1	303.8	303.7	300.0	284.0	0.0	303.0	3309.8
EAF (%)	100.0	100.0	100.0	99.8	99.9	99.6	99.1	99.0	99.9	92.6	0.0	96.7	90.7
UCF (%)	100.0	100.0	100.0	99.8	100.0	100.0	99.7	100.0	100.0	98.7	0.0	96.7	91.4
LF (%)	102.2	102.7	102.3	102.3	100.4	98.8	99.1	99.1	101.1	92.5	0.0	98.9	91.7
OF (%)	100.0	100.0	99.9	100.1	100.0	100.0	100.0	100.0	100.0	99.1	0.0	96.8	91.4
EUf (%)	0.0	0.0	0.0	0.2	0.1	0.4	0.9	1.0	0.1	7.4	100.0	3.3	9.3
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	1.3	100.0	3.2	8.6
UCLF (%)	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.1	0.4	0.6	1.0	0.1	6.1	0.0	0.0	0.7

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Mar 1979      Lifetime Generation: 51039.7 GW(e).h  
 Date of First Criticality: 01 Jun 1987      Cumulative Energy Availability Factor: 81.7%  
 Date of Grid Connection: 11 Jun 1987      Cumulative Load Factor: 84.0%  
 Date of Commercial Operation: 19 Jul 1987      Cumulative Unit Capability Factor: 78.2%  
    Cumulative Energy Unavailability Factor: 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 (%)
1987	1624.9	408.0	0.0	0.0	99.1	100.0	45.5	0.0	4643	53.0
1988	2764.0	408.0	74.5	74.5	73.8	73.8	77.1	77.1	7092	80.7
1989	2984.5	408.0	80.8	77.6	80.4	77.1	83.5	80.3	7314	83.5
1990	2995.3	408.0	82.8	79.3	80.0	78.0	83.8	81.5	7836	89.5
1991	2672.0	408.0	78.0	79.0	77.9	78.0	74.8	79.8	7301	83.3
1992	3328.4	408.0	84.5	80.1	83.7	79.1	92.9	82.4	7614	86.7
1993	2939.8	448.0	62.0	76.9	62.1	76.1	74.9	81.1	6859	78.3
1994	3259.8	448.0	84.5	78.0	83.1	77.1	83.1	81.4	7538	86.1
1995	3311.1	448.0	85.5	79.0	85.4	78.2	84.4	81.8	7712	88.0
1996	3202.1	412.0	88.2	80.0	87.1	79.2	88.5	82.5	7762	88.4
1997	3149.2	440.0	80.9	80.1	80.9	79.4	81.7	82.4	7202	82.2
1998	3078.6	412.0	85.7	80.6	83.8	79.8	85.3	82.7	7536	86.0
1999	3179.4	412.0	88.6	81.3	86.6	80.3	88.1	83.1	7792	88.9
2000	3234.5	412.0	89.5	81.9	88.1	80.9	89.4	83.6	7839	89.2
2001	3258.1	412.0	90.4	82.5	89.2	81.5	90.3	84.1	7946	90.7
2002	2748.2	412.0	77.3	82.1	75.6	81.1	76.1	83.5	6745	77.0
2003	3309.8	412.0	91.3	82.7	90.7	81.7	91.7	84.0	8009	91.4

## CZ-9 DUKOVANY-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	3.6	0.2	XP	K	LOAD FOLLOWING
04 Jan	4.8	0.4	XP	K	LOAD FOLLOWING
17 Mar	2.0	0.0	PP	E42	TESTS OF UNIT OPERATION IN LOAD FOLLOWING
19 Apr	5.8	0.5	UP1	A31	POWER REDUCTION FOR MAIN CONDENSER SPHERICAL VALVE REPLACEMENT
01 May	1464.0	1.4	XP	N	POWER LIMITATION DUE TO COOLING WATER TEMPERATURE
04 May	3.1	0.2	XP	K	LOAD FOLLOWING
23 May	24.1	0.4	XP	K	LOAD FOLLOWING
30 May	168.1	3.1	XP	K	LOAD FOLLOWING
26 Jun	4.5	0.1	PP	D	POWER REDUCTION DUE TO UNIT 2 STARTUP
01 Jul	2208.0	5.0	XP	N	POWER LIMITATION DUE TO COOLING WATER TEMPERATURE
10 Jul	9.8	0.9	PP	E42	CERTIFICATION OF THE LOAD FOLLOWING SYSTEM
13 Jul	1.2	0.0	XP	K	LOAD FOLLOWING
18 Jul	1.9	0.1	XP	K	LOAD FOLLOWING
20 Jul	1.2	0.0	XP	K	LOAD FOLLOWING
21 Jul	2.0	0.1	XP	K	LOAD FOLLOWING
02 Oct	687.0	18.7	XP	S	FUEL COASTDOWN EFFECT
31 Oct	750.0	309.1	PF	C	ANNUAL MAINTENANCE AND REFUELLING OUTAGE
12 Dec	8.6	0.1	PP	E42	UNIT REMOTE CONTROL TESTING
24 Dec	6.6	0.2	XP	K	POWER REDUCTION REQUIRED BY GRID DISPATCHER
31 Dec	4.7	0.3	UP2	A15	UNPLANNED POWER REDUCTION DUE TO MAIN COOLANT PUMP (MCP-1) TRIP

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					28	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	750			937		
D. Inspection, maintenance or repair without refuelling				109		
J. Grid failure or grid unavailability					3	1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						6
Subtotal	750	0	0	1046	32	7
Total		750			1085	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		8
15. Reactor Cooling Systems		10
32. Feedwater and Main Steam System		6
33. Circulating Water System		0
35. All other I&C Systems		2
42. Electrical Power Supply Systems		1
Total	0	27

# CZ-23 TEMELIN-1

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

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

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 912.0 MW(e)  
**Design Net Capacity:** 892.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5455.3 GW(e).h  
**Energy Availability Factor:** 65.3%  
**Load Factor:** 68.3%  
**Operating Factor:** 66.9%  
**Energy Unavailability Factor:** 34.7%  
**Total Off-line Time:** 2899 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	587.3	0.0	0.0	38.6	628.4	615.0	704.0	118.5	654.9	716.1	683.7	708.7	5455.3
<b>EAF (%)</b>	83.3	0.0	0.0	5.8	89.2	90.2	98.9	17.1	95.2	100.0	98.6	99.9	65.3
<b>UCF (%)</b>	83.3	0.0	0.0	5.8	89.2	90.2	98.9	17.1	95.2	100.0	98.6	99.9	65.3
<b>LF (%)</b>	86.6	0.0	0.0	5.9	92.6	93.7	103.8	17.5	99.7	105.4	104.1	104.5	68.3
<b>OF (%)</b>	85.8	0.0	0.0	12.0	94.6	91.9	100.0	19.6	94.3	100.0	99.0	100.0	66.9
<b>EUF (%)</b>	16.7	100.0	100.0	94.2	10.8	9.8	1.1	82.9	4.8	0.0	1.4	0.1	34.7
<b>PUF (%)</b>	10.6	100.0	100.0	69.5	2.2	0.2	0.0	82.7	0.0	0.0	0.0	0.0	30.0
<b>UCLF (%)</b>	6.1	0.0	0.0	24.8	8.6	9.6	1.1	0.3	4.8	0.0	1.4	0.1	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. 2003 Summary of Operation

THE FIRST YEAR OF OPERATION WITH SEVERAL UNPLANNED OUTAGES. THE REFUELLING OUTAGE WAS EXTENDED OUTAGE DUE TO PROBLEMS WITH REFUELLING MACHINE.

## 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:** 5455.3 GW(e).h  
**Cumulative Energy Availability Factor:** 65.3%  
**Cumulative Load Factor:** 68.3%  
**Cumulative Unit Capability Factor:** 81.5%  
**Cumulative Energy Unavailability Factor:** 34.7%

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	5455.3	912.0	65.3	65.3	65.3	65.3	68.3	68.3	5861	66.9

# CZ-23 TEMELIN-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	60.0	55.2	PF	D31	PLANNED OUTAGE FOR TURBINE CONTROL VALVE REPAIR
03 Jan	30.0	13.2	PP	D31	START-UP AFTER PLANNED OUTAGE FOR TURBINE CONTROL VALVE REPAIR
20 Jan	44.0	40.1	UF2	A31	MANUAL SHUTDOWN OF TURBINE DUE TO CONTROL OIL LEAKAGE
22 Jan	5.5	1.4	UP2	A31	START-UP AFTER MANUAL SHUTDOWN OF TURBINE DUE TO CONTROL OIL LEAKAGE
31 Jan	1873.0	1708.2	PF	C	ANNUAL MAINTENANCE AND REFUELLING OUTAGE
20 Apr	164.5	150.0	UF3	A21	UNPLANNED EXTENSION OF ANNUAL MAINTENANCE AND REFUELLING OUTAGE
26 Apr	18.0	9.5	PP	C	START-UP AFTER THE ANNUAL MAINTENANCE AND REFUELLING OUTAGE
27 Apr	13.5	12.3	UF2	A42	TRANSFORMER FAILURE
28 Apr	130.0	44.5	PP	C	START-UP AFTER THE ANNUAL MAINTENANCE AND REFUELLING OUTAGE
11 May	30.0	18.4	UP1	A33	UNPLANNED REVISION OF CIRCULATING WATER PUMPS - SHUTTING DOWN
12 May	39.0	35.6	UF1	A33	UNPLANNED REVISION OF CIRCULATING WATER PUMPS
14 May	16.0	1.3	UP1	A33	UNPLANNED REVISION OF CIRCULATING WATER PUMPS - START-UP
31 May	4.0	2.0	UP1	A41	UNPLANNED SHUTDOWN FOR EXCITATION REVISION - SHUTTING DOWN
31 May	1.0	0.9	UF1	A41	UNPLANNED SHUTDOWN FOR EXCITATION REVISION
01 Jun	9.0	8.2	UF1	A41	UNPLANNED SHUTDOWN FOR EXCITATION REVISION
01 Jun	17.0	2.0	UP1	A41	UNPLANNED SHUTDOWN FOR EXCITATION REVISION - START-UP
03 Jun	34.0	31.0	UF2	A32	REACTOR SHUTDOWN DUE TO TURBINE-DRIVEN FEEDWATER PUMP FAILURE
04 Jun	14.0	1.8	UP2	A32	START-UP FROM TURBINE-DRIVEN FEEDWATER PUMP FAILURE
13 Jun	35.0	0.6	XP2	K	LOAD FOLLOWING
22 Jun	6.0	1.4	PP	E42	CERTIFICATION OF THE LOAD FOLLOWING SYSTEM
28 Jun	39.0	1.0	XP2	K	LOAD FOLLOWING
29 Jun	15.0	13.7	UF2	A32	REACTOR MANUAL SHUTDOWN DUE TO TRIPPING OF TURBINE-DRIVEN FEEDWATER PUMP
30 Jun	15.0	6.3	UP2	A32	START-UP FROM TRIPPING OF TURBINE-DRIVEN FEEDWATER PUMP
01 Jul	8.0	1.7	UP2	A32	START-UP FROM TRIPPING OF TURBINE-DRIVEN FEEDWATER PUMP
28 Jul	14.0	5.9	UP2	A15	POWER REDUCTION DUE TO FAILURE OF A REACTOR COOLANT PUMP
01 Aug	4.0	1.7	UP1	E42	UNPLANNED TESTING OF PLANT SYSTEMS
02 Aug	598.0	545.4	PF	S	UNIT SHUTDOWN FOR CAMPAIGN EXTENSION (STRETCH OUT)
26 Aug	67.0	15.6	PP	S	START-UP AFTER UNIT SHUTDOWN FOR CAMPAIGN EXTENSION (STRETCH OUT)
17 Sep	14.0	5.3	UF2	A15	UNPLANNED SHUTDOWN DUE TO COOLANT PUMP FAILURE
23 Sep	27.0	24.6	UF2	A12	UNIT TRIP DUE TO SPURIOUS ACTUATION OF REACTOR LIMITATION SYSTEM
24 Sep	24.0	1.6	UP2	A12	START-UP FROM SPURIOUS ACTUATION OF REACTOR LIMITATION SYSTEM
08 Nov	4.0	1.0	UP1	A32	SHUTTING DOWN FOR UNPLANNED TURBINE-DRIVEN FEEDWATER PUMP REVISION
08 Nov	7.0	6.4	UF1	A32	UNPLANNED TURBINE-DRIVEN FEEDWATER PUMP REVISION
09 Nov	7.0	1.7	UP1	A32	START-UP AFTER UNPLANNED TURBINE-DRIVEN FEEDWATER PUMP REVISION

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			2003 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		368				
C. Inspection, maintenance or repair combined with refuelling	1873					
D. Inspection, maintenance or repair without refuelling	60					
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)	598					
Subtotal	2531	368	0	0	0	0
Total		2899			0	

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

System	2003	2003 to 2003
	Hours Lost	Average Hours Lost Per Year
12. Reactor I&C Systems	27	
15. Reactor Cooling Systems	14	
21. Fuel Handling and Storage Facilities	164	
31. Turbine and auxiliaries	44	
32. Feedwater and Main Steam System	56	
33. Circulating Water System	39	
41. Main Generator Systems	10	
42. Electrical Power Supply Systems	13	
Total	367	0

# FI-1 LOVIISA-1

**Operator:** FORTUMPH (FORTUM POWER AND HEAT OY (former IVO))  
**Contractor:** AEE (ATOMENERGOEXPORT)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 488.0 MW(e)  
**Design Net Capacity:** 420.0 MW(e)  
**Design Discharge Burnup:** 30500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3939.0 GW(e).h  
**Energy Availability Factor:** 92.4%  
**Load Factor:** 92.1%  
**Operating Factor:** 93.5%  
**Energy Unavailability Factor:** 7.6%  
**Total Off-line Time:** 566 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	366.1	331.7	365.9	355.6	363.4	350.2	313.9	58.7	349.7	363.4	353.7	366.7	3939.0
<b>EAF (%)</b>	99.8	100.0	100.0	99.9	99.7	99.5	91.6	20.7	99.4	100.0	100.0	100.0	92.4
<b>UCF (%)</b>	99.8	100.0	100.0	99.9	99.7	99.6	99.7	22.2	99.4	100.0	100.0	100.0	93.2
<b>LF (%)</b>	100.8	101.1	100.8	101.3	100.1	99.7	86.5	16.2	99.5	100.0	100.7	101.0	92.1
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	100.0	100.0	23.9	100.0	100.0	100.0	100.0	93.5
<b>EUf (%)</b>	0.2	0.0	0.0	0.1	0.3	0.5	8.4	79.3	0.6	0.0	0.0	0.0	7.6
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.3	55.9	0.0	0.0	0.0	0.0	4.8
<b>UCLF (%)</b>	0.3	0.0	0.0	0.1	0.3	0.5	0.0	21.9	0.6	0.0	0.0	0.0	2.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.1	8.1	1.5	0.0	0.0	0.0	0.0	0.8

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1971      **Lifetime Generation:** 90547.8 GW(e).h  
**Date of First Criticality:** 21 Jan 1977      **Cumulative Energy Availability Factor:** 86.0%  
**Date of Grid Connection:** 08 Feb 1977      **Cumulative Load Factor:** 85.4%  
**Date of Commercial Operation:** 09 May 1977      **Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1982	3245.4	440.0	84.2	72.4	84.2	72.4	84.2	72.0	7576	86.5
1983	3337.4	445.0	86.7	74.8	86.7	74.9	85.6	74.3	7982	91.1
1984	3343.9	445.0	86.2	76.5	86.2	76.5	85.5	76.0	7653	87.1
1985	3600.0	440.0	92.5	78.5	92.5	78.5	93.4	78.2	8248	94.2
1986	3522.4	445.0	91.1	80.0	91.1	80.0	90.4	79.6	8093	92.4
1987	3600.4	445.0	94.5	81.4	94.6	81.4	92.4	80.9	8257	94.3
1988	3354.6	445.0	87.0	82.0	87.0	82.0	85.8	81.3	7678	87.4
1989	3575.7	445.0	92.8	82.9	92.6	82.9	91.7	82.2	8183	93.4
1990	3271.1	445.0	85.5	83.1	85.5	83.1	83.9	82.3	7605	86.8
1991	3360.9	445.0	88.8	83.5	88.6	83.5	86.2	82.6	7927	90.5
1992	3108.4	445.0	80.6	83.3	80.5	83.3	79.5	82.4	7186	81.8
1993	3443.2	445.0	89.5	83.7	89.5	83.6	88.4	82.8	8052	92.0
1994	3497.6	445.0	90.8	84.1	90.7	84.1	89.7	83.2	8017	91.5
1995	3389.1	445.0	88.5	84.3	87.7	84.3	86.9	83.4	7834	89.4
1996	3203.5	445.0	82.5	84.3	82.0	84.1	82.0	83.3	7281	82.9
1997	3794.8	445.0	93.9	84.7	93.0	84.6	97.3	84.0	8309	94.9
1998	3852.4	488.0	93.4	85.2	91.3	84.9	90.1	84.3	8234	94.0
1999	3883.3	488.0	92.4	85.5	91.6	85.3	90.8	84.7	8304	94.8
2000	3618.0	488.0	86.5	85.6	84.9	85.3	84.4	84.7	7720	87.9
2001	3921.0	488.0	93.4	86.0	92.4	85.6	91.7	85.0	8233	94.0
2002	3790.1	488.0	91.4	86.2	89.3	85.7	88.7	85.1	8095	92.4
2003	3939.0	488.0	93.2	86.5	92.4	86.0	92.1	85.4	8194	93.5



# FI-1 LOVIISA-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
13 Jan	12.0	0.9	UP1	A15	CHECK OF PCP'S SEALING PACKAGE BOLTS.
27 May	18.0	1.2	UP1	A32	REPAIR OF FEED WATER PUMP LEAKAGE.
22 Jun	15.0	1.6	UP1	A15	CHANGING THE N-BEARING OF ONE PCP.
27 Jun	846.0	32.2	XP	S	STRETCH-OUT AND COAST DOWN.
13 Jul	10.0	0.1	PP	E32	ANNUAL TESTING OF MAIN STEAM SAFETY VALVES.
31 Jul	18.0	1.6	UP2	A33	BEARING DAMAGE OF SEA WATER PUMP AND HIGH TEMPERATURE OF CONDENSATE AND SEA WATER RESTRICTED THE POWE OF TURBINE.
01 Aug	24.0	3.1	XP2	N31	HIGH TEMPERATURE OF CONDENSATE RESTRICTED THE POWER OF TURBINE.
02 Aug	566.0	282.5	PF	C21	ANNUAL MAINTENANCE AND REFUELLING
05 Sep	49.0	0.4	UP1	A32	HIGH PRESSURE PRE-HEATER ISOLATED BECAUSE OF LEAK OF CHOKER FLANGE

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1977 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					253	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	566			727		
D. Inspection, maintenance or repair without refuelling				22		
E. Testing of plant systems or components				3		
H. Nuclear regulatory requirements				0		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				1	2	6
Subtotal	566	0	0	753	256	6
Total		566			1015	

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

System	2003 Hours Lost	1977 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		16
14. Safety Systems		5
15. Reactor Cooling Systems		194
16. Steam generation systems		3
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		21
32. Feedwater and Main Steam System		9
42. Electrical Power Supply Systems		1
Total	0	249

## FI-2 LOVIISA-2

**Operator:** FORTUMPH (FORTUM POWER AND HEAT OY (former IVO))

**Contractor:** AEE (ATOMENERGOEXPORT)

### 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 488.0 MW(e)  
**Design Net Capacity:** 420.0 MW(e)  
**Design Discharge Burnup:** 30500 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 3736.7 GW(e).h  
**Energy Availability Factor:** 90.0%  
**Load Factor:** 87.4%  
**Operating Factor:** 95.4%  
**Energy Unavailability Factor:** 10.0%  
**Total Off-line Time:** 402 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	370.1	333.8	369.3	357.7	257.2	353.3	350.2	227.4	130.3	262.2	355.3	369.9	3736.7
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	99.8	100.0	99.3	71.7	37.9	72.1	99.6	100.0	90.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	99.8	100.0	99.7	72.9	37.9	72.1	99.6	100.0	90.1
<b>LF (%)</b>	101.9	101.8	101.7	101.9	70.8	100.5	96.4	62.6	37.1	72.1	101.1	101.9	87.4
<b>OF (%)</b>	100.0	100.0	99.9	100.0	100.0	100.0	100.0	72.4	72.8	100.0	100.0	100.0	95.4
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.2	0.0	0.7	28.3	62.1	27.9	0.4	0.0	10.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.3	27.1	60.6	27.7	0.0	0.0	9.7
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	1.5	0.2	0.4	0.0	0.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.2	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Aug 1972      **Lifetime Generation:** 80453.5 GW(e).h  
**Date of First Criticality:** 17 Oct 1980      **Cumulative Energy Availability Factor:** 87.7%  
**Date of Grid Connection:** 04 Nov 1980      **Cumulative Load Factor:** 87.3%  
**Date of Commercial Operation:** 05 Jan 1981      **Cumulative Unit Capability Factor:** 77.4%  
**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 (%)
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	90.0	80.1	89.1	79.1	8063	92.0
1984	3608.6	445.0	93.2	83.4	93.2	83.4	92.3	82.5	8251	93.9
1985	3549.8	440.0	92.2	85.2	92.2	85.2	92.1	84.4	8162	93.2
1986	3174.9	445.0	81.5	84.5	81.5	84.5	81.4	83.9	7273	83.0
1987	3572.1	445.0	93.4	85.8	93.4	85.8	91.6	85.0	8242	94.1
1988	3602.3	445.0	94.7	86.9	94.7	86.9	92.2	85.9	8305	94.5
1989	3551.0	445.0	91.8	87.5	91.7	87.5	91.1	86.5	8128	92.8
1990	3251.1	445.0	85.3	87.3	85.3	87.2	83.4	86.2	7584	86.6
1991	3442.2	445.0	89.8	87.5	89.0	87.4	88.3	86.4	7941	90.7
1992	3468.4	445.0	89.5	87.7	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	87.5	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	87.6	92.0	87.3	97.6	87.0	8267	94.4
1998	3687.9	488.0	88.5	87.6	86.4	87.3	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

## FI-2 LOVIISA-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
05 May	484.0	107.0	UP1	A41	REPAIR OF HYDROGEN LEAKAGE IN GENERATOR.
22 Jun	10.0	0.8	UP1	A33	REPAIRING SHAFT LEAKAGE IN SEA WATER PUMP.
21 Jul	189.0	5.8	XP2	N31	HIGH TEMPERATURE OF CONDENSATE RESTRICTED THE POWER OF TURBINE.
26 Jul	14.0	1.2	PP	E32	ANNUAL TESTING OF MAIN STEAM SAFETY VALVES.
31 Jul	0.0	1.0	XP2	N31	HIGH TEMPERATURE OF SEA WATER RESTRICTED THE POWER OF TURBINE.
09 Aug	332.0	9.2	XP	S	STRETCH-OUT
23 Aug	402.0	218.2	PF	C	ANNUAL MAINTENANCE AND REFUELLING.
23 Sep	1184.0	220.4	PP	D41	CHANGE OF GENERATOR STATOR.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1980 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					112	
C. Inspection, maintenance or repair combined with refuelling	402			670		
D. Inspection, maintenance or repair without refuelling				50		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				2	2	
Subtotal	402	0	0	722	114	0
Total		402			836	

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

System	2003 Hours Lost	1980 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		6
14. Safety Systems		6
15. Reactor Cooling Systems		50
16. Steam generation systems		2
21. Fuel Handling and Storage Facilities		16
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		18
41. Main Generator Systems		0
XX. Miscellaneous Systems		0
Total	0	99

# FI-3 OLKILUOTO-1

**Operator:** TVO (TEOLLISUUJEN VOIMA OY)  
**Contractor:** ASEASTAL (ASEA-ATOM / STAL-LAVAL)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 840.0 MW(e)  
**Design Net Capacity:** 660.0 MW(e)  
**Design Discharge Burnup:** 36000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7127.4 GW(e).h  
**Energy Availability Factor:** 96.5%  
**Load Factor:** 96.9%  
**Operating Factor:** 97.2%  
**Energy Unavailability Factor:** 3.5%  
**Total Off-line Time:** 245 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	633.7	568.0	632.4	610.3	494.6	480.3	617.7	614.4	605.3	628.2	611.4	631.1	7127.4
<b>EAF (%)</b>	100.0	99.3	100.0	99.7	78.9	80.3	100.0	99.8	100.0	99.8	100.0	99.8	96.5
<b>UCF (%)</b>	100.0	99.3	100.0	99.7	86.1	80.3	100.0	99.8	100.0	99.8	100.0	99.8	97.1
<b>LF (%)</b>	101.4	100.6	101.2	101.1	79.1	79.4	98.8	98.3	100.1	100.4	101.1	101.0	96.9
<b>OF (%)</b>	100.0	100.0	99.9	100.1	86.0	80.4	100.0	100.0	100.0	100.0	100.0	100.0	97.2
<b>EUf (%)</b>	0.0	0.7	0.0	0.3	21.1	19.7	0.0	0.2	0.0	0.2	0.0	0.2	3.5
<b>PUf (%)</b>	0.0	0.2	0.0	0.3	13.7	14.2	0.0	0.2	0.0	0.2	0.0	0.2	2.4
<b>UCLF (%)</b>	0.0	0.6	0.0	0.0	0.1	5.5	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	7.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

THE PLANT WAS OPERATED IN BASE LOAD OPERATING MODE.

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1974      **Lifetime Generation:** 145010.2 GW(e).h  
**Date of First Criticality:** 21 Jul 1978      **Cumulative Energy Availability Factor:** 91.9%  
**Date of Grid Connection:** 02 Sep 1978      **Cumulative Load Factor:** 91.5%  
**Date of Commercial Operation:** 10 Oct 1979      **Cumulative Unit Capability Factor:** 77.3%  
**Cumulative Energy Unavailability Factor:** 8.1%

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 (%)
1982	4997.5	658.0	86.7	81.3	86.7	81.3	86.7	79.8	7903	90.2
1983	4808.3	657.0	81.9	81.4	81.9	81.3	82.0	80.7	7651	87.3
1984	5505.6	678.0	91.9	83.6	91.9	83.5	90.3	83.1	8247	93.9
1985	5414.5	710.0	88.8	84.5	88.8	84.4	87.1	83.8	8180	93.4
1986	5463.2	710.0	90.1	85.3	90.1	85.2	87.8	84.4	8008	91.4
1987	5636.5	710.0	92.0	86.2	92.1	86.1	90.6	85.2	8142	92.9
1988	5778.9	710.0	94.3	87.1	94.1	87.1	92.7	86.1	8248	93.9
1989	5056.2	710.0	83.2	86.7	83.2	86.7	81.3	85.6	7278	83.1
1990	5857.3	710.0	95.6	87.6	95.6	87.5	94.2	86.4	8356	95.4
1991	5873.2	710.0	95.7	88.3	94.9	88.1	94.4	87.1	8373	95.6
1992	5803.0	710.0	93.7	88.7	93.2	88.5	93.0	87.6	8251	93.9
1993	5944.9	710.0	95.8	89.2	95.3	89.0	95.6	88.2	8433	96.3
1994	5978.0	710.0	96.5	89.7	96.0	89.5	96.1	88.7	8485	96.9
1995	5931.5	710.0	96.1	90.1	95.5	89.9	95.4	89.1	8427	96.2
1996	5938.6	710.0	92.2	90.2	92.1	90.0	95.2	89.5	8212	93.5
1997	6374.2	772.0	93.9	90.5	93.8	90.2	94.3	89.8	8254	94.2
1998	6807.0	840.0	95.6	90.8	95.0	90.5	92.5	89.9	8384	95.7
1999	7111.8	840.0	97.2	91.2	96.4	90.9	96.6	90.3	8542	97.5
2000	7043.1	840.0	95.8	91.4	95.2	91.1	95.5	90.6	8448	96.2
2001	7163.8	840.0	97.6	91.7	97.2	91.4	97.4	91.0	8561	97.7
2002	6997.5	840.0	95.5	91.9	95.1	91.6	95.1	91.2	8377	95.6
2003	7127.4	840.0	97.1	92.2	96.5	91.9	96.9	91.5	8515	97.2

## FI-3 OLKILUOTO-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
02 May	612.0	45.2	XP	S	COAST-DOWN
27 May	206.0	171.6	PF	C	REFUELLING OUTAGE
06 Jun	29.0	25.1	UF3	Z	EXTENSION OF REFUELLING OUTAGE
26 Jun	10.0	8.4	UF2	A31	HOT SHUT DOWN DUE TO REPAIR OF LEAK IN MOISTURE SEPARATOR

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1979 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		10			101	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	206			465		
D. Inspection, maintenance or repair without refuelling				21		
E. Testing of plant systems or components					7	
J. Grid failure or grid unavailability						4
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					54	0
Z. Others		29				
Subtotal	206	39	0	486	162	4
Total		245			652	

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

System	2003 Hours Lost	1979 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		9
12. Reactor I&C Systems		1
14. Safety Systems		6
15. Reactor Cooling Systems		12
31. Turbine and auxiliaries	10	23
32. Feedwater and Main Steam System		3
33. Circulating Water System		1
41. Main Generator Systems		42
42. Electrical Power Supply Systems		0
Total	10	97

# FI-4 OLKILUOTO-2

**Operator:** TVO (TEOLLISUUJEN VOIMA OY)  
**Contractor:** ASEASTAL (ASEA-ATOM / STAL-LAVAL)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 840.0 MW(e)  
**Design Net Capacity:** 660.0 MW(e)  
**Design Discharge Burnup:** 35000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7026.9 GW(e).h  
**Energy Availability Factor:** 95.2%  
**Load Factor:** 95.5%  
**Operating Factor:** 95.6%  
**Energy Unavailability Factor:** 4.8%  
**Total Off-line Time:** 382 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	631.7	571.2	630.1	604.9	307.5	580.0	611.2	614.0	603.9	630.0	610.1	632.4	7026.9
<b>EAF (%)</b>	99.8	99.9	99.8	99.1	49.0	96.3	99.3	100.0	99.7	100.0	99.7	100.0	95.2
<b>UCF (%)</b>	99.8	100.0	99.8	100.0	52.0	96.3	99.3	100.0	99.7	100.0	99.8	100.0	95.5
<b>LF (%)</b>	101.1	101.2	100.8	100.2	49.2	95.9	97.8	98.3	99.9	100.7	100.9	101.2	95.5
<b>OF (%)</b>	100.0	100.0	99.9	100.1	51.3	97.2	100.0	100.0	100.0	100.0	100.0	100.0	95.6
<b>EUf (%)</b>	0.2	0.1	0.2	0.9	51.0	3.7	0.7	0.0	0.3	0.0	0.3	0.0	4.8
<b>PUF (%)</b>	0.1	0.0	0.2	0.0	45.1	0.0	0.0	0.0	0.2	0.0	0.2	0.0	3.9
<b>UCLF (%)</b>	0.0	0.1	0.0	0.0	2.9	3.7	0.7	0.0	0.1	0.0	0.0	0.0	0.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.9	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

THE PLANT WAS OPERATED IN BASE LOAD OPERATING MODE.

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1975  
**Date of First Criticality:** 13 Oct 1979  
**Date of Grid Connection:** 18 Feb 1980  
**Date of Commercial Operation:** 10 Jul 1982

**Lifetime Generation:** 136122.9 GW(e).h  
**Cumulative Energy Availability Factor:** 93.5%  
**Cumulative Load Factor:** 93.0%  
**Cumulative Unit Capability Factor:** 77.6%  
**Cumulative Energy Unavailability Factor:** 6.5%

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 (%)
1982	4587.1	658.0	0.0	0.0	79.5	100.0	79.6	0.0	7269	83.0
1983	5087.2	657.0	86.8	86.8	86.7	86.7	88.3	88.4	8221	93.8
1984	5341.3	678.0	89.6	88.2	89.6	88.0	87.3	89.0	8031	91.4
1985	5415.8	710.0	88.2	88.2	88.2	88.1	87.1	88.4	7912	90.3
1986	5840.2	710.0	95.1	90.0	95.1	89.9	93.9	89.8	8437	96.3
1987	5725.0	710.0	93.7	90.7	93.7	90.7	92.0	90.3	8379	95.7
1988	5713.2	710.0	92.7	91.0	92.7	91.0	91.6	90.5	8220	93.6
1989	5827.0	710.0	94.9	91.6	94.9	91.6	93.7	90.9	8363	95.5
1990	5749.9	710.0	93.8	91.9	93.8	91.9	92.4	91.1	8265	94.3
1991	5731.0	710.0	93.7	92.1	93.0	92.0	92.1	91.3	8216	93.8
1992	5790.4	710.0	94.5	92.3	93.3	92.1	92.8	91.4	8306	94.6
1993	5861.6	710.0	95.1	92.6	94.4	92.3	94.2	91.7	8327	95.1
1994	5732.6	710.0	93.2	92.6	92.3	92.3	92.2	91.7	8130	92.8
1995	5747.2	710.0	93.7	92.7	92.5	92.3	92.4	91.8	8236	94.0
1996	5915.4	710.0	95.3	92.9	95.0	92.5	94.8	92.0	8413	95.8
1997	6077.0	736.0	94.6	93.0	93.7	92.6	94.3	92.1	8258	94.3
1998	6628.5	840.0	94.3	93.1	93.2	92.7	90.1	92.0	8207	93.7
1999	7091.2	840.0	96.9	93.4	96.4	92.9	96.4	92.3	8505	97.1
2000	7028.9	840.0	95.9	93.5	95.3	93.1	95.3	92.5	8457	96.3
2001	6988.0	840.0	95.1	93.6	95.1	93.2	95.0	92.6	8387	95.7
2002	7108.5	840.0	97.0	93.8	96.8	93.4	96.6	92.9	8472	96.7
2003	7026.9	840.0	95.5	93.9	95.2	93.5	95.5	93.0	8378	95.6

## FI-4 OLKILUOTO-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
21 Apr	484.0	24.1	XP	S	COAST-DOWN
11 May	335.0	281.9	PF	C	REFUELLING AND MAINTENANCE OUTAGE
27 May	21.0	18.0	UF3	Z	EXTENSION OF REFUELLING OUTAGE
19 Jun	26.0	22.5	UF1	A31	HOT SHUT DOWN DUE TO BALANCE OF LP-TURBINE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1980 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		26			390	
B. Refuelling without a maintenance					12	
C. Inspection, maintenance or repair combined with refuelling	335			394		
D. Inspection, maintenance or repair without refuelling				18		
E. Testing of plant systems or components				29		
H. Nuclear regulatory requirements					1	
J. Grid failure or grid unavailability						14
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					3	5
Z. Others		21				
Subtotal	335	47	0	441	406	19
Total		382			866	

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

System	2003 Hours Lost	1980 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		10
12. Reactor I&C Systems		0
13. Reactor Auxiliary Systems		0
14. Safety Systems		3
15. Reactor Cooling Systems		13
31. Turbine and auxiliaries	26	1
32. Feedwater and Main Steam System		8
33. Circulating Water System		1
35. All other I&C Systems		1
41. Main Generator Systems		344
42. Electrical Power Supply Systems		4
XX. Miscellaneous Systems		0
Total	26	385

**FR-54 BELLEVILLE-1**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1310.0 MW(e)  
 Design Net Capacity: 1310.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 8401.7 GW(e).h  
 Energy Availability Factor: 75.4%  
 Load Factor: 73.2%  
 Operating Factor: 78.4%  
 Energy Unavailability Factor: 24.6%  
 Total Off-line Time: 1889 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	961.4	855.7	838.4	269.4	0.0	221.8	920.2	887.2	892.2	853.1	925.7	776.6	8401.7
EAF (%)	99.9	97.0	86.1	29.0	0.0	25.2	99.3	99.5	99.2	90.0	100.0	80.6	75.4
UCF (%)	99.9	100.0	100.0	36.9	0.0	25.4	99.9	100.0	99.6	90.1	100.0	80.6	77.6
LF (%)	98.6	97.2	86.1	28.6	0.0	23.5	94.4	91.0	94.6	87.4	98.1	79.7	73.2
OF (%)	100.0	100.0	100.0	32.4	0.0	42.2	100.0	100.0	100.0	86.6	100.0	80.9	78.4
EUf (%)	0.1	3.0	13.9	71.0	100.0	74.8	0.7	0.5	0.8	10.0	0.0	19.4	24.6
PUF (%)	0.0	0.0	0.0	63.1	100.0	16.8	0.0	0.0	0.5	0.0	0.0	0.0	15.1
UCLF (%)	0.1	0.0	0.0	0.0	0.0	57.8	0.1	0.0	0.0	9.9	0.0	19.4	7.3
XUF (%)	0.0	3.0	13.9	7.9	0.0	0.2	0.6	0.4	0.3	0.0	0.0	0.0	2.2

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 May 1980      Lifetime Generation: 123608.4 GW(e).h  
 Date of First Criticality: 09 Sep 1987      Cumulative Energy Availability Factor: 73.8%  
 Date of Grid Connection: 14 Oct 1987      Cumulative Load Factor: 67.8%  
 Date of Commercial Operation: 01 Jun 1988      Cumulative Unit Capability Factor: 78.4%  
    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 (%)
1987	622.0	1310.0	0.0	0.0	84.1	100.0	5.6	0.0	1184	14.0
1988	6283.0	1310.0	0.0	0.0	68.7	100.0	54.6	0.0	6478	73.7
1989	5152.6	1310.0	46.5	46.5	46.0	46.0	44.9	44.9	4244	48.4
1990	7914.3	1310.0	71.4	59.0	71.2	58.6	69.0	56.9	6408	73.2
1991	8660.2	1310.0	80.8	66.3	79.3	65.5	75.5	63.1	7092	81.0
1992	8494.3	1310.0	91.8	72.7	91.2	71.9	73.8	65.8	7600	86.5
1993	7921.5	1310.0	77.5	73.6	71.3	71.8	69.0	66.4	6873	78.5
1994	6575.8	1310.0	65.2	72.2	64.0	70.5	57.3	64.9	5848	66.8
1995	7740.9	1310.0	76.2	72.8	73.4	70.9	67.5	65.3	6796	77.6
1996	7365.1	1310.0	76.8	73.3	76.5	71.6	64.0	65.1	6002	68.3
1997	9785.3	1310.0	93.4	75.5	93.2	74.0	85.3	67.4	8294	94.7
1998	5740.9	1310.0	53.7	73.3	51.2	71.7	50.0	65.6	4865	55.5
1999	9580.5	1310.0	92.0	75.0	90.4	73.4	83.5	67.2	7957	90.8
2000	4238.6	1310.0	38.0	71.9	37.9	70.5	36.8	64.7	3459	39.4
2001	9564.5	1310.0	87.3	73.1	86.8	71.7	83.3	66.1	7774	88.7
2002	9567.3	1310.0	99.5	75.0	98.9	73.7	83.4	67.4	8447	96.4
2003	8401.7	1310.0	77.6	75.2	75.4	73.8	73.2	67.8	6871	78.4



# FR-54 BELLEVILLE-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	121.0	14.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
09 Feb	1488.0	236.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
12 Apr	1197.0	1568.0	PF	C	REFUELLING AND PARTIAL INSPECTION
01 Jun	216.0	283.0	UF3	A11	INTERNAL STRUCTURES
10 Jun	48.0	63.0	UF3	K	INDUSTRIAL ACTION DURING PROGRAMMED OUTAGE, EXTENSION
12 Jun	48.0	63.0	UF3	A	NON-RETURN AND STOP VALVES
14 Jun	24.0	31.0	UF3	A	PARALLEL AND TAPER-SEAT VALVES
15 Jun	24.0	31.0	UF3	A	GENERAL VALVES AND FITTINGS
16 Jun	56.0	74.0	UF3	A31	MOISTURE SEPARATOR-REHEATERS
18 Jun	169.0	75.0	PP	E	START-UP TESTS AFTER REFUELLING
18 Jun	64.0	84.0	PF	E	START-UP TESTS AFTER REFUELLING
28 Jun	322.0	8.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Jul	1456.0	191.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCOMAX
01 Aug	105.0	4.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
19 Oct	67.0	88.0	UF3	A34	AUXILIARY STEAM/SUPERHEATED WATER DISTRIBUTION SYSTEM
22 Oct	3.0	4.0	UF3	A31	CONTROL AND PROTECTION SYSTEMS
01 Nov	408.0	20.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCOMAX
01 Dec	151.0	12.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCOMAX
25 Dec	142.0	186.0	UF3	A41	ALTERNATOR BEARINGS AND SHAFT LINE

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		580			483	
B. Refuelling without a maintenance					23	
C. Inspection, maintenance or repair combined with refuelling	1197			1076	12	
D. Inspection, maintenance or repair without refuelling				9		
E. Testing of plant systems or components	64			69	4	1
H. Nuclear regulatory requirements					136	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)		48			100	1
Subtotal	1261	628	0	1154	758	2
Total		1889			1914	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	216	19
12. Reactor I&C Systems		93
13. Reactor Auxiliary Systems		55
14. Safety Systems		45
15. Reactor Cooling Systems		51
16. Steam generation systems		10
21. Fuel Handling and Storage Facilities		3
31. Turbine and auxiliaries	59	9
32. Feedwater and Main Steam System		89
41. Main Generator Systems	142	47
42. Electrical Power Supply Systems		21
XX. Miscellaneous Systems	67	
Total	484	442

**FR-55 BELLEVILLE-2**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1310.0 MW(e)  
 Design Net Capacity: 1310.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 8624.7 GW(e).h  
 Energy Availability Factor: 79.4%  
 Load Factor: 75.2%  
 Operating Factor: 81.4%  
 Energy Unavailability Factor: 20.6%  
 Total Off-line Time: 1625 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	955.5	870.5	902.7	822.4	829.9	835.6	911.9	913.4	552.6	0.0	141.8	888.3	8624.7
EAF (%)	100.0	99.9	99.9	92.5	93.1	96.3	99.6	99.0	59.0	0.0	17.3	97.1	79.4
UCF (%)	100.0	100.0	100.0	95.1	94.0	100.0	99.9	100.0	61.6	0.0	17.3	97.1	80.4
LF (%)	98.0	98.9	92.7	87.2	85.2	88.6	93.6	93.7	58.6	0.0	15.0	91.1	75.2
OF (%)	100.0	100.0	100.0	95.3	94.4	100.0	100.0	100.0	60.3	0.0	28.1	100.0	81.4
EUf (%)	0.0	0.1	0.1	7.5	6.9	3.7	0.4	1.0	41.0	100.0	82.7	2.9	20.6
PUF (%)	0.0	0.0	0.0	4.9	0.0	0.0	0.0	0.0	38.4	100.0	13.6	2.2	13.4
UCLF (%)	0.0	0.0	0.1	0.0	6.0	0.0	0.1	0.0	0.0	0.0	69.1	0.6	6.3
XUF (%)	0.0	0.1	0.0	2.6	0.9	3.7	0.3	1.0	2.7	0.0	0.0	0.0	0.9

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Aug 1980      Lifetime Generation: 120177.3 GW(e).h  
 Date of First Criticality: 25 May 1988      Cumulative Energy Availability Factor: 74.9%  
 Date of Grid Connection: 06 Jul 1988      Cumulative Load Factor: 68.6%  
 Date of Commercial Operation: 01 Jan 1989      Cumulative Unit Capability Factor: 78.4%  
    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 (%)
1988	2087.0	1310.0	0.0	0.0	69.6	100.0	18.4	0.0	2477	28.6
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	86.2	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

## FR-55 BELLEVILLE-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	286.0	94.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Apr	310.0	32.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
05 Apr	34.0	44.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
01 May	287.0	82.0	XP	K	LOAD VARIATION WITHOUT REMOTE LOAD DISPATCH CONTROL
18 May	42.0	56.0	UF3	A	CONTROL AND ISOLATING VALVES
01 Jun	246.0	70.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Jun	176.0	7.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
03 Jun	39.0	27.0	XP	R	LOAD LIMITATION OR SHUTDOWN CAUSED BY INDUSTRIAL ACTION
01 Jul	334.0	53.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
03 Jul	226.0	13.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Aug	361.0	51.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
02 Sep	406.0	25.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
19 Sep	1021.0	1338.0	PF	C	REFUELLING AND PARTIAL INSPECTION
01 Nov	180.0	236.0	UF3	A11	VESSEL AND VESSEL HEAD
02 Nov	24.0	31.0	UF3	L	HUMAN ERROR IN PREPARATION OF INSTRUCTIONS
03 Nov	24.0	31.0	UF3	A42	MISCELLANEOUS ELECTRICAL PRODUCTION FOR AUXILIARIES
04 Nov	48.0	63.0	UF3	A11	INTERNAL STRUCTURES
06 Nov	48.0	63.0	UF3	A22	REFUELLING MACHINE
08 Nov	24.0	31.0	UF3	A	GENERAL VALVES AND FITTINGS
09 Nov	24.0	31.0	UF3	A13	CHEMICAL CHARACTERISTICS OF THE PRIMARY SYSTEM
10 Nov	24.0	31.0	UF3	Z	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
11 Nov	99.0	130.0	UF3	A42	EMERGENCY GENERATOR
15 Nov	32.0	41.0	PF	E	START-UP TESTS AFTER REFUELLING
13 Dec	90.0	5.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
14 Dec	30.0	5.0	UP3	A12	REACTOR INSTRUMENTATION AND CONTROL
16 Dec	117.0	50.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		489			372	
B. Refuelling without a maintenance					19	
C. Inspection, maintenance or repair combined with refuelling	1021			1036		
E. Testing of plant systems or components	66			46		
H. Nuclear regulatory requirements					176	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					88	
L. Human factor related		24				
Z. Others		24				
Subtotal	1087	537	0	1082	655	0
Total		1624			1737	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	228	43
12. Reactor I&C Systems		63
13. Reactor Auxiliary Systems	24	9
14. Safety Systems		35
15. Reactor Cooling Systems		62
16. Steam generation systems		43
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		25
32. Feedwater and Main Steam System		18
33. Circulating Water System		3
41. Main Generator Systems		8
42. Electrical Power Supply Systems	123	7
Total	375	317

# FR-32 BLAYAIS-1

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 910.0 MW(e)  
**Design Net Capacity:** 910.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4541.7 GW(e).h  
**Energy Availability Factor:** 58.1%  
**Load Factor:** 57.0%  
**Operating Factor:** 60.7%  
**Energy Unavailability Factor:** 41.9%  
**Total Off-line Time:** 3439 hours

## 3. 2003 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	2.7	603.0	283.4	654.5	414.3	644.1	666.8	614.5	658.5	4541.7
<b>EAF (%)</b>	0.0	0.0	0.0	2.9	89.3	44.7	96.7	62.3	98.3	99.5	98.5	99.9	58.1
<b>UCF (%)</b>	0.0	0.0	0.0	2.9	89.6	45.1	99.8	99.3	100.0	99.8	98.5	99.9	61.8
<b>LF (%)</b>	0.0	0.0	0.0	0.4	89.1	43.2	96.7	61.2	98.3	98.4	93.8	97.3	57.0
<b>OF (%)</b>	0.0	0.0	0.0	9.7	94.8	54.4	100.0	64.7	100.0	100.0	100.0	100.0	60.7
<b>EUf (%)</b>	100.0	100.0	100.0	97.1	10.7	55.3	3.3	37.7	1.7	0.5	1.5	0.1	41.9
<b>PUF (%)</b>	100.0	100.0	100.0	5.9	3.3	0.0	0.2	0.0	0.0	0.2	0.2	0.0	25.5
<b>UCLF (%)</b>	0.0	0.0	0.0	91.2	7.1	54.9	0.0	0.7	0.0	0.0	1.3	0.1	12.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.3	0.4	3.2	37.1	1.7	0.4	0.0	0.0	3.6

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1977      **Lifetime Generation:** 123972.0 GW(e).h  
**Date of First Criticality:** 20 May 1981      **Cumulative Energy Availability Factor:** 75.7%  
**Date of Grid Connection:** 12 Jun 1981      **Cumulative Load Factor:** 69.7%  
**Date of Commercial Operation:** 01 Dec 1981      **Cumulative Unit Capability Factor:** 77.4%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	6129.8	910.0	81.5	81.5	81.5	81.5	76.9	76.9	7588	86.6
1983	3453.0	910.0	46.9	64.2	46.9	64.2	43.3	60.1	4285	48.9
1984	6509.0	910.0	85.1	71.2	84.6	71.0	81.4	67.2	7536	85.8
1985	6225.2	910.0	83.0	74.1	82.8	73.9	78.1	69.9	7348	83.9
1986	6460.6	910.0	87.8	76.8	87.0	76.5	81.0	72.2	7754	88.5
1987	5586.6	910.0	78.2	77.1	76.2	76.5	70.1	71.8	6793	77.5
1988	5730.0	910.0	82.1	77.8	81.3	77.2	71.7	71.8	7069	80.5
1989	6222.4	910.0	84.3	78.6	83.3	77.9	78.1	72.6	7419	84.7
1990	5822.6	910.0	77.2	78.4	76.9	77.8	73.0	72.6	6834	78.0
1991	6379.0	910.0	83.8	79.0	83.3	78.4	80.0	73.4	7400	84.5
1992	4349.2	910.0	57.5	77.0	56.6	76.4	54.4	71.6	5079	57.8
1993	5979.2	910.0	83.7	77.6	78.3	76.5	75.0	71.9	7253	82.8
1994	3474.9	910.0	86.6	78.3	85.8	77.3	43.6	69.7	5119	58.4
1995	6075.8	910.0	87.1	78.9	84.3	77.8	76.2	70.2	7206	82.3
1996	6639.1	910.0	88.5	79.5	85.6	78.3	83.1	71.1	7798	88.8
1997	6196.6	910.0	90.1	80.2	84.6	78.7	77.7	71.5	7621	87.0
1998	5917.6	910.0	81.1	80.3	78.2	78.6	74.2	71.6	7078	80.8
1999	6046.8	910.0	80.9	80.3	77.9	78.6	75.9	71.9	7082	80.8
2000	2854.1	910.0	53.4	78.9	36.6	76.4	35.7	70.0	3602	41.0
2001	4881.5	910.0	66.3	78.2	64.0	75.8	61.2	69.5	5768	65.8
2002	6861.1	910.0	95.0	79.0	93.0	76.6	86.1	70.3	8251	94.2
2003	4541.7	910.0	61.8	78.3	58.1	75.7	57.0	69.7	5321	60.7

# FR-32 BLAYAIS-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	2159.0	1965.0	PF	C	REFUELLING AND 10-YEARLY INSPECTION
01 Apr	650.0	591.0	UF3	K	INDUSTRIAL ACTION DURING PROGRAMMED OUTAGE, EXTENSION
28 Apr	61.0	39.0	PP	E	START-UP TESTS AFTER REFUELLING
29 Apr	9.0	6.0	UP3	L	HUMAN ERRORS DURING TESTING
01 May	66.0	12.0	UP3	A	VARIOUS, PRIMARY CIRCUIT (SOME NOT EXPLAINED)
01 May	174.0	22.0	PP	E	START-UP TESTS AFTER REFUELLING
11 May	456.0	2.0	XP	K	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
30 May	15.0	14.0	UF3	K	MALFUNCTION OF REGULATION, CONTROL AND PROTECTION SYSTEM
31 May	352.0	321.0	UF3	A15	PRIMARY PUMP
01 Jun	149.0	27.0	UP3	A15	PRIMARY PUMP
14 Jun	149.0	33.0	UP3	A	VARIOUS, PRIMARY CIRCUIT (SOME NOT EXPLAINED)
27 Jun	825.0	24.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
09 Jul	8.0	1.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
01 Aug	320.0	12.0	XP	K	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
12 Aug	409.0	239.0	XP	K	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
25 Aug	16.0	5.0	UP3	A	VARIOUS, PRIMARY CIRCUIT (SOME NOT EXPLAINED)
01 Sep	1006.0	12.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
17 Oct	4.0	1.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
20 Oct	78.0	6.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
20 Oct	50.0	1.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Nov	399.0	28.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
02 Nov	122.0	2.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
11 Nov	4.0	1.0	PP	E	TEST OF HOUSE LOAD OPERATION
11 Nov	5.0	5.0	UP3	K	MALFUNCTION OF REGULATION, CONTROL AND PROTECTION SYSTEM
11 Nov	6.0	3.0	UP3	A	VARIOUS, PRIMARY CIRCUIT (SOME NOT EXPLAINED)
01 Dec	306.0	18.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
12 Dec	49.0	2.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		352			450	
C. Inspection, maintenance or repair combined with refuelling	2159			960	7	
D. Inspection, maintenance or repair without refuelling				51		
E. Testing of plant systems or components				1	2	
H. Nuclear regulatory requirements					91	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)		665			5	66
Subtotal	2159	1017	0	1012	555	66
Total		3176			1633	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		35
12. Reactor I&C Systems		55
13. Reactor Auxiliary Systems		5
14. Safety Systems		5
15. Reactor Cooling Systems	352	73
16. Steam generation systems		4
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries		37
32. Feedwater and Main Steam System		44
33. Circulating Water System		1
41. Main Generator Systems		97
42. Electrical Power Supply Systems		13
Total	352	371

# FR-33 BLAYAIS-2

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 910.0 MW(e)  
**Design Net Capacity:** 910.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5181.2 GW(e).h  
**Energy Availability Factor:** 63.7%  
**Load Factor:** 65.0%  
**Operating Factor:** 66.0%  
**Energy Unavailability Factor:** 36.3%  
**Total Off-line Time:** 2976 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	682.4	618.9	567.5	323.3	0.0	0.0	0.0	364.3	549.5	707.0	687.3	680.8	5181.2
<b>EAF (%)</b>	99.5	100.0	84.4	50.0	0.0	0.0	0.0	55.2	82.2	100.0	100.0	95.7	63.7
<b>UCF (%)</b>	99.6	100.0	88.2	57.0	0.0	0.0	0.0	55.2	99.9	100.0	100.0	95.7	66.0
<b>LF (%)</b>	100.8	101.2	83.9	49.3	0.0	0.0	0.0	53.8	83.9	104.3	104.9	100.6	65.0
<b>OF (%)</b>	100.0	100.0	89.0	56.9	0.0	0.0	0.0	69.0	83.1	100.0	100.0	96.9	66.0
<b>EUf (%)</b>	0.5	0.0	15.6	50.0	100.0	100.0	100.0	44.8	17.8	0.0	0.0	4.3	36.3
<b>PUF (%)</b>	0.3	0.0	0.0	43.0	100.0	100.0	100.0	44.8	0.0	0.0	0.0	0.1	32.6
<b>UCLF (%)</b>	0.2	0.0	11.8	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	4.2	1.4
<b>XUF (%)</b>	0.0	0.0	3.8	7.0	0.0	0.0	0.0	0.0	17.6	0.0	0.0	0.0	2.3

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1977  
**Date of First Criticality:** 28 Jun 1982  
**Date of Grid Connection:** 17 Jul 1982  
**Date of Commercial Operation:** 01 Feb 1983

**Lifetime Generation:** 126529.8 GW(e).h  
**Cumulative Energy Availability Factor:** 80.7%  
**Cumulative Load Factor:** 75.1%  
**Cumulative Unit Capability Factor:** 77.7%  
**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 (%)
1982	1672.7	910.0	0.0	0.0	73.7	100.0	21.9	0.0	2571	30.7
1983	5094.0	910.0	0.0	0.0	64.6	100.0	63.9	0.0	5817	66.4
1984	6645.0	910.0	86.5	86.5	85.5	85.5	83.1	83.1	7716	87.8
1985	6819.7	910.0	90.0	88.3	89.9	87.7	85.5	84.3	7937	90.6
1986	6048.4	910.0	83.2	86.6	82.9	86.1	75.9	81.5	7142	81.5
1987	5987.1	910.0	84.8	86.1	84.2	85.6	75.1	79.9	7218	82.4
1988	4162.0	910.0	91.2	87.2	90.8	86.7	52.1	74.3	5718	65.1
1989	5561.0	910.0	77.0	85.5	73.4	84.5	69.8	73.6	6720	76.7
1990	5656.4	910.0	87.4	85.7	85.7	84.6	71.0	73.2	7381	84.3
1991	5326.5	910.0	78.3	84.8	75.1	83.4	66.8	72.4	6789	77.5
1992	5953.3	910.0	86.9	85.0	83.7	83.5	74.5	72.6	7505	85.4
1993	5253.2	910.0	71.0	83.6	67.0	81.8	65.9	72.0	6203	70.8
1994	6692.6	910.0	88.7	84.1	88.1	82.4	84.0	73.1	7658	87.4
1995	6725.5	910.0	87.9	84.4	85.6	82.7	84.4	74.0	7775	88.8
1996	6709.8	910.0	87.4	84.7	85.0	82.9	83.9	74.8	7587	86.4
1997	6769.9	910.0	88.7	84.9	84.8	83.0	84.9	75.5	7681	87.7
1998	6974.3	910.0	90.0	85.3	87.2	83.3	87.5	76.3	7883	90.0
1999	5836.2	910.0	75.1	84.6	73.1	82.6	73.2	76.1	6544	74.7
2000	4941.1	910.0	75.2	84.1	63.0	81.5	61.8	75.3	5592	63.7
2001	6548.0	910.0	83.6	84.0	81.9	81.5	82.1	75.6	7358	84.0
2002	5972.0	910.0	84.3	84.1	82.7	81.6	74.9	75.6	7357	84.0
2003	5181.2	910.0	66.0	83.2	63.7	80.7	65.0	75.1	5784	66.0

## FR-33 BLAYAIS-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	24.0	1.0	UP3	A	VARIOUS, PRIMARY CIRCUIT (SOME NOT EXPLAINED)
17 Jan	38.0	2.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
03 Mar	543.0	20.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
19 Mar	7.0	1.0	UP3	A	VARIOUS, PRIMARY CIRCUIT (SOME NOT EXPLAINED)
19 Mar	32.0	6.0	XP	K	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
20 Mar	82.0	75.0	UF3	A12	REACTOR CONTROL
20 Mar	29.0	4.0	UP3	A12	REACTOR CONTROL
01 Apr	410.0	46.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
18 Apr	2749.0	2501.0	PF	C	REFUELLING AND 10-YEARLY INSPECTION
10 Aug	3.0	2.0	PF	E	START-UP TESTS AFTER REFUELLING
10 Aug	243.0	91.0	PP	E	START-UP TESTS AFTER REFUELLING
06 Sep	127.0	116.0	XF	K	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
27 Dec	16.0	8.0	UP3	A	VALVE ACCESSORIES
27 Dec	23.0	21.0	UF3	A	VALVE ACCESSORIES

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1982 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		105			162	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	2749			1055	3	
D. Inspection, maintenance or repair without refuelling				30		
E. Testing of plant systems or components	3			88	0	
H. Nuclear regulatory requirements					17	
J. Grid failure or grid unavailability						5
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)			127		12	58
Subtotal	2752	105	127	1173	197	63
Total		2984			1433	

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

System	2003 Hours Lost	1982 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		15
12. Reactor I&C Systems	82	4
13. Reactor Auxiliary Systems		9
14. Safety Systems		16
15. Reactor Cooling Systems		34
16. Steam generation systems		4
31. Turbine and auxiliaries		20
32. Feedwater and Main Steam System		15
33. Circulating Water System		7
41. Main Generator Systems		6
42. Electrical Power Supply Systems		6
Total	82	136

**FR-34 BLAYAIS-3**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 910.0 MW(e)  
 Design Net Capacity: 910.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 5844.9 GW(e).h  
 Energy Availability Factor: 73.6%  
 Load Factor: 73.3%  
 Operating Factor: 76.8%  
 Energy Unavailability Factor: 26.4%  
 Total Off-line Time: 2035 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	685.7	619.3	670.3	628.0	341.8	381.2	269.2	635.4	570.4	47.8	311.7	684.1	5844.9
EAF (%)	100.0	100.0	98.3	96.0	48.0	64.5	41.5	93.9	87.0	7.8	48.7	99.9	73.6
UCF (%)	100.0	100.0	100.0	96.1	100.0	98.6	88.7	98.0	100.0	9.6	48.7	99.9	86.5
LF (%)	101.3	101.3	99.1	95.9	50.5	58.2	39.8	93.9	87.1	7.1	47.6	101.0	73.3
OF (%)	100.0	100.0	98.7	96.4	52.3	62.1	48.4	100.0	100.0	9.7	56.4	100.0	76.8
EUf (%)	0.0	0.0	1.7	4.0	52.0	35.5	58.5	6.1	13.0	92.2	51.3	0.1	26.4
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	90.4	44.4	0.1	11.4
UCLF (%)	0.0	0.0	0.0	4.0	0.0	1.5	11.3	2.0	0.0	0.0	6.9	0.0	2.1
XUF (%)	0.0	0.0	1.7	0.0	52.0	34.0	47.1	4.2	13.0	1.8	0.0	0.0	12.9

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Apr 1978      Lifetime Generation: 122305.8 GW(e).h  
 Date of First Criticality: 29 Jul 1983      Cumulative Energy Availability Factor: 80.4%  
 Date of Grid Connection: 17 Aug 1983      Cumulative Load Factor: 75.5%  
 Date of Commercial Operation: 14 Nov 1983      Cumulative Unit Capability Factor: 77.7%  
    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	1912.0	910.0	0.0	0.0	85.8	100.0	25.1	0.0	2739	32.7
1984	5944.0	910.0	80.3	80.3	80.3	80.3	74.4	74.4	7055	80.3
1985	6568.9	910.0	87.0	83.7	86.6	83.5	82.4	78.4	7729	88.2
1986	6504.9	910.0	88.3	85.2	88.1	85.0	81.6	79.5	7759	88.6
1987	4304.7	910.0	93.9	87.4	93.5	87.1	54.0	73.1	5473	62.5
1988	5287.0	910.0	82.8	86.4	81.6	86.0	66.1	71.7	6708	76.4
1989	6086.4	910.0	82.7	85.8	78.5	84.8	76.4	72.5	7292	83.2
1990	4871.2	910.0	64.3	82.7	62.8	81.6	61.1	70.9	5673	64.8
1991	6372.3	910.0	84.6	83.0	84.0	81.9	79.9	72.0	7448	85.0
1992	5967.9	910.0	83.0	83.0	81.8	81.9	74.7	72.3	7220	82.2
1993	6285.3	910.0	87.7	83.5	79.8	81.7	78.8	72.9	7728	88.2
1994	4212.8	910.0	57.8	81.1	57.7	79.5	52.8	71.1	4979	56.8
1995	6739.6	910.0	85.9	81.5	85.4	80.0	84.5	72.2	7525	85.9
1996	6924.1	910.0	87.2	82.0	86.8	80.5	86.6	73.3	7744	88.2
1997	6614.1	910.0	86.4	82.3	86.4	80.9	83.0	74.0	7659	87.4
1998	6970.2	910.0	90.1	82.8	87.8	81.4	87.4	74.9	7954	90.8
1999	5123.0	910.0	66.8	81.8	64.2	80.3	64.3	74.3	5861	66.9
2000	6183.6	910.0	80.3	81.7	78.2	80.2	77.4	74.4	7143	81.3
2001	6707.1	910.0	85.4	81.9	84.2	80.4	84.1	75.0	7540	86.1
2002	6882.0	910.0	87.5	82.2	86.4	80.7	86.3	75.6	7682	87.7
2003	5844.9	910.0	86.5	82.4	73.6	80.4	73.3	75.5	6725	76.8



## FR-34 BLAYAIS-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
18 Mar	17.0	12.0	XP	K	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
11 Apr	22.0	20.0	UF3	A12	REACTOR CONTROL
11 Apr	3.0	2.0	UP3	A12	REACTOR CONTROL
11 Apr	4.0	4.0	UF3	A12	CONTROL ROD ASSEMBLIES AND DRIVE MECHANISMS
15 Apr	372.0	2.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
17 May	386.0	352.0	XF	K	LOAD LIMITATION OR SHUTDOWN TO OPTIMIZE SHUTDOWN
03 Jun	240.0	5.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
13 Jun	245.0	223.0	XF	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
20 Jun	10.0	2.0	UP3	A32	EXTRACION UNIT (PUMP, COUPLING, REDUCING FITTING)
30 Jun	50.0	45.0	UF3	A32	CHEMICAL CHARACTERISTICS OF THE SECONDARY SYSTEM
01 Jul	14.0	5.0	UP3	A32	CHEMICAL CHARACTERISTICS OF THE SECONDARY SYSTEM
03 Jul	350.0	319.0	XF	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
28 Jul	64.0	28.0	UP3	A31	FEED PUMP DRIVE TURBINE
30 Jul	159.0	18.0	UP3	A32	MAIN DRAIN RECOVERY PUMP
06 Aug	209.0	7.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
15 Aug	1199.0	118.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
03 Oct	937.0	852.0	PF	C	REFUELLING AND PARTIAL INSPECTION
12 Nov	48.0	44.0	UF3	A12	INSTRUMENTATION AND CONTROL OF PRIMARY CIRCUIT (INCLUDING SG)
14 Nov	2.0	2.0	UF3	A31	LUBRICATION SYSTEM (EXCLUDING JACKING SYSTEM)
14 Nov	19.0	17.0	PF	E	START-UP TESTS AFTER REFUELLING
14 Nov	100.0	33.0	PP	E	START-UP TESTS AFTER REFUELLING

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		126			271	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	937			939	8	
D. Inspection, maintenance or repair without refuelling				34		
E. Testing of plant systems or components	19			1	0	
H. Nuclear regulatory requirements					37	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)			386		66	
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)			595			
Subtotal	956	126	981	974	383	0
Total		2063			1357	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		17
12. Reactor I&C Systems	74	11
13. Reactor Auxiliary Systems		46
14. Safety Systems		7
15. Reactor Cooling Systems		13
16. Steam generation systems		60
31. Turbine and auxiliaries	2	7
32. Feedwater and Main Steam System	50	2
33. Circulating Water System		1
41. Main Generator Systems		14
42. Electrical Power Supply Systems		18
Total	126	196

**FR-35 BLAYAIS-4**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 910.0 MW(e)  
 Design Net Capacity: 910.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 5311.1 GW(e).h  
 Energy Availability Factor: 68.4%  
 Load Factor: 66.6%  
 Operating Factor: 71.8%  
 Energy Unavailability Factor: 31.6%  
 Total Off-line Time: 2468 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	638.4	597.2	494.6	590.2	613.8	580.9	546.6	8.5	0.0	0.0	582.9	657.9	5311.1
EAF (%)	100.0	99.4	77.4	90.9	94.0	90.4	80.7	2.4	0.0	0.0	89.2	100.0	68.4
UCF (%)	100.0	99.4	91.1	99.7	94.1	100.0	100.0	3.4	0.0	0.0	89.2	100.0	72.9
LF (%)	94.3	97.7	73.1	90.1	90.7	88.7	80.7	1.3	0.0	0.0	89.0	97.2	66.6
OF (%)	100.0	100.0	83.7	91.8	94.6	95.1	100.0	3.6	0.0	0.0	95.7	100.0	71.8
EUAF (%)	0.0	0.6	22.6	9.1	6.0	9.6	19.3	97.6	100.0	100.0	10.8	0.0	31.6
PUF (%)	0.0	0.0	0.0	0.1	0.0	0.0	0.0	96.6	40.3	0.0	0.1	0.0	11.5
UCLF (%)	0.0	0.6	8.9	0.1	6.0	0.0	0.0	0.0	59.7	100.0	10.7	0.0	15.6
XUF (%)	0.0	0.0	13.7	8.8	0.1	9.6	19.3	1.0	0.0	0.0	0.0	0.0	4.4

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Apr 1978      Lifetime Generation: 121394.3 GW(e).h  
 Date of First Criticality: 01 May 1983      Cumulative Energy Availability Factor: 79.4%  
 Date of Grid Connection: 16 May 1983      Cumulative Load Factor: 74.0%  
 Date of Commercial Operation: 01 Oct 1983      Cumulative Unit Capability Factor: 77.7%  
    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 (%)
1983	3356.0	910.0	0.0	0.0	78.3	100.0	44.0	0.0	4418	52.7
1984	6012.0	910.0	76.3	76.3	76.0	76.0	75.2	75.2	6780	77.2
1985	5972.6	910.0	78.8	77.5	78.7	77.4	74.9	75.1	7024	80.2
1986	6278.1	910.0	82.5	79.2	81.9	78.9	78.8	76.3	7412	84.6
1987	6104.6	910.0	85.6	80.8	83.9	80.1	76.6	76.4	7437	84.9
1988	4337.0	910.0	71.5	78.9	70.2	78.1	54.3	71.9	5662	64.5
1989	5816.3	910.0	89.4	80.7	87.5	79.7	73.0	72.1	7250	82.8
1990	5912.3	910.0	83.4	81.1	78.2	79.5	74.2	72.4	7347	83.9
1991	5467.7	910.0	73.5	80.1	73.1	78.7	68.6	71.9	6496	74.2
1992	6120.6	910.0	84.1	80.6	83.5	79.2	76.6	72.4	7430	84.6
1993	5096.4	910.0	85.3	81.0	72.9	78.6	63.9	71.6	6854	78.2
1994	5897.1	910.0	82.6	81.2	81.8	78.9	74.0	71.8	7308	83.4
1995	5342.4	910.0	75.2	80.7	71.5	78.3	67.0	71.4	6198	70.8
1996	6719.6	910.0	88.2	81.3	86.9	78.9	84.1	72.4	7761	88.4
1997	6497.2	910.0	89.1	81.8	86.6	79.5	81.5	73.0	7705	88.0
1998	6692.6	910.0	90.3	82.4	87.9	80.0	84.0	73.8	7930	90.5
1999	6161.2	910.0	83.3	82.5	80.2	80.0	77.3	74.0	7369	84.1
2000	5467.5	910.0	75.0	82.0	72.5	79.6	68.4	73.7	6559	74.7
2001	6370.0	910.0	82.4	82.0	82.1	79.7	79.9	74.0	7297	83.3
2002	6462.2	910.0	86.2	82.3	85.1	80.0	81.1	74.4	7623	87.0
2003	5311.1	910.0	72.9	81.8	68.4	79.4	66.6	74.0	6292	71.8

## FR-35 BLAYAIS-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	451.0	54.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
25 Feb	10.0	3.0	UP3	A32	FEEDWATER PUMP (EXCLUDING TURBINE-DRIVEN FEEDWATER PUMP)
01 Mar	209.0	15.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
18 Mar	102.0	93.0	XF	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
23 Mar	209.0	60.0	UP3	A33	NORMAL COOLING SERVICE WATER CIRCUIT
15 Apr	63.0	58.0	XF	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
24 Apr	43.0	3.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 May	293.0	22.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
20 May	35.0	32.0	UF3	A32	FAULING OF EQUIPMENT, CLEANING FILTERS
21 May	5.0	4.0	UF3	A12	INSTRUMENTATION AND CONTROL OF PRIMARY CIRCUIT (INCLUDING SG)
21 May	8.0	3.0	UP3	A12	INSTRUMENTATION AND CONTROL OF PRIMARY CIRCUIT (INCLUDING SG)
02 Jun	1156.0	154.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
07 Jun	163.0	10.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCOMAX
22 Jun	145.0	46.0	XP	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
02 Aug	1007.0	917.0	PF	C	REFUELLING AND PARTIAL INSPECTION
13 Sep	30.0	27.0	UF3	A	NON-RETURN AND STOP VALVES
14 Sep	117.0	106.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
16 Sep	52.0	47.0	UF3	A	CONTROL AND ISOLATING VALVES
18 Sep	36.0	33.0	UF3	A13	BLOWDOWN, VENT AND DRAIN SYSTEM
22 Sep	195.0	177.0	UF3	A41	STATIC EXCITATION SYSTEM
01 Oct	776.0	706.0	UF3	A41	STATIC EXCITATION SYSTEM
02 Nov	113.0	42.0	PP	E	START-UP TESTS AFTER REFUELLING
01 Dec	237.0	22.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCOMAX

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		1129			275	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	1007			965	42	
D. Inspection, maintenance or repair without refuelling				10	0	
E. Testing of plant systems or components				1	0	
G. Major back-fitting, refurbishment or upgrading activities without refuelling						3
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					15	27
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)			165			
Z. Others		117				
Subtotal	1007	1246	165	976	334	30
Total		2418			1340	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems	5	60
13. Reactor Auxiliary Systems	36	14
15. Reactor Cooling Systems		6
16. Steam generation systems		23
31. Turbine and auxiliaries		58
32. Feedwater and Main Steam System	35	3
33. Circulating Water System		11
41. Main Generator Systems	971	8
42. Electrical Power Supply Systems		17
XX. Miscellaneous Systems		0
Total	1047	202

# FR-13 BUGEY-2

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 910.0 MW(e)  
**Design Net Capacity:** 920.0 MW(e)  
**Design Discharge Burnup:** 33700 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5521.7 GW(e).h  
**Energy Availability Factor:** 71.0%  
**Load Factor:** 69.3%  
**Operating Factor:** 75.1%  
**Energy Unavailability Factor:** 29.0%  
**Total Off-line Time:** 2181 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	676.9	609.2	660.6	592.6	649.2	464.8	556.7	38.7	0.0	0.0	601.6	671.4	5521.7
<b>EAF (%)</b>	99.8	99.3	97.8	91.3	97.0	73.5	84.5	19.4	0.0	0.0	92.1	99.5	71.0
<b>UCF (%)</b>	99.8	99.3	99.2	91.3	98.3	94.5	99.6	25.7	0.0	0.0	92.1	100.0	74.8
<b>LF (%)</b>	100.0	99.6	97.7	90.4	95.9	70.9	82.2	5.7	0.0	0.0	91.8	99.2	69.3
<b>OF (%)</b>	100.0	100.0	100.0	93.2	100.0	86.1	100.0	23.8	0.0	0.0	100.0	100.0	75.1
<b>EU (%)</b>	0.2	0.7	2.2	8.7	3.0	26.5	15.5	80.6	100.0	100.0	7.9	0.5	29.0
<b>PU (%)</b>	0.0	0.0	0.0	7.8	0.0	0.0	0.3	74.1	100.0	65.3	7.9	0.0	21.4
<b>UCLF (%)</b>	0.2	0.7	0.8	0.9	1.7	5.5	0.1	0.3	0.0	34.7	0.0	0.0	3.8
<b>XUF (%)</b>	0.0	0.0	1.5	0.0	1.3	21.1	15.1	6.3	0.0	0.0	0.0	0.5	3.8

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1972      **Lifetime Generation:** 129399.9 GW(e).h  
**Date of First Criticality:** 20 Apr 1978      **Cumulative Energy Availability Factor:** 70.4%  
**Date of Grid Connection:** 10 May 1978      **Cumulative Load Factor:** 64.7%  
**Date of Commercial Operation:** 01 Mar 1979      **Cumulative Unit Capability Factor:** 77.3%  
**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 (%)
1982	3341.7	920.0	41.6	54.2	41.6	54.2	41.5	53.8	3863	44.1
1983	6725.0	920.0	85.3	62.0	85.3	62.0	83.4	61.2	7689	87.8
1984	5748.0	920.0	88.0	67.2	87.9	67.2	71.1	63.2	6580	74.9
1985	5948.8	920.0	79.7	69.3	76.0	68.6	73.8	64.9	7118	81.3
1986	5945.6	920.0	86.4	71.7	84.5	70.9	73.8	66.2	7515	85.8
1987	3581.1	920.0	53.4	69.4	51.6	68.5	44.4	63.5	4729	54.0
1988	4495.0	920.0	67.0	69.1	63.1	67.9	55.6	62.6	5718	65.1
1989	4700.8	920.0	64.7	68.7	61.1	67.2	58.3	62.2	5721	65.3
1990	4878.7	920.0	69.7	68.8	69.3	67.4	60.5	62.0	6213	70.9
1991	4927.2	920.0	66.7	68.6	64.4	67.2	61.1	62.0	6001	68.5
1992	3918.3	910.0	53.9	67.5	50.2	65.9	49.0	61.0	4781	54.4
1993	4509.9	910.0	99.2	69.7	94.2	67.9	56.6	60.7	5718	65.3
1994	5782.2	910.0	77.7	70.3	76.5	68.4	72.5	61.4	6811	77.8
1995	6045.7	910.0	79.7	70.8	78.1	69.0	75.8	62.3	7051	80.5
1996	5533.9	910.0	78.7	71.3	75.4	69.4	69.2	62.7	6863	78.1
1997	5477.7	910.0	84.4	72.0	81.0	70.1	68.7	63.1	6815	77.8
1998	5379.4	910.0	77.6	72.3	72.9	70.2	67.5	63.3	6605	75.4
1999	5960.3	910.0	78.9	72.6	77.5	70.6	74.8	63.9	7050	80.5
2000	5183.5	910.0	68.5	72.5	66.3	70.4	64.8	63.9	6025	68.6
2001	5685.9	910.0	72.3	72.4	72.2	70.4	71.3	64.2	6493	74.1
2002	5542.3	910.0	70.2	72.3	69.9	70.4	69.5	64.5	6212	70.9
2003	5521.7	910.0	74.8	72.4	71.0	70.4	69.3	64.7	6579	75.1

## FR-13 BUGEY-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
24 Jan	52.0	1.0	UP3	A32	LOW-PRESSURE HEATING
01 Feb	50.0	4.0	UP3	A32	MAIN DRAIN RECOVERY PUMP
11 Mar	26.0	10.0	XP	R	LOAD LIMITATION OR SHUTDOWN CAUSED BY INDUSTRIAL ACTION
13 Mar	709.0	8.0	UP3	A32	LOW-PRESSURE HEATING
11 Apr	49.0	45.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
11 Apr	13.0	6.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
14 Apr	7.0	3.0	UP3	L	HUMAN ERROR DURING MAINTENANCE
14 Apr	1834.0	37.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
12 May	22.0	9.0	XP	R	LOAD LIMITATION OR SHUTDOWN CAUSED BY INDUSTRIAL ACTION
20 May	127.0	12.0	UP3	A32	MAIN DRAIN RECOVERY PUMP
02 Jun	70.0	47.0	XP	R	LOAD LIMITATION OR SHUTDOWN CAUSED BY INDUSTRIAL ACTION
06 Jun	223.0	64.0	XP	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
12 Jun	30.0	27.0	XP	R	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
16 Jun	37.0	34.0	UF3	A32	CHEMICAL CHARACTERISTICS OF THE SECONDARY SYSTEM
11 Jul	191.0	102.0	XP	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
01 Aug	57.0	42.0	XP	K	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
04 Aug	121.0	4.0	UP3	A32	HIGH-PRESSURE HEATING
09 Aug	1752.0	1595.0	PF	C	REFUELLING AND PARTIAL INSPECTION
21 Oct	258.0	235.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
01 Nov	215.0	52.0	PP	E	START-UP TESTS AFTER REFUELLING
10 Nov	842.0	5.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
10 Dec	22.0	4.0	XP	R	LOAD LIMITATION OR SHUTDOWN CAUSED BY INDUSTRIAL ACTION

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1978 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		37			621	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1752			1198	51	
D. Inspection, maintenance or repair without refuelling				144		
E. Testing of plant systems or components	49			8	0	
H. Nuclear regulatory requirements				50		
J. Grid failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				3	63	17
Z. Others		258				
Subtotal	1801	295	0	1403	736	17
Total		296			2156	

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

System	2003 Hours Lost	1978 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		206
12. Reactor I&C Systems		25
13. Reactor Auxiliary Systems		7
14. Safety Systems		80
15. Reactor Cooling Systems		38
16. Steam generation systems		20
21. Fuel Handling and Storage Facilities		74
31. Turbine and auxiliaries		28
32. Feedwater and Main Steam System	37	24
33. Circulating Water System		1
41. Main Generator Systems		81
42. Electrical Power Supply Systems		4
XX. Miscellaneous Systems		0
Total	37	588

# FR-14 BUGEY-3

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 910.0 MW(e)  
**Design Net Capacity:** 920.0 MW(e)  
**Design Discharge Burnup:** 33700 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6646.1 GW(e).h  
**Energy Availability Factor:** 85.2%  
**Load Factor:** 83.4%  
**Operating Factor:** 90.5%  
**Energy Unavailability Factor:** 14.8%  
**Total Off-line Time:** 836 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	637.8	612.9	670.5	618.1	649.6	485.4	531.6	57.2	630.5	669.7	618.9	463.7	6646.1
<b>EAF (%)</b>	98.4	100.0	100.0	96.6	97.9	76.4	80.5	11.8	98.6	99.5	94.5	70.0	85.2
<b>UCF (%)</b>	98.4	100.0	100.0	96.6	98.2	93.7	98.2	98.7	99.2	100.0	100.0	83.9	97.2
<b>LF (%)</b>	94.2	100.2	99.2	94.3	95.9	74.1	78.5	8.5	96.2	98.8	94.5	68.5	83.4
<b>OF (%)</b>	95.7	100.0	100.0	96.8	98.7	95.1	100.0	18.3	100.0	100.0	100.0	82.8	90.5
<b>EUf (%)</b>	1.6	0.0	0.0	3.4	2.1	23.6	19.5	88.2	1.4	0.5	5.5	30.0	14.8
<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	16.1	1.4
<b>UCLF (%)</b>	1.6	0.0	0.0	3.4	1.8	6.3	1.8	1.3	0.7	0.0	0.0	0.0	1.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.3	17.3	17.7	86.9	0.6	0.5	5.5	13.9	12.1

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1973      **Lifetime Generation:** 131041.0 GW(e).h  
**Date of First Criticality:** 31 Aug 1978      **Cumulative Energy Availability Factor:** 72.8%  
**Date of Grid Connection:** 21 Sep 1978      **Cumulative Load Factor:** 66.1%  
**Date of Commercial Operation:** 01 Mar 1979      **Cumulative Unit Capability Factor:** 77.3%  
**Cumulative Energy Unavailability Factor:** 27.2%

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	6002.2	920.0	84.3	73.3	84.3	73.3	74.5	69.5	7661	87.5
1983	5525.0	920.0	74.2	73.6	74.2	73.6	68.6	69.2	6556	74.8
1984	5793.0	920.0	78.0	74.4	78.0	74.4	71.7	69.7	6905	78.6
1985	4571.1	920.0	58.7	71.8	57.2	71.6	56.7	67.6	5235	59.8
1986	6558.1	920.0	87.7	74.1	87.1	73.8	81.4	69.5	7634	87.1
1987	5482.5	920.0	78.4	74.6	76.4	74.1	68.0	69.3	6637	75.8
1988	3812.0	920.0	64.7	73.5	62.4	72.8	47.2	66.9	4935	56.2
1989	4914.3	920.0	88.7	75.0	87.4	74.3	61.0	66.3	6467	73.8
1990	4538.6	920.0	68.0	74.4	62.9	73.2	56.3	65.4	5474	62.5
1991	3442.8	920.0	55.7	72.8	51.7	71.4	42.7	63.5	4168	47.6
1992	2490.0	910.0	32.5	69.8	32.2	68.4	31.2	61.0	2879	32.8
1993	5954.4	910.0	80.2	70.5	76.1	69.0	74.7	62.0	7117	81.2
1994	4717.7	910.0	70.0	70.5	65.2	68.7	59.2	61.8	5872	67.0
1995	5535.7	910.0	95.9	72.0	95.2	70.4	69.4	62.3	6564	74.9
1996	5652.9	910.0	78.7	72.4	76.4	70.7	70.7	62.8	7012	79.8
1997	5596.6	910.0	75.0	72.6	74.9	71.0	70.2	63.2	6561	74.9
1998	6680.4	910.0	89.1	73.4	89.0	71.9	83.8	64.3	7875	89.9
1999	5786.6	910.0	77.6	73.6	77.3	72.2	72.6	64.7	7001	79.9
2000	5745.1	910.0	75.7	73.7	74.7	72.3	71.9	65.0	6765	77.0
2001	6230.6	910.0	81.8	74.1	81.2	72.7	78.2	65.6	7129	81.4
2002	4634.7	880.0	65.3	73.7	62.7	72.3	60.1	65.4	5654	64.5
2003	6646.1	910.0	97.2	74.7	85.2	72.8	83.4	66.1	7924	90.5

## FR-14 BUGEY-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
02 Jan	12.0	8.0	UP3	A12	REACTOR INSTRUMENTATION AND CONTROL
02 Jan	57.0	3.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
02 Apr	407.0	4.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
29 Apr	23.0	21.0	UF3	A42	HIGH-VOLTAGE BREAKER
01 May	10.0	9.0	UF3	A42	HIGH-VOLTAGE BREAKER
01 May	10.0	2.0	UP3	A42	HIGH-VOLTAGE BREAKER
02 May	917.0	29.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
02 Jun	24.0	3.0	XP	R	LOAD LIMITATION OR SHUTDOWN CAUSED BY INDUSTRIAL ACTION
07 Jun	287.0	111.0	XP	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
27 Jun	24.0	2.0	UP3	A32	LOW-PRESSURE HEATING
28 Jun	35.0	32.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
30 Jun	34.0	6.0	UP3	A12	REACTOR INSTRUMENTATION AND CONTROL
02 Jul	67.0	8.0	UP3	A31	STEAM VALVES
03 Jul	347.0	11.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
12 Jul	263.0	120.0	XP	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
01 Aug	605.0	550.6	XF	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
05 Aug	3.0	3.0	UF3	A42	CIRCUIT BREAKERS
07 Aug	18.0	2.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
01 Sep	26.0	2.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
02 Sep	949.0	15.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
16 Sep	195.0	3.0	UP3	A32	HIGH-PRESSURE HEATING
22 Oct	1568.0	133.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
27 Dec	120.0	109.0	PF	C	REFUELLING AND PARTIAL INSPECTION

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1978 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		36			581	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	120			1040	49	
D. Inspection, maintenance or repair without refuelling				89		
E. Testing of plant systems or components	35			54	1	
H. Nuclear regulatory requirements						3
J. Grid failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					76	68
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)			605			
Subtotal	155	36	605	1183	711	71
Total		796			1965	

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

System	2003 Hours Lost	1978 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		248
12. Reactor I&C Systems		8
13. Reactor Auxiliary Systems		15
14. Safety Systems		25
15. Reactor Cooling Systems		50
16. Steam generation systems		25
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		43
32. Feedwater and Main Steam System		18
33. Circulating Water System		1
41. Main Generator Systems		120
42. Electrical Power Supply Systems	36	15
Total	36	568

**FR-15 BUGEY-4**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 880.0 MW(e)  
 Design Net Capacity: 900.0 MW(e)  
 Design Discharge Burnup: 33700 MW.d/t

**2. Production Summary 2003**

Energy Production: 6645.3 GW(e).h  
 Energy Availability Factor: 94.2%  
 Load Factor: 86.2%  
 Operating Factor: 93.5%  
 Energy Unavailability Factor: 5.8%  
 Total Off-line Time: 568 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	507.5	596.7	569.9	560.2	562.3	525.7	594.6	371.8	567.1	562.3	609.0	618.2	6645.3
EAF (%)	77.5	100.0	94.6	95.1	96.5	94.4	98.9	89.0	98.3	88.5	100.0	98.9	94.2
UCF (%)	77.5	100.0	94.6	95.1	96.9	97.8	98.9	89.0	98.3	99.5	100.0	100.0	95.6
LF (%)	77.5	100.9	87.2	88.4	85.9	83.0	90.8	56.8	89.5	85.8	96.1	94.4	86.2
OF (%)	80.2	100.0	94.8	95.7	97.0	98.3	100.0	66.1	100.0	91.3	100.0	100.0	93.5
EUf (%)	22.5	0.0	5.4	4.9	3.5	5.6	1.1	11.0	1.7	11.5	0.0	1.1	5.8
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 (%)	22.5	0.0	5.4	4.9	3.2	2.2	1.1	11.0	1.7	0.5	0.0	0.0	4.4
XUF (%)	0.0	0.0	0.0	0.0	0.3	3.4	0.0	0.0	0.0	11.0	0.0	1.1	1.3

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Jun 1974      Lifetime Generation: 126495.6 GW(e).h  
 Date of First Criticality: 17 Feb 1979      Cumulative Energy Availability Factor: 72.2%  
 Date of Grid Connection: 08 Mar 1979      Cumulative Load Factor: 65.8%  
 Date of Commercial Operation: 01 Jul 1979      Cumulative Unit Capability Factor: 77.3%  
    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 (%)
1982	5474.9	900.0	69.8	70.4	69.9	70.4	69.4	68.5	6276	71.6
1983	6329.0	900.0	84.6	74.0	84.6	74.0	80.3	71.4	7389	84.3
1984	5882.0	900.0	75.8	74.3	75.8	74.3	74.4	72.0	6896	78.5
1985	6224.4	900.0	87.2	76.5	86.7	76.4	78.9	73.2	7696	87.9
1986	5312.7	900.0	78.7	76.8	76.1	76.4	67.4	72.3	6622	75.6
1987	4670.9	900.0	79.8	77.2	78.2	76.6	59.2	70.7	6180	70.5
1988	3323.0	900.0	67.3	76.1	51.5	73.8	42.0	67.5	4524	51.5
1989	5541.3	900.0	76.7	76.1	76.2	74.0	70.3	67.8	6846	78.2
1990	3186.6	880.0	56.7	74.4	53.5	72.2	41.3	65.4	4312	49.2
1991	4984.9	880.0	71.8	74.2	69.3	72.0	64.7	65.4	6317	72.1
1992	1649.1	880.0	22.3	70.3	22.2	68.2	21.3	62.0	2012	22.9
1993	5748.6	880.0	82.2	71.1	74.2	68.6	74.6	62.9	7506	85.7
1994	5209.3	880.0	83.5	71.9	82.2	69.5	67.6	63.2	6619	75.6
1995	3989.9	880.0	64.3	71.4	59.1	68.9	51.8	62.5	4843	55.3
1996	4188.1	880.0	62.6	70.9	62.4	68.5	54.2	62.0	5333	60.7
1997	5652.5	880.0	83.6	71.6	80.7	69.2	73.3	62.7	7420	84.7
1998	6304.0	880.0	88.3	72.5	86.3	70.1	81.8	63.6	7791	88.9
1999	5591.3	880.0	81.5	72.9	77.5	70.4	72.5	64.1	7231	82.5
2000	5988.0	880.0	85.1	73.5	82.6	71.0	77.5	64.7	7544	85.9
2001	4746.0	880.0	65.8	73.2	63.4	70.7	61.6	64.6	5921	67.6
2002	5590.8	880.0	83.5	73.6	83.4	71.2	72.5	64.9	7130	81.4
2003	6645.3	880.0	95.6	74.5	94.2	72.2	86.2	65.8	8192	93.5



## FR-15 BUGEY-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	125.0	111.0	UF3	A12	REACTOR CONTROL
19 Jan	22.0	19.0	UF3	A12	CONTROL ROD ASSEMBLIES AND DRIVE MECHANISMS
04 Mar	299.0	41.0	XP	K	LOAD VARIATION WITH REMOTE LOAD DISPATCH CONTROL
20 Mar	39.0	34.0	UF3	A12	REACTOR INSTRUMENTATION AND CONTROL
01 Apr	249.0	38.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
12 Apr	13.0	12.0	UF3	B	HUMAN ERROR DURING MAINTENANCE
17 Apr	17.0	15.0	UF3	A42	LOW-VOLTAGE ELECTRICAL AUXILIARIES NETWORK
01 May	313.0	71.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
31 May	34.0	31.0	UF3	A42	MAIN TRANSFORMER WITH FIRE PROTECTION
01 Jun	369.0	71.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
02 Jun	44.0	17.0	XP	R	LOAD LIMITATION OR SHUTDOWN CAUSED BY INDUSTRIAL ACTION
13 Jun	15.0	5.0	XP	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
01 Jul	163.0	25.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
15 Jul	1784.0	28.0	UP3	A32	LOW-PRESSURE HEATING
01 Aug	68.0	60.0	UF3	A42	ELECTRICAL PROTECTION SYSTEMS OF AUXILIARIES
01 Oct	217.0	2.0	UP3	A32	LOW-PRESSURE HEATING
10 Oct	126.0	72.0	XP	E	LOAD LIMITATION OR SHUTDOWN FOR EXTERNAL THERMAL PRODUCTION SERVICE TESTS
01 Nov	310.0	25.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Dec	291.0	33.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
10 Dec	18.0	7.0	XP	S	LOAD LIMITATION OR SHUTDOWN CAUSED BY INDUSTRIAL ACTION

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1979 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		305			667	
B. Refuelling without a maintenance		13			9	
C. Inspection, maintenance or repair combined with refuelling				1148	25	
D. Inspection, maintenance or repair without refuelling				126		
E. Testing of plant systems or components				11	0	
H. Nuclear regulatory requirements						2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					11	37
Subtotal	0	318	0	1285	712	39
Total		318			2036	

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

System	2003 Hours Lost	1979 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		328
12. Reactor I&C Systems	186	16
13. Reactor Auxiliary Systems		4
14. Safety Systems		13
15. Reactor Cooling Systems		29
16. Steam generation systems		37
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		3
31. Turbine and auxiliaries		39
32. Feedwater and Main Steam System		9
33. Circulating Water System		3
41. Main Generator Systems		37
42. Electrical Power Supply Systems	119	142
XX. Miscellaneous Systems		0
Total	305	660

# FR-16 BUGEY-5

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 880.0 MW(e)  
**Design Net Capacity:** 900.0 MW(e)  
**Design Discharge Burnup:** 33700 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5711.1 GW(e).h  
**Energy Availability Factor:** 80.0%  
**Load Factor:** 74.1%  
**Operating Factor:** 82.4%  
**Energy Unavailability Factor:** 20.0%  
**Total Off-line Time:** 1540 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	638.0	539.9	594.4	184.7	0.0	424.8	555.6	407.0	551.1	606.6	593.8	615.3	5711.1
<b>EAF (%)</b>	100.0	91.6	90.9	29.7	0.0	71.6	99.9	78.0	99.9	100.0	100.0	99.3	80.0
<b>UCF (%)</b>	100.0	92.2	100.0	36.8	0.0	73.5	99.9	100.0	100.0	100.0	100.0	100.0	83.5
<b>LF (%)</b>	97.4	91.3	90.9	29.1	0.0	67.0	84.9	62.2	87.0	92.5	93.7	94.0	74.1
<b>OF (%)</b>	100.0	93.5	100.0	36.9	0.0	80.3	100.0	79.0	100.0	100.0	100.0	100.0	82.4
<b>EUf (%)</b>	0.0	8.4	9.1	70.3	100.0	28.4	0.1	22.0	0.1	0.0	0.0	0.7	20.0
<b>PUF (%)</b>	0.0	0.0	0.0	63.2	62.3	4.4	0.0	0.0	0.0	0.0	0.0	0.0	10.9
<b>UCLF (%)</b>	0.0	7.8	0.1	0.0	37.7	22.0	0.1	0.0	0.0	0.0	0.0	0.0	5.6
<b>XUF (%)</b>	0.0	0.6	9.0	7.2	0.0	1.9	0.0	22.0	0.1	0.0	0.0	0.6	3.5

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jul 1974      **Lifetime Generation:** 128067.2 GW(e).h  
**Date of First Criticality:** 15 Jul 1979      **Cumulative Energy Availability Factor:** 74.1%  
**Date of Grid Connection:** 31 Jul 1979      **Cumulative Load Factor:** 67.8%  
**Date of Commercial Operation:** 03 Jan 1980      **Cumulative Unit Capability Factor:** 77.3%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	5738.5	900.0	76.4	79.7	76.4	74.5	72.8	72.6	6956	79.4
1983	5578.0	900.0	73.9	78.3	73.9	74.4	70.8	72.2	6649	75.9
1984	5778.0	900.0	74.1	77.4	74.1	74.3	73.1	72.4	6884	78.4
1985	6079.7	900.0	84.6	78.6	80.5	75.4	77.1	73.1	7314	83.5
1986	5465.5	900.0	75.7	78.2	75.5	75.4	69.3	72.6	6493	74.1
1987	5015.9	900.0	67.8	76.9	66.6	74.3	63.6	71.5	6044	69.0
1988	5466.0	900.0	89.7	78.3	84.6	75.4	69.1	71.2	6465	73.6
1989	4758.0	900.0	68.8	77.4	64.7	74.4	60.3	70.1	6185	70.6
1990	5586.0	880.0	80.7	77.7	74.9	74.4	72.5	70.3	7156	81.7
1991	3358.4	880.0	47.9	75.2	44.0	71.9	43.6	68.2	4258	48.6
1992	4035.0	880.0	56.4	73.8	52.5	70.5	52.2	66.9	5003	57.0
1993	4416.6	880.0	60.5	72.9	57.4	69.5	57.3	66.3	5329	60.8
1994	4487.3	880.0	85.9	73.7	85.7	70.6	58.2	65.7	6311	72.0
1995	5582.8	880.0	79.9	74.1	78.0	71.1	72.4	66.1	7060	80.6
1996	5361.4	880.0	79.0	74.4	77.5	71.4	69.4	66.3	6844	77.9
1997	5592.9	880.0	88.0	75.1	84.3	72.1	72.6	66.7	7302	83.4
1998	5320.4	880.0	83.9	75.6	80.5	72.6	69.0	66.8	6844	78.1
1999	6108.8	880.0	86.8	76.2	82.7	73.1	79.2	67.4	7679	87.7
2000	5403.2	880.0	77.3	76.2	74.6	73.1	69.9	67.5	6889	78.4
2001	4358.6	880.0	77.9	76.3	72.1	73.1	56.5	67.0	5604	64.0
2002	6146.9	900.0	91.2	76.9	91.2	73.9	78.0	67.5	7925	90.5
2003	5711.1	880.0	83.5	77.2	80.0	74.1	74.1	67.8	7220	82.4

## FR-16 BUGEY-5

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	405.0	21.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
11 Feb	45.0	39.0	UF3	A31	MOISTURE SEPARATOR-REHEATERS
11 Feb	1199.0	108.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
12 Apr	849.0	747.0	PF	C	REFUELLING WITH NO INSPECTION
17 May	281.0	247.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
29 May	278.0	79.0	PP	E	START-UP TESTS AFTER REFUELLING
09 Jun	207.0	11.0	UP3	A12	INSTRUMENTATION AND CONTROL OF PRIMARY CIRCUIT (INCLUDING SG)
14 Jun	61.0	16.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
19 Jun	6.0	6.0	UF3	A31	THRUST BEARINGS-SHAFTING, BEARING BUSHES
20 Jun	136.0	120.0	PF	D	UPGRADING WORK OR EXTENSION OF PLANT
25 Jun	817.0	119.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Aug	574.0	99.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCOMAX
10 Aug	163.0	144.0	XF	P	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
01 Sep	346.0	82.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT BELOW MAXIMUM SET POINT PCOMAX
01 Oct	259.0	50.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Nov	338.0	37.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Dec	264.0	38.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1980 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		51			358	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	849			1355	15	
D. Inspection, maintenance or repair without refuelling	136			21		
E. Testing of plant systems or components				8	2	
H. Nuclear regulatory requirements					1	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					63	27
P. Fire			163			
Z. Others		281				
Subtotal	985	332	163	1384	443	27
Total		1480			1854	

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

System	2003 Hours Lost	1980 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		29
12. Reactor I&C Systems		12
13. Reactor Auxiliary Systems		10
14. Safety Systems		4
15. Reactor Cooling Systems		34
16. Steam generation systems		179
31. Turbine and auxiliaries	51	39
32. Feedwater and Main Steam System		7
41. Main Generator Systems		19
42. Electrical Power Supply Systems		10
XX. Miscellaneous Systems		0
Total	51	343

**FR-50 CATTENOM-1**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1300.0 MW(e)  
 Design Net Capacity: 1300.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 8531.0 GW(e).h  
 Energy Availability Factor: 78.4%  
 Load Factor: 74.9%  
 Operating Factor: 81.6%  
 Energy Unavailability Factor: 21.6%  
 Total Off-line Time: 1610 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	945.2	857.3	873.9	881.9	899.1	862.4	883.8	677.0	0.0	0.0	765.8	884.4	8531.0
EAF (%)	100.0	99.3	95.2	99.5	98.7	99.9	93.8	70.9	0.0	0.0	85.5	99.6	78.4
UCF (%)	100.0	99.3	95.2	100.0	99.2	99.9	100.0	86.3	0.0	0.0	85.5	99.7	80.4
LF (%)	97.7	98.1	90.5	94.2	93.0	92.1	91.4	70.0	0.0	0.0	81.8	91.4	74.9
OF (%)	100.0	100.0	95.7	100.0	100.0	100.0	100.0	87.8	0.0	0.0	96.9	100.0	81.6
EUf (%)	0.0	0.7	4.8	0.5	1.3	0.1	6.2	29.1	100.0	100.0	14.5	0.4	21.6
PUF (%)	0.0	0.5	4.8	0.0	0.1	0.1	0.0	6.5	100.0	100.0	14.4	0.0	18.9
UCLF (%)	0.0	0.2	0.0	0.0	0.8	0.0	0.0	7.2	0.0	0.0	0.1	0.3	0.7
XUF (%)	0.0	0.0	0.0	0.4	0.4	0.0	6.2	15.4	0.0	0.0	0.0	0.0	1.9

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 29 Oct 1979      Lifetime Generation: 127269.3 GW(e).h  
 Date of First Criticality: 24 Oct 1986      Cumulative Energy Availability Factor: 69.7%  
 Date of Grid Connection: 13 Nov 1986      Cumulative Load Factor: 65.6%  
 Date of Commercial Operation: 01 Apr 1987      Cumulative Unit Capability Factor: 78.2%  
    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 (%)
1986	221.2	1294.0	0.0	0.0	88.7	100.0	2.0	0.0	665	7.9
1987	7429.8	1265.0	0.0	0.0	69.6	100.0	67.0	0.0	6393	73.0
1988	5283.0	1300.0	47.8	47.8	47.4	47.4	46.3	46.3	4369	49.7
1989	6802.4	1300.0	60.3	54.0	60.3	53.8	59.7	53.0	5548	63.3
1990	7781.9	1300.0	75.7	61.3	75.3	61.0	68.3	58.1	6710	76.6
1991	1509.3	1300.0	13.5	49.3	13.5	49.1	13.3	46.9	1336	15.3
1992	7933.3	1300.0	71.5	53.8	71.0	53.5	69.5	51.4	6595	75.1
1993	6956.6	1300.0	63.5	55.4	61.5	54.8	61.1	53.0	5608	64.0
1994	6775.4	1300.0	64.1	56.6	64.0	56.1	59.5	54.0	6006	68.6
1995	6634.3	1300.0	59.8	57.0	59.5	56.6	58.3	54.5	6346	72.4
1996	9539.2	1300.0	87.5	60.4	87.3	60.0	83.5	57.7	7783	88.6
1997	8688.9	1300.0	84.1	62.8	81.4	62.1	76.3	59.6	7374	84.2
1998	9365.8	1300.0	85.9	64.9	85.7	64.3	82.2	61.6	7644	87.3
1999	8273.0	1300.0	79.8	66.1	76.3	65.3	72.6	62.6	7028	80.2
2000	8053.8	1300.0	81.0	67.3	78.1	66.3	70.5	63.2	6873	78.2
2001	9220.2	1300.0	96.4	69.3	96.4	68.4	81.0	64.4	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	80.3	70.7	78.4	69.7	74.9	65.6	7150	81.6

# FR-50 CATTENOM-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	2621.0	260.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Mar	32.0	42.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
12 May	21.0	4.0	XP	R	LOAD LIMITATION OR SHUTDOWN CAUSED BY INDUSTRIAL ACTION
25 May	101.0	7.0	UP3	A32	HP WATER CIRCUIT
12 Jul	1085.0	209.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
15 Aug	23.0	29.0	UF3	A33	CIRCULATING PUMP
16 Aug	33.0	10.0	UP3	A31	MAIN CONDENSER
16 Aug	22.0	29.0	UF3	A31	MAIN CONDENSER
29 Aug	1533.0	1994.0	PF	C	REFUELLING AND PARTIAL INSPECTION
01 Nov	218.0	106.0	PP	E	START-UP TESTS AFTER REFUELLING
13 Nov	354.0	88.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Dec	22.0	3.0	UP3	A31	INSTRUMENTATION AND CONTROL OF TURBINE AND FEEDWATER PLANT

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1986 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		45			984	
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling	1533			909	19	
D. Inspection, maintenance or repair without refuelling				60	10	
E. Testing of plant systems or components	32			79		
H. Nuclear regulatory requirements					9	
J. Grid failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					83	
Subtotal	1565	45	0	1048	1111	1
Total		1610			2160	

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

System	2003 Hours Lost	1986 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		21
12. Reactor I&C Systems		47
13. Reactor Auxiliary Systems		35
14. Safety Systems		12
15. Reactor Cooling Systems		109
16. Steam generation systems		46
17. Safety I&C Systems (excluding reactor I&C)		2
21. Fuel Handling and Storage Facilities		5
31. Turbine and auxiliaries	22	46
32. Feedwater and Main Steam System		111
33. Circulating Water System	23	23
41. Main Generator Systems		475
42. Electrical Power Supply Systems		19
XX. Miscellaneous Systems		5
Total	45	956

# FR-53 CATTENOM-2

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1300.0 MW(e)  
**Design Net Capacity:** 1300.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 10197.5 GW(e).h  
**Energy Availability Factor:** 93.5%  
**Load Factor:** 89.5%  
**Operating Factor:** 93.8%  
**Energy Unavailability Factor:** 6.5%  
**Total Off-line Time:** 543 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	881.9	833.6	930.3	913.4	940.0	844.8	195.5	915.7	916.5	955.7	912.1	958.1	10197.5
<b>EAF (%)</b>	99.9	99.9	99.9	99.7	99.4	94.4	31.6	98.4	99.8	99.9	99.8	99.9	93.5
<b>UCF (%)</b>	99.9	99.9	99.9	99.8	99.5	94.9	99.8	98.4	99.8	99.9	99.8	99.9	99.3
<b>LF (%)</b>	91.2	95.4	96.3	97.6	97.2	90.3	20.2	94.7	97.9	98.7	97.5	99.1	89.5
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	95.4	31.5	100.0	100.0	100.0	100.0	100.0	93.8
<b>EUf (%)</b>	0.1	0.1	0.1	0.3	0.6	5.6	68.4	1.6	0.2	0.1	0.2	0.1	6.5
<b>PUf (%)</b>	0.1	0.1	0.1	0.0	0.1	0.1	0.2	0.1	0.0	0.1	0.1	0.0	0.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.2	0.5	5.0	0.0	1.5	0.1	0.0	0.1	0.0	0.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.1	0.0	0.5	68.1	0.0	0.0	0.0	0.0	0.0	5.8

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 28 Jul 1980  
**Date of First Criticality:** 07 Aug 1987  
**Date of Grid Connection:** 17 Sep 1987  
**Date of Commercial Operation:** 01 Feb 1988

**Lifetime Generation:** 131223.7 GW(e).h  
**Cumulative Energy Availability Factor:** 76.2%  
**Cumulative Load Factor:** 71.2%  
**Cumulative Unit Capability Factor:** 78.4%  
**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	1317.0	1288.0	0.0	0.0	82.6	100.0	12.2	0.0	1700	20.3
1988	8138.0	1300.0	0.0	0.0	89.0	100.0	71.3	0.0	7156	81.5
1989	1765.5	1300.0	16.5	16.5	15.5	15.5	15.5	15.5	1452	16.6
1990	8137.6	1300.0	83.0	49.7	82.7	49.1	71.5	43.5	6670	76.1
1991	7543.1	1300.0	71.8	57.1	68.2	55.5	66.2	51.1	6472	73.9
1992	8134.3	1300.0	75.6	61.7	72.4	59.7	71.2	56.1	6752	76.9
1993	8627.0	1300.0	78.8	65.1	76.2	63.0	75.8	60.0	6990	79.8
1994	8526.3	1300.0	80.5	67.7	77.7	65.4	74.9	62.5	7158	81.7
1995	8603.7	1300.0	79.9	69.5	78.3	67.3	75.6	64.4	7138	81.5
1996	9018.1	1300.0	99.6	73.2	98.1	71.1	79.0	66.2	7804	88.8
1997	8487.4	1300.0	84.4	74.5	82.2	72.4	74.5	67.1	7503	85.7
1998	7259.5	1300.0	69.0	73.9	68.0	71.9	63.7	66.8	6144	70.1
1999	9367.5	1300.0	90.2	75.4	87.3	73.3	82.3	68.2	7781	88.8
2000	9164.3	1300.0	88.6	76.5	88.6	74.6	80.3	69.2	7868	89.6
2001	8649.0	1300.0	79.4	76.7	77.5	74.8	75.9	69.7	7033	80.3
2002	8288.0	1300.0	76.9	76.7	76.9	75.0	72.8	69.9	6918	79.0
2003	10197.5	1300.0	99.3	78.2	93.5	76.2	89.5	71.2	8217	93.8

## FR-53 CATTENOM-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	2261.0	235.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
02 Apr	75.0	1.0	UP3	A31	MAIN CONDENSER
04 May	110.0	1.0	UP3	A31	MAIN CONDENSER
13 Jun	5.0	6.0	UF3	A	GENERAL CONTROL AND REGULATION CHANNELS
20 Jun	26.0	33.0	UF3	L	HUMAN ERRORS DURING TESTING
05 Jul	510.0	663.0	XF	K	LOAD LIMITATION OR SHUTDOWN TO OPTIMIZE SHUTDOWN
26 Jul	213.0	94.0	UP3	A12	REACTOR INSTRUMENTATION AND CONTROL
04 Aug	2142.0	84.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
04 Sep	111.0	1.0	UP3	A31	MAIN CONDENSER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		5			551	
B. Refuelling without a maintenance					13	
C. Inspection, maintenance or repair combined with refuelling				954	9	
D. Inspection, maintenance or repair without refuelling				70	26	
E. Testing of plant systems or components				71	0	2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)			510		15	
L. Human factor related		26				
Subtotal	0	31	510	1095	614	2
Total		541			1711	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		16
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		8
14. Safety Systems		37
15. Reactor Cooling Systems		241
16. Steam generation systems		116
31. Turbine and auxiliaries		19
32. Feedwater and Main Steam System		20
33. Circulating Water System		1
41. Main Generator Systems		3
42. Electrical Power Supply Systems		30
XX. Miscellaneous Systems		7
Total	0	502

## FR-60 CATTENOM-3

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1300.0 MW(e)  
 Design Net Capacity: 1300.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

### 2. Production Summary 2003

Energy Production: 11254.0 GW(e).h  
 Energy Availability Factor: 98.4%  
 Load Factor: 98.8%  
 Operating Factor: 99.5%  
 Energy Unavailability Factor: 1.6%  
 Total Off-line Time: 45 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	978.1	881.6	968.5	934.4	956.5	908.6	938.4	937.5	875.0	955.0	942.6	977.6	11254.0
EAF (%)	100.0	99.9	99.8	99.5	98.9	97.2	97.1	96.9	93.6	98.0	99.8	100.0	98.4
UCF (%)	100.0	99.9	100.0	99.9	99.9	99.9	99.9	100.0	94.7	98.1	99.8	100.0	99.3
LF (%)	101.1	100.9	100.3	99.8	98.9	97.1	97.0	96.9	93.5	98.6	100.7	101.1	98.8
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.0	98.8	100.0	100.0	99.5
EUf (%)	0.0	0.1	0.2	0.5	1.1	2.8	2.9	3.1	6.4	2.0	0.2	0.0	1.6
PUF (%)	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	5.3	0.0	0.0	0.0	0.5
UCLF (%)	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	1.9	0.1	0.0	0.2
XUF (%)	0.0	0.0	0.1	0.4	1.0	2.8	2.8	3.0	1.1	0.1	0.0	0.0	1.0

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 15 Jun 1982      Lifetime Generation: 110188.4 GW(e).h  
 Date of First Criticality: 16 Feb 1990      Cumulative Energy Availability Factor: 78.7%  
 Date of Grid Connection: 06 Jul 1990      Cumulative Load Factor: 72.4%  
 Date of Commercial Operation: 01 Feb 1991      Cumulative Unit Capability Factor: 79.8%  
    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 (%)
1990	1545.4	1300.0	0.0	0.0	65.1	100.0	13.6	0.0	1961	22.4
1991	9683.1	1300.0	0.0	0.0	87.3	100.0	85.0	0.0	7897	90.1
1992	7145.0	1300.0	67.0	67.0	65.6	65.6	62.6	62.6	5903	67.2
1993	8035.1	1300.0	81.2	74.1	75.9	70.7	70.6	66.6	6858	78.3
1994	8613.3	1300.0	85.7	78.0	84.4	75.3	75.6	69.6	7464	85.2
1995	8344.3	1300.0	82.2	79.0	78.9	76.2	73.3	70.5	7269	83.0
1996	8264.7	1300.0	80.6	79.3	77.3	76.4	72.4	70.9	7184	81.8
1997	9504.1	1300.0	94.5	81.8	93.2	79.2	83.5	73.0	8097	92.4
1998	8054.9	1300.0	83.5	82.1	80.2	79.3	70.7	72.7	7175	81.9
1999	8237.0	1300.0	83.5	82.3	79.7	79.4	72.3	72.6	7169	81.8
2000	8933.5	1300.0	99.2	84.1	98.7	81.5	78.2	73.2	7984	90.9
2001	3171.5	1300.0	29.8	78.7	29.7	76.4	27.8	68.7	2739	31.3
2002	9402.5	1300.0	83.6	79.2	82.5	76.9	82.6	70.0	7443	85.0
2003	11254.0	1300.0	99.3	80.8	98.4	78.7	98.8	72.4	8715	99.5



## FR-60 CATTENOM-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Feb	7.0	1.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
05 Mar	3826.0	107.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
06 Sep	7.0	2.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
06 Sep	36.0	46.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
01 Oct	149.0	1.0	XP	R	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
03 Oct	8.0	7.0	UP3	A12	REACTOR INSTRUMENTATION AND CONTROL
03 Oct	9.0	11.0	UF3	A12	REACTOR INSTRUMENTATION AND CONTROL
10 Nov	4.0	1.0	UP3	A31	INSTRUMENTATION AND CONTROL OF TURBINE AND FEEDWATER PLANT

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		9			232	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling				822	24	
D. Inspection, maintenance or repair without refuelling				82		
E. Testing of plant systems or components	36			12		
H. Nuclear regulatory requirements					143	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					47	4
Subtotal	36	9	0	916	446	4
Total		45			1366	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	9	33
13. Reactor Auxiliary Systems		68
14. Safety Systems		20
15. Reactor Cooling Systems		15
16. Steam generation systems		6
21. Fuel Handling and Storage Facilities		6
31. Turbine and auxiliaries		30
32. Feedwater and Main Steam System		6
41. Main Generator Systems		12
42. Electrical Power Supply Systems		8
XX. Miscellaneous Systems		4
Total	9	208

**FR-65 CATTENOM-4**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1300.0 MW(e)  
 Design Net Capacity: 1300.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 7708.3 GW(e).h  
 Energy Availability Factor: 69.8%  
 Load Factor: 67.7%  
 Operating Factor: 73.1%  
 Energy Unavailability Factor: 30.2%  
 Total Off-line Time: 2354 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	931.8	749.3	331.6	0.0	0.0	274.7	905.5	880.0	893.2	907.1	872.8	962.4	7708.3
EAF (%)	96.2	85.8	35.0	0.0	0.0	31.0	99.2	99.3	99.7	95.6	95.0	100.0	69.8
UCF (%)	100.0	100.0	45.0	0.0	0.0	31.0	99.6	99.5	100.0	95.7	95.0	100.0	72.1
LF (%)	96.3	85.8	34.3	0.0	0.0	29.4	93.6	91.0	95.4	93.7	93.2	99.5	67.7
OF (%)	100.0	100.0	45.2	0.0	0.0	41.7	100.0	100.0	100.0	96.0	95.4	100.0	73.1
EUf (%)	3.8	14.2	65.0	100.0	100.0	69.0	0.8	0.7	0.3	4.4	5.0	0.0	30.2
PUF (%)	0.0	0.0	55.0	100.0	100.0	67.3	0.0	0.0	0.0	0.0	0.0	0.0	26.9
UCLF (%)	0.0	0.0	0.0	0.0	0.0	1.7	0.4	0.5	0.0	4.3	5.0	0.0	1.0
XUF (%)	3.7	14.2	10.0	0.0	0.0	0.0	0.4	0.3	0.3	0.1	0.0	0.0	2.3

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 28 Sep 1983      Lifetime Generation: 107784.3 GW(e).h  
 Date of First Criticality: 04 May 1991      Cumulative Energy Availability Factor: 83.1%  
 Date of Grid Connection: 27 May 1991      Cumulative Load Factor: 77.2%  
 Date of Commercial Operation: 01 Jan 1992      Cumulative Unit Capability Factor: 79.8%  
    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 (%)
1991	2161.2	1300.0	0.0	0.0	59.5	100.0	19.0	0.0	2581	29.5
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	82.8	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	86.5	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

## FR-65 CATTENOM-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
08 Jan	1562.0	256.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
14 Mar	2259.0	2936.0	PF	C	REFUELLING AND FULL INSPECTION
17 Jun	24.0	31.0	PF	E	START-UP TESTS AFTER REFUELLING
17 Jun	274.0	94.0	PP	E	START-UP TESTS AFTER REFUELLING
29 Jun	8.0	10.0	UF3	A31	INSTRUMENTATION AND CONTROL OF TURBINE AND FEEDWATER PLANT
29 Jun	7.0	4.0	UP3	A31	INSTRUMENTATION AND CONTROL OF TURBINE AND FEEDWATER PLANT
01 Jul	132.0	4.0	UP3	A	NON-RETURN AND STOP VALVES
06 Jul	145.0	4.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
07 Jul	299.0	42.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Aug	969.0	115.0	XP	K	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Aug	163.0	3.0	UP3	A31	VIBRATION OF TURBOGENERATOR SET WITHOUT DAMAGE
01 Oct	308.0	9.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
24 Oct	30.0	39.0	UF3	A	CONTROL AND ISOLATING VALVES
01 Nov	226.0	5.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
07 Nov	33.0	43.0	UF3	A	CONTROL AND ISOLATING VALVES
11 Nov	92.0	12.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Dec	129.0	13.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1991 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		71			175	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	2259			759	50	
D. Inspection, maintenance or repair without refuelling				88		
E. Testing of plant systems or components	24			79		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					5	
Subtotal	2283	71	0	926	231	0
Total		2354			1157	

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

System	2003 Hours Lost	1991 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		14
13. Reactor Auxiliary Systems		3
14. Safety Systems		53
16. Steam generation systems		5
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries	8	28
32. Feedwater and Main Steam System		20
41. Main Generator Systems		26
42. Electrical Power Supply Systems		10
Total	8	162

# FR-40 CHINON-B-1

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 905.0 MW(e)  
**Design Net Capacity:** 870.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5181.7 GW(e).h  
**Energy Availability Factor:** 68.4%  
**Load Factor:** 65.4%  
**Operating Factor:** 72.6%  
**Energy Unavailability Factor:** 31.6%  
**Total Off-line Time:** 2403 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	610.7	592.8	638.6	600.6	528.3	58.9	0.0	0.0	299.1	634.6	583.2	634.8	5181.7
<b>EAF (%)</b>	99.5	99.9	99.6	94.5	78.7	10.4	0.0	0.0	47.6	97.9	95.6	98.9	68.4
<b>UCF (%)</b>	99.6	99.9	99.7	99.9	99.9	15.1	0.0	0.0	47.7	97.9	95.6	98.9	71.0
<b>LF (%)</b>	90.7	97.5	95.0	92.2	78.5	9.0	0.0	0.0	45.9	94.1	89.5	94.3	65.4
<b>OF (%)</b>	96.0	100.0	100.0	100.0	100.0	15.4	0.0	0.0	61.7	100.0	100.0	100.0	72.6
<b>EU (%)</b>	0.5	0.1	0.4	5.5	21.3	89.6	100.0	100.0	52.4	2.1	4.4	1.1	31.6
<b>PU (%)</b>	0.1	0.1	0.3	0.1	0.1	79.7	100.0	100.0	23.4	0.2	0.1	0.1	25.5
<b>UCLF (%)</b>	0.3	0.0	0.0	0.0	0.0	5.2	0.0	0.0	29.0	2.0	4.3	1.0	3.4
<b>XUF (%)</b>	0.1	0.0	0.1	5.4	21.2	4.7	0.0	0.0	0.0	0.0	0.0	0.0	2.6

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Mar 1977  
**Date of First Criticality:** 28 Oct 1982  
**Date of Grid Connection:** 30 Nov 1982  
**Date of Commercial Operation:** 01 Feb 1984

**Lifetime Generation:** 118816.7 GW(e).h  
**Cumulative Energy Availability Factor:** 79.4%  
**Cumulative Load Factor:** 74.1%  
**Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1982	37.1	899.0	0.0	0.0	91.5	100.0	0.5	0.0	470	5.8
1983	3835.0	870.0	0.0	0.0	50.8	100.0	50.3	0.0	6027	68.8
1984	4568.0	870.0	0.0	0.0	61.0	100.0	59.8	0.0	5570	63.4
1985	5978.2	870.0	84.5	84.5	82.1	82.1	78.4	78.4	7402	84.5
1986	6322.2	870.0	86.1	85.3	86.1	84.1	83.0	80.7	7609	86.9
1987	4914.1	870.0	73.7	81.4	72.9	80.4	64.5	75.3	6438	73.5
1988	5271.0	870.0	97.4	85.4	96.2	84.3	69.0	73.7	7195	81.9
1989	4734.3	870.0	64.4	81.2	63.6	80.2	62.1	71.4	5724	65.3
1990	5913.0	870.0	79.3	80.9	79.1	80.0	77.6	72.4	7043	80.4
1991	5339.2	905.0	68.0	79.0	67.7	78.2	67.3	71.7	6033	68.9
1992	5972.0	905.0	80.9	79.2	80.6	78.5	75.1	72.1	7133	81.2
1993	5651.7	905.0	77.7	79.1	73.3	77.9	71.3	72.0	6914	78.9
1994	5366.3	905.0	71.9	78.3	71.4	77.2	67.7	71.6	6347	72.5
1995	6333.9	905.0	85.6	79.0	84.4	77.9	79.9	72.4	7573	86.4
1996	6295.2	905.0	83.6	79.4	83.4	78.4	79.2	72.9	7476	85.1
1997	6093.3	905.0	81.9	79.6	81.8	78.6	76.9	73.2	7268	83.0
1998	6631.3	905.0	87.1	80.1	85.7	79.1	83.6	74.0	7759	88.6
1999	6214.0	905.0	84.3	80.4	82.1	79.3	78.4	74.3	7483	85.4
2000	6166.8	905.0	83.6	80.6	82.7	79.6	77.6	74.5	7416	84.4
2001	5769.0	905.0	82.6	80.8	81.2	79.7	72.8	74.4	7260	82.9
2002	6229.3	920.0	88.8	81.2	85.6	80.0	77.3	74.6	7671	87.6
2003	5181.7	905.0	71.0	80.7	68.4	79.4	65.4	74.1	6357	72.6

# FR-40 CHINON-B-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	198.0	26.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
02 Jan	2.0	2.0	UF3	A41	STATIC EXCITATION SYSTEM
08 Jan	406.0	6.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Feb	572.0	8.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
02 Feb	68.0	6.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Mar	26.0	2.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
01 Mar	407.0	8.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Mar	231.0	19.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
19 Mar	42.0	3.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCOMAX
01 Apr	380.0	15.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
17 Apr	1174.0	209.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
05 Jun	35.0	32.0	UF3	A31	MOISTURE SEPARATOR-REHEATERS
07 Jun	2134.0	1930.0	PF	C	REFUELLING AND FULL INSPECTION
04 Sep	48.0	43.0	UF3	A13	CHEMICAL CHARACTERISTICS OF THE PRIMARY SYSTEM
06 Sep	48.0	43.0	UF3	A22	SPENT FUEL STORAGE
08 Sep	48.0	43.0	UF3	A42	MISCELLANEOUS ELECTRICAL PRODUCTION FOR AUXILIARIES
10 Sep	60.0	55.0	UF3	A13	SHUTDOWN COOLING CIRCUIT
12 Sep	231.0	84.0	PP	E	START-UP TESTS AFTER REFUELLING
22 Sep	65.0	3.0	UP3	K	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
25 Sep	43.0	3.0	PP	E	VARIOUS, TESTS
25 Sep	10.0	1.0	UP3	A12	REACTOR INSTRUMENTATION AND CONTROL
27 Sep	82.0	3.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Oct	329.0	16.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Oct	10.0	1.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
09 Oct	17.0	3.0	UP3	L	HUMAN ERROR DURING MAINTENANCE
16 Oct	1045.0	21.0	UP3	A31	VARIOUS, CONDENSERS
02 Nov	6.0	1.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
22 Nov	35.0	16.0	UP3	A31	MAIN CONDENSER
01 Dec	734.0	6.0	UP3	A31	VARIOUS, CONDENSERS

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1982 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		241			368	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	2134			995	78	
E. Testing of plant systems or components				6	1	
H. Nuclear regulatory requirements					5	
J. Grid failure or grid unavailability						6
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					61	
Subtotal	2134	241	0	1001	517	6
Total		2375			1524	

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

System	2003 Hours Lost	1982 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems	108	28
14. Safety Systems		11
15. Reactor Cooling Systems		15
16. Steam generation systems		13
21. Fuel Handling and Storage Facilities		2
31. Turbine and auxiliaries	35	162
32. Feedwater and Main Steam System		10
41. Main Generator Systems	2	34
42. Electrical Power Supply Systems	48	33
XX. Miscellaneous Systems		6
Total	193	326

# FR-41 CHINON-B-2

Operator: EDF (ELECTRICITE DE FRANCE)  
 Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 905.0 MW(e)  
 Design Net Capacity: 870.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

## 2. Production Summary 2003

Energy Production: 5746.2 GW(e).h  
 Energy Availability Factor: 78.7%  
 Load Factor: 72.5%  
 Operating Factor: 81.8%  
 Energy Unavailability Factor: 21.3%  
 Total Off-line Time: 1597 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	592.5	598.5	604.3	533.5	591.0	506.5	611.6	557.8	248.5	43.7	214.4	643.9	5746.2
EAF (%)	99.6	99.9	99.9	95.4	97.0	99.3	93.5	83.0	39.1	7.3	34.5	96.7	78.7
UCF (%)	99.7	99.9	99.9	96.3	97.0	99.9	98.2	95.5	48.3	9.9	34.5	96.8	81.3
LF (%)	88.0	98.4	89.9	81.9	87.8	77.7	90.8	82.8	38.1	6.5	32.9	95.6	72.5
OF (%)	94.2	100.0	100.0	92.8	97.6	88.9	100.0	95.6	50.8	10.1	53.1	98.8	81.8
EUf (%)	0.4	0.1	0.1	4.6	3.0	0.7	6.5	17.0	60.9	92.7	65.5	3.3	21.3
PUF (%)	0.1	0.1	0.1	0.1	0.0	0.1	0.2	0.0	0.0	90.1	34.8	0.1	10.6
UCLF (%)	0.3	0.0	0.0	3.7	3.0	0.0	1.6	4.5	51.7	0.0	30.7	3.1	8.1
XUF (%)	0.0	0.0	0.0	0.9	0.0	0.6	4.7	12.5	9.2	2.6	0.0	0.0	2.6

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Mar 1977  
 Date of First Criticality: 23 Sep 1983  
 Date of Grid Connection: 29 Nov 1983  
 Date of Commercial Operation: 01 Aug 1984

Lifetime Generation: 114149.4 GW(e).h  
 Cumulative Energy Availability Factor: 79.2%  
 Cumulative Load Factor: 73.4%  
 Cumulative Unit Capability Factor: 77.8%  
 Cumulative Energy Unavailability Factor: 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 (%)
1983	1.0	870.0	0.0	0.0	90.2	100.0	0.0	0.0	212	2.6
1984	5394.0	870.0	0.0	0.0	82.2	100.0	70.6	0.0	7226	82.3
1985	5037.4	870.0	69.3	69.3	67.9	67.9	66.1	66.1	6201	70.8
1986	6215.1	870.0	86.4	77.9	86.0	77.0	81.6	73.8	7639	87.2
1987	5618.8	870.0	81.1	79.0	80.7	78.2	73.7	73.8	7171	81.9
1988	4425.0	870.0	68.4	76.3	67.3	75.5	57.9	69.8	5731	65.2
1989	6043.4	870.0	94.4	79.9	91.2	78.6	79.3	71.7	7873	89.9
1990	5217.0	870.0	84.4	80.7	84.1	79.5	68.5	71.2	6714	76.6
1991	3142.2	870.0	55.8	77.1	53.2	75.8	41.2	66.9	3921	44.8
1992	6295.4	870.0	82.0	77.7	80.8	76.4	82.4	68.8	7321	83.3
1993	5491.6	870.0	81.4	78.1	76.2	76.4	72.1	69.2	6867	78.4
1994	6174.6	905.0	84.7	78.8	83.9	77.2	77.9	70.1	7407	84.6
1995	6356.3	905.0	86.1	79.5	86.0	78.0	80.2	71.0	7741	88.4
1996	5287.6	905.0	69.6	78.7	69.4	77.2	66.5	70.6	6206	70.7
1997	6637.9	905.0	86.5	79.3	85.2	77.9	83.7	71.7	7622	87.0
1998	6186.4	905.0	80.4	79.3	79.9	78.0	78.0	72.1	7136	81.5
1999	5900.9	905.0	79.1	79.3	79.0	78.1	74.4	72.3	7075	80.8
2000	6177.0	905.0	81.2	79.5	80.8	78.3	77.7	72.6	7260	82.7
2001	6646.2	905.0	88.5	80.0	87.5	78.8	83.8	73.3	7846	89.6
2002	6155.6	920.0	86.4	80.4	85.6	79.2	76.4	73.5	7404	84.5
2003	5746.2	905.0	81.3	80.4	78.7	79.2	72.5	73.4	7163	81.8

## FR-41 CHINON-B-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
02 Jan	481.0	39.0	XP	K	LOAD VARIATION WITH REMOTE LOAD DISPATCH CONTROL AT REQUEST OF DISPATCHER
01 Mar	319.0	66.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Apr	228.0	75.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
05 Apr	15.0	14.0	UF3	A42	HIGH-VOLTAGE CABLES-LINES-BARS
13 Apr	23.0	6.0	UP3	A12	REACTOR CONTROL
18 Apr	5.0	3.0	UP3	A14	HIGH-PRESSURE SAFETY INJECTION SYSTEM ACCUMULATORS
01 May	263.0	59.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
18 May	18.0	17.0	UF3	K	MALFUNCTION OF REGULATION, PROTECTION AND CONTROL SYSTEMS
01 Jun	237.0	65.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Jul	129.0	14.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
10 Jul	439.0	29.0	XP	R	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
20 Jul	35.0	11.0	UP3	A31	MAIN CONDENSER
30 Jul	755.0	86.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
30 Aug	33.0	30.0	UF3	A42	MAIN TRANSFORMER WITH FIRE PROTECTION
01 Sep	315.0	286.0	UF3	A42	MAIN TRANSFORMER WITH FIRE PROTECTION
14 Sep	34.0	31.0	UF3	A32	CHEMICAL CHARACTERISTICS OF THE SECONDARY SYSTEM
15 Sep	2.0	2.0	UF3	A41	STATIC EXCITATION SYSTEM
18 Sep	382.0	78.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
04 Oct	751.0	680.0	PF	C	REFUELLING WITH NO INSPECTION
04 Nov	64.0	58.0	UF3	A34	COMPRESSED AIR
07 Nov	133.0	58.0	PP	E	START-UP TESTS AFTER REFUELLING
07 Nov	107.0	97.0	PF	E	START-UP TESTS AFTER REFUELLING
13 Nov	52.0	47.0	UF3	A12	MISCELLANEOUS INDEPENDENT MEASUREMENTS
19 Nov	35.0	32.0	UF3	A31	CONTROL AND PROTECTION SYSTEMS

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		550			415	
B. Refuelling without a maintenance					8	
C. Inspection, maintenance or repair combined with refuelling	751			1008	13	
D. Inspection, maintenance or repair without refuelling				4		
E. Testing of plant systems or components	107			13	1	
H. Nuclear regulatory requirements					6	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)		18			13	61
Subtotal	858	568	0	1025	456	61
Total		1426			1542	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		18
12. Reactor I&C Systems	52	11
13. Reactor Auxiliary Systems		25
14. Safety Systems		35
15. Reactor Cooling Systems		66
16. Steam generation systems		3
21. Fuel Handling and Storage Facilities		4
31. Turbine and auxiliaries	35	67
32. Feedwater and Main Steam System	34	19
33. Circulating Water System		4
35. All other I&C Systems		1
41. Main Generator Systems	2	9
42. Electrical Power Supply Systems	363	53
XX. Miscellaneous Systems	64	
Total	550	315

**FR-56 CHINON-B-3**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 905.0 MW(e)  
 Design Net Capacity: 905.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 5807.7 GW(e).h  
 Energy Availability Factor: 77.6%  
 Load Factor: 73.3%  
 Operating Factor: 79.4%  
 Energy Unavailability Factor: 22.4%  
 Total Off-line Time: 1806 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	645.9	592.1	640.2	495.5	0.0	49.4	643.5	576.4	590.3	611.8	590.6	372.2	5807.7
EAF (%)	99.8	98.4	99.9	79.7	0.0	10.2	98.9	93.4	98.7	96.5	97.0	59.6	77.6
UCF (%)	99.8	98.4	99.9	79.7	0.0	10.2	99.6	94.4	98.7	96.5	97.0	59.6	77.7
LF (%)	95.9	97.4	95.2	76.0	0.0	7.6	95.6	85.6	90.6	90.7	90.6	55.3	73.3
OF (%)	100.0	98.7	100.0	80.4	0.0	16.4	100.0	96.6	100.0	100.0	100.0	61.7	79.4
EUf (%)	0.2	1.6	0.1	20.3	100.0	89.8	1.1	6.6	1.3	3.5	3.0	40.4	22.4
PUF (%)	0.1	0.0	0.0	19.9	100.0	28.7	0.4	0.0	0.1	0.5	0.1	0.1	12.6
UCLF (%)	0.1	1.6	0.0	0.3	0.0	61.1	0.0	5.6	1.2	3.1	2.9	40.4	9.7
XUF (%)	0.1	0.0	0.0	0.0	0.0	0.0	0.7	1.0	0.0	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Oct 1980      Lifetime Generation: 98583.5 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: 73.9%  
 Date of Commercial Operation: 04 Mar 1987      Cumulative Unit Capability Factor: 78.2%  
    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 (%)
1986	596.8	896.0	0.0	0.0	87.5	100.0	8.0	0.0	1190	14.4
1987	4120.6	870.0	0.0	0.0	66.7	100.0	54.1	0.0	5311	60.6
1988	4413.0	905.0	61.5	61.5	58.9	58.9	55.5	55.5	5354	61.0
1989	5028.6	905.0	81.2	71.3	77.8	68.3	63.4	59.5	6125	69.9
1990	5417.6	905.0	69.2	70.6	69.1	68.6	68.3	62.4	6274	71.6
1991	7026.4	905.0	92.9	76.2	90.7	74.1	88.6	69.0	8204	93.7
1992	6091.5	905.0	87.5	78.4	85.6	76.4	76.6	70.5	7468	85.0
1993	5600.7	905.0	78.3	78.4	72.6	75.8	70.6	70.5	6827	77.9
1994	5064.0	905.0	76.2	78.1	75.5	75.7	63.9	69.6	6325	72.2
1995	6005.6	905.0	83.3	78.8	82.5	76.6	75.8	70.3	7177	81.9
1996	6278.0	905.0	87.2	79.7	86.9	77.7	79.0	71.3	7761	88.4
1997	5816.8	905.0	85.1	80.2	85.1	78.5	73.4	71.5	7249	82.8
1998	6345.6	905.0	84.1	80.6	81.3	78.7	80.0	72.3	7472	85.3
1999	5602.0	905.0	74.8	80.1	72.2	78.2	70.7	72.2	6656	76.0
2000	6330.1	905.0	83.1	80.3	82.5	78.5	79.6	72.7	7386	84.1
2001	6318.0	905.0	87.0	80.8	84.8	79.0	79.7	73.2	7665	87.5
2002	6720.4	920.0	90.1	81.4	87.6	79.5	83.4	73.9	7971	91.0
2003	5807.7	905.0	77.7	81.2	77.6	79.4	73.3	73.9	6954	79.4



## FR-56 CHINON-B-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	1308.0	55.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Apr	31.0	2.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
01 Apr	547.0	2.0	UP3	A31	MOISTURE SEPARATOR-REHEATERS
25 Apr	1030.0	931.0	PF	C	REFUELLING AND PARTIAL INSPECTION
07 Jun	264.0	239.0	UF3	H	SHUTDOWN PROLONGATION AWAITING SAFETY AUTHORITY
18 Jun	24.0	22.0	UF3	A15	PRIMARY SYSTEM
19 Jun	48.0	43.0	UF3	A11	VESSEL AND VESSEL HEAD
21 Jun	48.0	43.0	UF3	A12	REACTOR INSTRUMENTATION AND CONTROL
23 Jun	24.0	22.0	UF3	A13	SHUTDOWN COOLING CIRCUIT
24 Jun	18.0	16.0	PF	E	START-UP TESTS AFTER REFUELLING
24 Jun	26.0	24.0	UF3	A41	EXCITER AND GENERATOR INSTRUMENTATION AND CONTROL
24 Jun	165.0	42.0	PP	E	START-UP TESTS AFTER REFUELLING
03 Jul	431.0	22.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
14 Jul	135.0	5.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Aug	512.0	56.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCOMAX
09 Aug	23.0	10.0	UP3	A32	FEEDWATER PUMP (EXCLUDING TURBINE-DRIVEN FEEDWATER PUMP)
27 Aug	11.0	10.0	UF3	Z	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
01 Sep	2140.0	41.0	UP3	A31	VARIOUS, CONDENSERS
01 Dec	168.0	152.0	UF3	A31	VARIOUS, CONDENSERS
01 Dec	451.0	11.0	UP3	A31	VARIOUS, CONDENSERS
19 Dec	24.0	22.0	UF3	A41	ALTERNATOR STATOR
20 Dec	93.0	84.0	UF3	A42	HIGH-VOLTAGE CABLES-LINES-BARS

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1986 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		455			349	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	1030			907	42	
D. Inspection, maintenance or repair without refuelling				51		
E. Testing of plant systems or components	18			43	2	
H. Nuclear regulatory requirements		264				
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					23	
Z. Others		11				
Subtotal	1048	730	0	1001	420	0
Total		1778			1421	

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

System	2003 Hours Lost	1986 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	48	27
12. Reactor I&C Systems	48	3
13. Reactor Auxiliary Systems	24	44
14. Safety Systems		3
15. Reactor Cooling Systems	24	39
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries	168	76
32. Feedwater and Main Steam System		37
33. Circulating Water System		4
41. Main Generator Systems	50	32
42. Electrical Power Supply Systems	93	3
Total	455	269

## FR-57 CHINON-B-4

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 905.0 MW(e)  
 Design Net Capacity: 905.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

### 2. Production Summary 2003

Energy Production: 6431.8 GW(e).h  
 Energy Availability Factor: 86.6%  
 Load Factor: 81.1%  
 Operating Factor: 89.2%  
 Energy Unavailability Factor: 13.4%  
 Total Off-line Time: 949 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	665.3	546.0	31.5	337.2	566.3	598.2	618.6	608.3	600.8	633.0	600.1	626.6	6431.8
EAF (%)	99.1	90.6	5.4	54.4	99.4	100.0	98.8	98.8	98.7	98.3	98.0	98.4	86.6
UCF (%)	99.9	99.8	6.8	54.6	99.9	100.0	99.8	99.4	98.7	98.3	98.1	98.4	87.7
LF (%)	98.8	89.8	4.7	51.8	84.1	91.8	91.9	90.3	92.2	93.9	92.1	93.1	81.1
OF (%)	100.0	100.0	6.9	64.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.2
EUf (%)	0.9	9.4	94.6	45.6	0.6	0.0	1.2	1.2	1.3	1.7	2.0	1.6	13.4
PUF (%)	0.1	0.1	93.2	12.6	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.1	9.0
UCLF (%)	0.0	0.1	0.0	32.8	0.0	0.0	0.1	0.5	1.3	1.6	1.9	1.5	3.3
XUF (%)	0.8	9.2	1.4	0.3	0.5	0.0	1.0	0.6	0.0	0.0	0.0	0.0	1.1

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Feb 1981  
 Date of First Criticality: 13 Oct 1987  
 Date of Grid Connection: 14 Nov 1987  
 Date of Commercial Operation: 01 Apr 1988

Lifetime Generation: 94539.9 GW(e).h  
 Cumulative Energy Availability Factor: 80.9%  
 Cumulative Load Factor: 75.7%  
 Cumulative Unit Capability Factor: 78.4%  
 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 (%)
1987	13.0	899.0	0.0	0.0	86.9	100.0	0.2	0.0	236	2.8
1988	4410.0	905.0	0.0	0.0	77.9	100.0	55.5	0.0	5897	67.1
1989	4688.1	905.0	63.6	63.6	60.4	60.4	59.1	59.1	5664	64.7
1990	6098.0	905.0	77.2	70.4	77.0	68.7	76.9	68.0	7003	79.9
1991	6340.0	905.0	80.0	73.6	79.2	72.2	80.0	72.0	7204	82.2
1992	6388.0	905.0	85.0	76.5	82.8	74.9	80.4	74.1	7544	85.9
1993	6016.9	905.0	85.8	78.3	80.1	75.9	75.9	74.5	7359	84.0
1994	5935.1	905.0	82.4	79.0	81.2	76.8	74.9	74.5	7196	82.1
1995	6566.0	905.0	88.2	80.3	87.9	78.4	82.8	75.7	7805	89.1
1996	6574.2	905.0	87.6	81.2	87.0	79.5	82.7	76.6	7764	88.4
1997	6345.4	905.0	88.7	82.1	85.6	80.2	80.0	77.0	7795	89.0
1998	5940.1	905.0	83.1	82.2	80.2	80.2	74.9	76.8	7326	83.6
1999	5596.3	905.0	89.9	82.9	88.2	80.9	70.6	76.2	7059	80.6
2000	5110.7	905.0	74.1	82.1	72.9	80.2	64.3	75.2	6445	73.4
2001	5765.0	905.0	81.3	82.1	79.9	80.2	72.7	75.0	7078	80.8
2002	6321.3	920.0	85.8	82.3	84.3	80.5	78.4	75.3	7584	86.6
2003	6431.8	905.0	87.7	82.7	86.6	80.9	81.1	75.7	7811	89.2

## FR-57 CHINON-B-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	156.0	5.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
19 Jan	893.0	70.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
09 Feb	45.0	5.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCOMAX
03 Mar	728.0	660.0	PF	C	REFUELLING WITH NO INSPECTION
02 Apr	146.0	132.0	UF3	R	INDUSTRIAL ACTION DURING PROGRAMMED OUTAGE, EXTENSION
08 Apr	24.0	22.0	UF3	A42	MISCELLANEOUS ELECTRICAL PRODUCTION FOR AUXILIARIES
09 Apr	22.0	20.0	UF3	A13	WASTE HANDLING, STORAGE AND TREATMENT FACILITIES
10 Apr	21.0	19.0	UF3	A11	VESSEL AND VESSEL HEAD
11 Apr	8.0	8.0	UF3	A42	LOW-VOLTAGE ELECTRICAL AUXILIARIES NETWORK
11 Apr	199.0	49.0	PP	E	START-UP TESTS AFTER REFUELLING
12 Apr	18.0	13.0	UP3	A31	MOISTURE SEPARATOR-REHEATERS
22 Apr	202.0	11.0	XP	K	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 May	1230.0	185.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
10 Jul	185.0	7.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Aug	211.0	30.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
04 Aug	92.0	4.0	XP	R	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
19 Aug	3192.0	44.0	UP3	A31	VARIOUS, CONDENSERS

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		75			325	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	728			770	123	
E. Testing of plant systems or components				38		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				0	27	33
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.)		146				
Subtotal	728	221	0	808	475	33
Total		949			1316	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	21	18
12. Reactor I&C Systems		22
13. Reactor Auxiliary Systems	22	43
14. Safety Systems		8
15. Reactor Cooling Systems		73
16. Steam generation systems		2
31. Turbine and auxiliaries		32
32. Feedwater and Main Steam System		17
33. Circulating Water System		6
41. Main Generator Systems		47
42. Electrical Power Supply Systems	32	18
XX. Miscellaneous Systems		1
Total	75	287

# FR-62 CHOOZ-B-1

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1500.0 MW(e)  
**Design Net Capacity:** 1455.0 MW(e)  
**Design Discharge Burnup:** 36000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 10021.9 GW(e).h  
**Energy Availability Factor:** 85.6%  
**Load Factor:** 76.3%  
**Operating Factor:** 82.4%  
**Energy Unavailability Factor:** 14.4%  
**Total Off-line Time:** 1541 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	950.8	170.5	550.5	1050.2	1003.5	831.6	820.0	907.2	802.1	826.6	1079.5	1029.3	10021.9
<b>EAF (%)</b>	86.4	20.1	50.6	100.0	100.0	99.6	99.9	98.2	100.0	76.4	100.0	91.7	85.6
<b>UCF (%)</b>	100.0	25.3	50.6	100.0	100.0	100.0	100.0	98.3	100.0	100.0	100.0	93.8	89.4
<b>LF (%)</b>	85.2	16.9	49.4	97.2	89.9	77.0	73.5	81.3	74.3	74.0	100.0	92.2	76.3
<b>OF (%)</b>	100.0	23.2	61.2	100.0	96.4	83.2	78.8	87.4	80.8	76.4	100.0	96.9	82.4
<b>EUf (%)</b>	13.6	79.9	49.4	0.0	0.0	0.4	0.1	1.8	0.0	23.6	0.0	8.3	14.4
<b>PUF (%)</b>	0.0	74.7	49.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9
<b>UCLF (%)</b>	0.0	0.0	0.1	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	6.2	0.7
<b>XUF (%)</b>	13.6	5.2	0.0	0.0	0.0	0.4	0.1	0.1	0.0	23.6	0.0	2.1	3.8

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1984  
**Date of First Criticality:** 25 Jul 1996  
**Date of Grid Connection:** 30 Aug 1996  
**Date of Commercial Operation:** 15 May 2000

**Lifetime Generation:** 49702.6 GW(e).h  
**Cumulative Energy Availability Factor:** 80.6%  
**Cumulative Load Factor:** 75.2%  
**Cumulative Unit Capability Factor:** 83.5%  
**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 (%)
1997	5785.0	1455.0	0.0	0.0	45.4	100.0	45.4	0.0	5063	57.8
1998	1540.5	1455.0	0.0	0.0	11.8	100.0	12.1	0.0	1034	11.8
1999	4886.6	1455.0	0.0	0.0	38.2	100.0	38.3	0.0	3617	41.3
2000	8429.2	1455.0	0.0	0.0	65.8	100.0	66.0	0.0	5877	66.9
2001	9524.4	1455.0	78.0	78.0	75.0	75.0	74.7	74.7	6800	77.6
2002	9515.1	1455.0	82.4	80.2	81.0	78.0	74.7	74.7	6807	77.7
2003	10021.9	1500.0	89.4	83.3	85.6	80.6	76.3	75.2	7219	82.4

## FR-62 CHOOZ-B-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	896.0	204.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
07 Feb	18.0	25.0	XP	K	LOAD LIMITATION OR SHUTDOWN TO OPTIMIZE SHUTDOWN
08 Feb	790.0	1185.0	PF	C	REFUELLING WITH NO INSPECTION
13 Mar	148.0	78.0	PP	E	START-UP TESTS AFTER REFUELLING
13 Mar	26.0	39.0	PF	E	START-UP TESTS AFTER REFUELLING
29 Mar	5.0	1.0	UP3	A32	FEEDWATER PUMP (EXCLUDING TURBINE-DRIVEN FEEDWATER PUMP)
01 Apr	417.0	34.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 May	435.0	72.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
01 Jun	375.0	57.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
01 Jun	141.0	3.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Jul	442.0	28.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
03 Jul	22.0	15.0	XP	K	LOAD VARIATION WITHOUT REMOTE LOAD DISPATCH CONTROL AT REQUEST OF DISPATCHER
19 Jul	9.0	5.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
01 Aug	514.0	21.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
03 Aug	50.0	38.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
25 Aug	10.0	15.0	UF3	L	HUMAN OPERATING ERRORS
01 Sep	382.0	31.0	XP	K	LOAD VARIATION WITHOUT REMOTE LOAD DISPATCH CONTROL AT REQUEST OF DISPATCHER
27 Sep	92.0	138.0	XF	K	OUTAGE AGREED WITH INTERREGIONAL ELECTRICITY DISPATCHING CENTRE
01 Oct	176.0	264.0	XF	N	WEAK FLOW OF THE RIVERS.
08 Oct	172.0	26.0	XP	K	LOAD VARIATION WITHOUT REMOTE LOAD DISPATCH CONTROL AT REQUEST OF DISPATCHER
01 Nov	346.0	5.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
13 Dec	363.0	23.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
25 Dec	23.0	34.0	UF3	A34	FIRE SYSTEM

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1997 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		23			1398	
C. Inspection, maintenance or repair combined with refuelling	790			212		
E. Testing of plant systems or components	26			234		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)			92			
L. Human factor related		10				
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)			176			
Subtotal	816	33	268	446	1398	0
Total		1117			1844	

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

System	2003 Hours Lost	1997 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		125
13. Reactor Auxiliary Systems		41
15. Reactor Cooling Systems		127
31. Turbine and auxiliaries		1001
32. Feedwater and Main Steam System		2
41. Main Generator Systems		0
42. Electrical Power Supply Systems		14
XX. Miscellaneous Systems	23	
Total	23	1316

# FR-70 CHOOZ-B-2

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1500.0 MW(e)  
**Design Net Capacity:** 1455.0 MW(e)  
**Design Discharge Burnup:** 36000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 10472.8 GW(e).h  
**Energy Availability Factor:** 83.3%  
**Load Factor:** 79.7%  
**Operating Factor:** 85.1%  
**Energy Unavailability Factor:** 16.7%  
**Total Off-line Time:** 1303 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	1033.6	909.9	1083.8	808.3	196.9	627.6	1070.8	991.5	537.9	1101.3	1044.1	1067.0	10472.8
<b>EAF (%)</b>	95.8	90.4	97.5	75.5	18.1	61.7	99.8	99.5	67.5	99.6	97.9	96.0	83.3
<b>UCF (%)</b>	96.9	90.4	100.0	86.3	23.0	61.8	100.0	99.9	100.0	99.7	97.9	96.0	87.6
<b>LF (%)</b>	92.6	90.3	97.2	74.8	17.6	58.1	96.0	88.8	49.8	98.6	96.7	95.6	79.7
<b>OF (%)</b>	95.8	90.9	100.0	90.8	23.0	75.1	100.0	96.6	53.1	100.0	99.0	96.9	85.1
<b>EU (%)</b>	4.2	9.6	2.5	24.5	81.9	38.3	0.2	0.5	32.5	0.4	2.1	4.0	16.7
<b>PU (%)</b>	2.5	0.2	0.0	0.0	77.0	38.2	0.0	0.0	0.0	0.0	0.0	3.8	10.2
<b>UCLF (%)</b>	0.6	9.5	0.0	13.7	0.0	0.0	0.0	0.1	0.0	0.3	2.2	0.2	2.1
<b>XUF (%)</b>	1.1	0.0	2.5	10.8	4.9	0.1	0.2	0.4	32.5	0.1	0.0	0.0	4.3

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 31 Dec 1985  
**Date of First Criticality:** 10 Mar 1997  
**Date of Grid Connection:** 10 Apr 1997  
**Date of Commercial Operation:** 29 Sep 2000

**Lifetime Generation:** 48015.7 GW(e).h  
**Cumulative Energy Availability Factor:** 81.7%  
**Cumulative Load Factor:** 78.8%  
**Cumulative Unit Capability Factor:** 83.5%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1997	2960.3	1455.0	0.0	0.0	51.0	100.0	23.2	0.0	2997	34.2
1998	86.3	1455.0	0.0	0.0	1.1	100.0	0.7	0.0	172	2.0
1999	7308.7	1455.0	0.0	0.0	56.8	100.0	57.3	0.0	5267	60.1
2000	7213.4	1455.0	0.0	0.0	56.0	100.0	56.4	0.0	5347	60.9
2001	10159.5	1455.0	83.4	83.4	80.4	80.4	79.7	79.7	7221	82.4
2002	9814.8	1455.0	83.0	83.2	81.5	80.9	77.0	78.4	7240	82.6
2003	10472.8	1500.0	87.6	84.7	83.3	81.7	79.7	78.8	7457	85.1

## FR-70 CHOOZ-B-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
02 Jan	96.0	1.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
02 Jan	12.0	12.0	XP	J	LOAD LIMITATION OR CHANCE SHUTDOWN BY ORDER OF INTER-REGIONAL ELECTRICITY DISPATCHING CENTRE
18 Jan	195.0	3.0	UP3	K	MALFUNCTION OF REGULATION, PROTECTION AND CONTROL SYSTEMS
24 Jan	65.0	28.0	PP	E	EQUIPMENT PERFORMANCE TEST (SPECIAL)
31 Jan	2.0	3.0	UF3	A41	HYDROGEN COOLING SYSTEM
01 Feb	61.0	92.0	UF3	A41	HYDROGEN COOLING SYSTEM
04 Feb	186.0	3.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
07 Feb	12.0	2.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
01 Mar	235.0	6.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
15 Mar	955.0	144.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
01 Apr	66.0	99.0	UF3	A	CONTROL AND ISOLATING VALVES
01 May	171.0	55.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
08 May	752.0	1128.0	PF	C	REFUELLING WITH NO INSPECTION
08 Jun	170.0	103.0	PP	E	START-UP TESTS AFTER REFUELLING
08 Jun	27.0	41.0	PF	E	START-UP TESTS AFTER REFUELLING
17 Jun	324.0	32.0	XP	K	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Jul	630.0	27.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Aug	611.0	80.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
05 Aug	105.0	4.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Sep	351.0	527.0	XF	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Oct	293.0	15.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Nov	535.0	13.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
05 Nov	7.0	11.0	UF3	A32	FEEDWATER PUMP (EXCLUDING TURBINE-DRIVEN FEEDWATER PUMP)
01 Dec	366.0	8.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Dec	9.0	2.0	UP3	A31	CONTROL AND PROTECTION SYSTEMS
18 Dec	23.0	35.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1997 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		136			1417	
C. Inspection, maintenance or repair combined with refuelling	752			195		
E. Testing of plant systems or components	50			199		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)			351			
Subtotal	802	136	351	394	1417	0
Total		1289			1811	

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

System	2003 Hours Lost	1997 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		152
13. Reactor Auxiliary Systems		95
15. Reactor Cooling Systems		18
31. Turbine and auxiliaries		977
32. Feedwater and Main Steam System	7	
33. Circulating Water System		85
41. Main Generator Systems	63	9
42. Electrical Power Supply Systems		21
XX. Miscellaneous Systems		34
Total	70	1391

**FR-72 CIVAUX-1**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1495.0 MW(e)  
 Design Net Capacity: 1450.0 MW(e)  
 Design Discharge Burnup: 36000 MW.d/t

**2. Production Summary 2003**

Energy Production: 10932.1 GW(e).h  
 Energy Availability Factor: 83.1%  
 Load Factor: 83.5%  
 Operating Factor: 84.9%  
 Energy Unavailability Factor: 16.9%  
 Total Off-line Time: 1322 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	1129.8	1014.1	1047.0	1055.8	1114.0	973.2	113.6	92.6	1066.1	1119.5	1084.4	1121.9	10932.1
EAF (%)	100.0	99.6	93.5	97.2	99.6	90.4	10.9	9.8	99.3	99.8	99.9	100.0	83.1
UCF (%)	100.0	100.0	93.6	97.3	99.9	100.0	12.9	9.8	99.9	99.9	99.9	100.0	84.1
LF (%)	101.6	100.9	94.3	98.1	100.2	90.4	10.2	8.3	99.0	100.5	100.7	100.9	83.5
OF (%)	100.0	100.0	94.1	98.2	100.0	100.0	13.3	16.7	100.0	100.0	100.0	100.0	84.9
EUF (%)	0.0	0.4	6.5	2.8	0.4	9.6	89.1	90.2	0.7	0.2	0.1	0.0	16.9
PUF (%)	0.0	0.0	6.4	0.0	0.1	0.0	86.7	64.3	0.0	0.0	0.0	0.0	13.4
UCLF (%)	0.0	0.0	0.0	2.7	0.0	0.0	0.4	25.9	0.1	0.1	0.1	0.0	2.5
XUF (%)	0.0	0.4	0.0	0.0	0.3	9.6	2.0	0.0	0.6	0.1	0.0	0.0	1.1

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 15 Oct 1988      Lifetime Generation: 34278.9 GW(e).h  
 Date of First Criticality: 29 Nov 1997      Cumulative Energy Availability Factor: 81.4%  
 Date of Grid Connection: 24 Dec 1997      Cumulative Load Factor: 79.4%  
 Date of Commercial Operation: 29 Jan 2002      Cumulative Unit Capability Factor: 83.0%  
    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 (%)
1999	2916.8	1450.0	0.0	0.0	64.4	100.0	23.0	0.0	2608	29.8
2000	8859.0	1450.0	0.0	0.0	68.6	100.0	69.6	0.0	7133	81.2
2001	2026.8	1450.0	0.0	0.0	16.9	100.0	16.0	0.0	1667	19.0
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



## FR-72 CIVAUX-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
04 Feb	24.0	4.0	XP	K	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
06 Mar	19.0	4.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
06 Mar	44.0	66.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
03 Apr	10.0	4.0	UP3	A33	VARIOUS, PUMPHOUSE-CIRCULATING WATER
09 Apr	13.0	20.0	UF3	L	HUMAN ERROR IN PADLOCKING
04 May	127.0	2.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Jun	811.0	125.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
05 Jul	3.0	4.0	UP3	A15	VARIOUS, PRIMARY CIRCUIT (SOME NOT EXPLAINED)
05 Jul	1029.0	1538.0	PF	C	REFUELLING AND PARTIAL INSPECTION
17 Aug	193.0	288.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
25 Aug	116.0	77.0	PP	E	START-UP TESTS AFTER REFUELLING
25 Aug	43.0	64.0	PF	E	START-UP TESTS AFTER REFUELLING
03 Sep	444.0	7.0	XP	P	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			2002 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling	1029			293		
E. Testing of plant systems or components	87			6		
L. Human factor related		13				
Z. Others		193				
Subtotal	1116	206	0	299	0	0
Total		1322			299	

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

System	2003 Hours Lost	2002 to 2003 Average Hours Lost Per Year

## FR-73 CIVAUX-2

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1495.0 MW(e)  
**Design Net Capacity:** 1450.0 MW(e)  
**Design Discharge Burnup:** —

### 2. Production Summary 2003

**Energy Production:** 9084.8 GW(e).h  
**Energy Availability Factor:** 70.4%  
**Load Factor:** 69.4%  
**Operating Factor:** 74.7%  
**Energy Unavailability Factor:** 29.6%  
**Total Off-line Time:** 2218 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	0.0	696.6	693.9	1047.7	1091.8	797.7	1032.7	1034.0	420.2	147.7	1008.5	1113.8	9084.8
<b>EAF (%)</b>	0.0	69.2	64.4	98.7	99.6	77.0	94.0	94.9	39.5	14.3	93.8	99.8	70.4
<b>UCF (%)</b>	0.0	69.2	64.5	98.7	99.7	77.3	94.0	94.9	40.1	14.3	93.9	99.8	70.5
<b>LF (%)</b>	0.0	69.3	62.5	97.3	98.2	74.1	92.8	93.0	39.0	13.3	93.7	100.1	69.4
<b>OF (%)</b>	0.0	91.2	65.4	100.0	100.0	78.6	95.6	96.6	38.8	33.6	98.6	100.0	74.7
<b>EU (%)</b>	100.0	30.8	35.6	1.3	0.4	23.0	6.0	5.1	60.5	85.7	6.2	0.2	29.6
<b>PU (%)</b>	93.0	20.0	0.0	0.0	0.0	0.0	0.1	4.2	59.9	75.0	0.0	0.0	21.1
<b>UCLF (%)</b>	7.0	10.8	35.6	1.3	0.3	22.7	5.8	0.9	0.0	10.7	6.1	0.2	8.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.6	0.0	0.1	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Apr 1991  
**Date of First Criticality:** 27 Nov 1999  
**Date of Grid Connection:** 24 Dec 1999  
**Date of Commercial Operation:** 23 Apr 2002

**Lifetime Generation:** 30753.2 GW(e).h  
**Cumulative Energy Availability Factor:** 70.4%  
**Cumulative Load Factor:** 69.4%  
**Cumulative Unit Capability Factor:** 81.5%  
**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 (%)
2000	5121.8	1450.0	0.0	0.0	40.8	100.0	40.2	0.0	4638	52.8
2001	9055.4	1450.0	0.0	0.0	70.8	100.0	71.3	0.0	6555	74.8
2002	7491.3	1450.0	0.0	0.0	71.8	100.0	59.0	0.0	6080	69.4
2003	9084.8	1495.0	70.5	70.5	70.4	70.4	69.4	69.4	6542	74.7

## FR-73 CIVAUX-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	668.0	998.0	PF	C	REFUELLING WITH NO INSPECTION
28 Jan	52.0	78.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
30 Jan	48.0	72.0	PF	E	START-UP TESTS AFTER REFUELLING
01 Feb	269.0	166.0	PP	E	START-UP TESTS AFTER REFUELLING
02 Feb	35.0	52.0	UF3	A32	FEED PUMP DRIVE TURBINE
01 Mar	249.0	372.0	UF3	A15	PRIMARY PUMP
30 Mar	8.0	12.0	UF3	A	VALVE ACCESSORIES
01 Apr	941.0	15.0	UP3	A31	MOISTURE SEPARATOR-REHEATERS
01 May	208.0	14.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
04 May	124.0	1.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
02 Jun	78.0	3.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
03 Jun	178.0	4.0	UP3	K	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
12 Jun	13.0	20.0	UF3	L	HUMAN ERROR IN PADLOCKING
13 Jun	140.0	210.0	UF3	A13	CHEMICAL AND VOLUME CONTROL SYSTEM WITHOUT PUMP
22 Jun	891.0	12.0	UP3	A31	MOISTURE SEPARATOR-REHEATERS
06 Jul	14.0	22.0	UF3	L	HUMAN OPERATING ERRORS
06 Jul	18.0	28.0	UF3	A31	CONTROL AND PROTECTION SYSTEMS
01 Aug	634.0	9.0	UP3	A31	MOISTURE SEPARATOR-REHEATERS
02 Aug	25.0	38.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
01 Sep	261.0	6.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
13 Sep	888.0	1328.0	PF	C	REFUELLING AND PARTIAL INSPECTION
20 Oct	100.0	124.0	PP	E	START-UP TESTS AFTER REFUELLING
20 Oct	19.0	29.0	PF	E	START-UP TESTS AFTER REFUELLING
25 Oct	152.0	102.0	UP3	A32	FEED PUMP DRIVE TURBINE
01 Nov	48.0	17.0	UP3	A31	CONTROL AND PROTECTION SYSTEMS
01 Nov	11.0	16.0	UF3	A31	CONTROL AND PROTECTION SYSTEMS
02 Nov	143.0	30.0	UP3	K	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
03 Dec	238.0	4.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			2002 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		461				
B. Refuelling without a maintenance					12	
C. Inspection, maintenance or repair combined with refuelling	1556			131		
E. Testing of plant systems or components	92					
L. Human factor related		27				
Z. Others		52				
Subtotal	1648	540	0	131	12	0
Total		2188			143	

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

System	2003 Hours Lost	2002 to 2003 Average Hours Lost Per Year
13. Reactor Auxiliary Systems	140	
15. Reactor Cooling Systems	249	
31. Turbine and auxiliaries	29	
32. Feedwater and Main Steam System	35	
Total	453	0

# FR-42 CRUAS-1

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 915.0 MW(e)  
**Design Net Capacity:** 880.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6120.5 GW(e).h  
**Energy Availability Factor:** 81.1%  
**Load Factor:** 76.4%  
**Operating Factor:** 84.5%  
**Energy Unavailability Factor:** 18.9%  
**Total Off-line Time:** 1357 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	571.5	514.2	125.7	49.6	611.4	530.0	595.2	602.4	600.8	648.5	619.5	651.7	6120.5
<b>EAF (%)</b>	85.6	84.1	19.0	9.1	96.3	93.5	96.4	97.6	97.8	98.3	97.0	98.3	81.1
<b>UCF (%)</b>	85.6	89.9	21.9	9.1	98.0	98.8	96.4	98.8	97.8	98.3	97.0	98.3	82.5
<b>LF (%)</b>	84.0	83.6	18.5	7.5	89.8	80.5	87.4	88.5	91.2	95.1	94.0	95.7	76.4
<b>OF (%)</b>	87.2	92.0	22.9	16.8	99.9	100.0	98.5	98.9	99.0	100.0	99.0	99.7	84.5
<b>EUf (%)</b>	14.4	15.9	81.0	90.9	3.7	6.5	3.6	2.4	2.2	1.7	3.0	1.7	18.9
<b>PUF (%)</b>	0.1	0.1	77.6	74.4	0.9	0.1	0.1	0.2	0.1	0.1	0.1	0.1	12.8
<b>UCLF (%)</b>	14.2	10.0	0.5	16.5	1.1	1.1	3.5	1.0	2.1	1.6	2.9	1.6	4.6
<b>XUF (%)</b>	0.0	5.8	2.9	0.0	1.7	5.3	0.0	1.3	0.0	0.0	0.0	0.0	1.4

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1978      **Lifetime Generation:** 112382.8 GW(e).h  
**Date of First Criticality:** 02 Apr 1983      **Cumulative Energy Availability Factor:** 80.8%  
**Date of Grid Connection:** 29 Apr 1983      **Cumulative Load Factor:** 71.2%  
**Date of Commercial Operation:** 02 Apr 1984      **Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1983	388.4	888.0	0.0	0.0	33.0	100.0	5.4	0.0	1150	14.2
1984	5482.0	880.0	0.0	0.0	70.9	100.0	70.9	0.0	7165	81.6
1985	5185.2	880.0	77.2	77.2	72.0	72.0	67.3	67.3	6615	75.5
1986	5888.0	880.0	87.6	82.4	86.0	79.0	76.4	71.8	7377	84.2
1987	5359.5	880.0	83.7	82.8	81.8	79.9	69.5	71.1	6860	78.3
1988	4025.0	880.0	98.0	86.6	96.7	84.1	52.1	66.3	5562	63.3
1989	5648.9	880.0	86.0	86.5	83.6	84.0	73.3	67.7	7239	82.6
1990	4983.5	880.0	84.8	86.2	82.6	83.8	64.6	67.2	6809	77.7
1991	4477.8	880.0	68.2	83.7	65.3	81.2	58.1	65.9	5762	65.8
1992	5739.4	880.0	81.0	83.3	77.8	80.7	74.2	66.9	7183	81.8
1993	6156.6	880.0	87.2	83.8	84.6	81.2	79.9	68.4	7353	83.9
1994	6181.2	915.0	84.5	83.8	84.3	81.5	77.1	69.3	7498	85.6
1995	4630.4	915.0	63.3	81.9	62.5	79.7	57.8	68.2	5624	64.2
1996	6258.5	915.0	83.9	82.1	83.0	80.0	77.9	69.0	7478	85.1
1997	5271.2	915.0	77.9	81.7	74.1	79.5	65.8	68.8	6784	77.4
1998	6387.3	915.0	90.8	82.4	89.5	80.2	79.7	69.6	7864	89.8
1999	5890.7	915.0	85.5	82.6	83.8	80.5	73.5	69.8	7367	84.1
2000	6320.5	915.0	87.6	82.9	86.0	80.8	78.6	70.4	7742	88.1
2001	5918.3	915.0	81.7	82.9	81.1	80.9	73.8	70.6	7264	82.9
2002	6069.8	915.0	80.6	82.7	80.5	80.8	75.7	70.9	7349	83.9
2003	6120.5	915.0	82.5	82.7	81.1	80.8	76.4	71.2	7403	84.5

## FR-42 CRUAS-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	405.0	8.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
03 Jan	73.0	66.0	UF3	A31	MAIN CONDENSER
27 Jan	22.0	20.0	UF3	A41	STATIC EXCITATION SYSTEM
03 Feb	658.0	56.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
06 Feb	54.0	49.0	UF3	A31	MAIN CONDENSER
06 Feb	39.0	12.0	UP3	A31	MAIN CONDENSER
07 Mar	1042.0	953.0	PF	C	REFUELLING AND PARTIAL INSPECTION
18 Apr	11.0	10.0	PF	E	START-UP TESTS AFTER REFUELLING
21 Apr	119.0	109.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
01 May	161.0	5.0	PP	E	START-UP TESTS AFTER REFUELLING
07 May	273.0	52.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Jun	379.0	83.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
02 Jun	58.0	35.0	XP	N	LOAD LIMITATION OR SHUTDOWN CAUSED BY INDUSTRIAL ACTION
05 Jun	20.0	9.0	UP3	A31	MAIN CONDENSER
01 Jul	553.0	54.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT BELOW MAXIMUM SET POINT PCOMAX
04 Jul	11.0	10.0	UF3	K	MALFUNCTION OF REGULATION, CONTROL AND PROTECTION SYSTEM
11 Jul	26.0	12.0	UP3	A31	MAIN CONDENSER
01 Aug	20.0	6.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT BELOW MAXIMUM SET POINT PCOMAX
01 Aug	13.0	1.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
01 Aug	494.0	54.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
03 Aug	23.0	6.0	UP3	A31	MAIN CONDENSER
01 Sep	553.0	42.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
14 Sep	7.0	6.0	UF3	A31	CONTROL AND PROTECTION SYSTEMS
01 Oct	1314.0	32.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
02 Nov	7.0	7.0	UF3	A31	MOISTURE SEPARATOR-REHEATERS
01 Dec	685.0	17.0	XP	K	LOAD VARIATION WITHOUT REMOTE LOAD DISPATCH CONTROL AT REQUEST OF DISPATCHER
24 Dec	2.0	2.0	UF3	A31	CONTROL AND PROTECTION SYSTEMS

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		165			450	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	1042			850	24	
D. Inspection, maintenance or repair without refuelling				30		
E. Testing of plant systems or components	11			18		
G. Major back-fitting, refurbishment or upgrading activities without refuelling						1
J. Grid failure or grid unavailability						2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)		11			43	24
Z. Others		119				
Subtotal	1053	295	0	898	519	27
Total		1348			1444	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		24
12. Reactor I&C Systems		15
13. Reactor Auxiliary Systems		8
14. Safety Systems		15
15. Reactor Cooling Systems		24
16. Steam generation systems		0
31. Turbine and auxiliaries	143	25
32. Feedwater and Main Steam System		8
33. Circulating Water System		4
41. Main Generator Systems	22	288
42. Electrical Power Supply Systems		7
XX. Miscellaneous Systems		1
Total	165	419

## FR-43 CRUAS-2

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 915.0 MW(e)  
**Design Net Capacity:** 915.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 5727.9 GW(e).h  
**Energy Availability Factor:** 75.6%  
**Load Factor:** 71.5%  
**Operating Factor:** 79.1%  
**Energy Unavailability Factor:** 24.4%  
**Total Off-line Time:** 1833 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	655.7	599.6	642.3	629.2	486.8	151.9	0.0	139.6	576.6	632.2	623.8	590.1	5727.9
<b>EAF (%)</b>	99.9	99.1	98.2	99.4	74.2	29.6	0.0	22.5	95.5	99.9	99.3	92.2	75.6
<b>UCF (%)</b>	99.9	99.1	98.2	99.4	76.5	29.6	0.0	22.5	95.5	99.9	99.3	92.3	75.8
<b>LF (%)</b>	96.3	97.5	94.5	95.5	71.5	23.1	0.0	20.5	87.5	92.7	94.7	86.7	71.5
<b>OF (%)</b>	100.0	100.0	100.0	100.0	78.0	43.1	0.0	41.5	96.5	100.0	100.0	92.6	79.1
<b>EUf (%)</b>	0.1	0.9	1.8	0.6	25.8	70.4	100.0	77.5	4.5	0.1	0.7	7.8	24.4
<b>PUF (%)</b>	0.1	0.0	0.1	0.0	0.0	57.3	83.9	20.5	0.7	0.1	0.1	0.1	13.7
<b>UCLF (%)</b>	0.0	0.8	1.6	0.6	23.5	13.1	16.1	57.0	3.8	0.0	0.5	7.7	10.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 15 Nov 1978      **Lifetime Generation:** 109889.0 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:** 72.0%  
**Date of Commercial Operation:** 01 Apr 1985      **Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1984	146.0	903.0	0.0	0.0	70.5	100.0	1.9	0.0	651	7.5
1985	6103.2	880.0	0.0	0.0	88.6	100.0	79.2	0.0	8330	95.1
1986	4955.0	880.0	70.4	70.4	70.1	70.1	64.3	64.3	6258	71.4
1987	5559.9	900.0	79.8	75.2	79.1	74.6	70.5	67.4	6761	77.2
1988	5698.0	915.0	85.0	78.5	80.6	76.7	70.9	68.6	7176	81.7
1989	6298.5	915.0	86.2	80.4	83.3	78.3	78.6	71.1	7697	87.9
1990	6001.8	915.0	79.8	80.3	77.7	78.2	74.9	71.9	7114	81.2
1991	4099.9	915.0	55.3	76.1	53.7	74.1	51.2	68.4	4838	55.2
1992	5946.9	915.0	77.0	76.2	77.0	74.5	74.0	69.2	6910	78.7
1993	5441.0	915.0	78.1	76.5	73.5	74.4	67.9	69.0	6463	73.8
1994	5566.1	915.0	96.8	78.8	94.1	76.6	69.4	69.1	6765	77.2
1995	5366.8	915.0	76.3	78.5	72.4	76.2	67.0	68.9	6581	75.1
1996	6521.9	915.0	88.8	79.4	87.1	77.2	81.1	70.0	7870	89.6
1997	5176.1	915.0	80.9	79.6	76.5	77.1	64.6	69.5	6596	75.3
1998	6003.6	915.0	82.8	79.8	79.0	77.3	74.9	70.0	7396	84.4
1999	6393.8	915.0	88.1	80.4	85.3	77.8	79.8	70.7	7787	88.9
2000	6420.9	915.0	87.0	80.8	85.6	78.4	79.9	71.3	7755	88.3
2001	5914.4	915.0	79.7	80.8	76.5	78.2	73.8	71.4	7053	80.5
2002	6547.4	915.0	86.5	81.1	86.0	78.7	81.7	72.0	7776	88.8
2003	5727.9	915.0	75.8	80.8	75.6	78.5	71.5	72.0	6927	79.1

## FR-43 CRUAS-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	240.0	25.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Feb	499.0	9.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Mar	442.0	24.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
02 Mar	29.0	11.0	UP3	A31	MAIN CONDENSER
01 Apr	524.0	22.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 May	144.0	10.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
09 May	328.0	16.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
11 May	84.0	77.0	UF3	A31	MAIN CONDENSER
12 May	49.0	45.0	UF3	A31	CONTROL AND PROTECTION SYSTEMS
15 May	31.0	28.0	UF3	A13	WASTE HANDLING, STORAGE AND TREATMENT FACILITIES
01 Jun	307.0	86.0	UP3	A31	MAIN CONDENSER
13 Jun	1034.0	946.0	PF	C	REFUELLING AND PARTIAL INSPECTION
27 Jul	525.0	480.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
17 Aug	276.0	120.0	PP	E	START-UP TESTS AFTER REFUELLING
17 Aug	22.0	20.0	PF	E	START-UP TESTS AFTER REFUELLING
01 Sep	94.0	4.0	PP	E	START-UP TESTS AFTER REFUELLING
04 Sep	375.0	52.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
09 Sep	25.0	23.0	UF3	A	NON-RETURN AND STOP VALVES
01 Oct	396.0	49.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Nov	433.0	28.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Dec	429.0	35.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT BELOW MAXIMUM SET POINT PCOMAX
11 Dec	55.0	50.0	UF3	A31	MAIN CONDENSER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		244			337	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	1034			833	12	
E. Testing of plant systems or components	22			9	0	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					53	
Z. Others		525				
Subtotal	1056	769	0	842	405	0
Total		1825			1247	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		28
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems	31	
15. Reactor Cooling Systems		11
16. Steam generation systems		21
31. Turbine and auxiliaries	188	100
32. Feedwater and Main Steam System		8
33. Circulating Water System		1
35. All other I&C Systems		1
41. Main Generator Systems		149
XX. Miscellaneous Systems		1
Total	219	326

**FR-44 CRUAS-3**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 915.0 MW(e)  
 Design Net Capacity: 880.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 5779.4 GW(e).h  
 Energy Availability Factor: 76.8%  
 Load Factor: 72.1%  
 Operating Factor: 81.6%  
 Energy Unavailability Factor: 23.2%  
 Total Off-line Time: 1614 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	667.0	578.4	618.0	315.6	0.0	200.8	517.2	577.5	556.8	611.1	596.8	540.1	5779.4
EAF (%)	98.7	94.0	90.9	48.4	0.0	32.2	85.3	98.7	95.1	96.3	96.0	86.1	76.8
UCF (%)	98.7	94.1	98.5	58.6	0.0	32.2	85.3	98.7	95.1	98.5	96.0	95.1	79.2
LF (%)	98.0	94.1	90.9	47.9	0.0	30.5	76.0	84.8	84.5	89.6	90.6	79.3	72.1
OF (%)	100.0	96.6	100.0	60.0	0.0	49.7	89.4	100.0	96.9	100.0	98.3	88.7	81.6
EUf (%)	1.3	6.0	9.1	51.6	100.0	67.8	14.7	1.3	4.9	3.7	4.0	13.9	23.2
PUF (%)	0.2	0.1	0.1	40.4	100.0	26.4	1.1	0.0	0.0	0.1	0.0	0.0	14.1
UCLF (%)	1.1	5.8	1.4	1.1	0.0	41.4	13.5	1.3	4.9	1.4	4.0	4.9	6.7
XUF (%)	0.0	0.1	7.6	10.2	0.0	0.0	0.0	0.0	0.0	2.2	0.0	9.1	2.5

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 15 Apr 1979      Lifetime Generation: 110649.1 GW(e).h  
 Date of First Criticality: 09 Apr 1984      Cumulative Energy Availability Factor: 81.1%  
 Date of Grid Connection: 14 May 1984      Cumulative Load Factor: 71.2%  
 Date of Commercial Operation: 10 Sep 1984      Cumulative Unit Capability Factor: 77.8%  
    Cumulative Energy Unavailability Factor: 18.9%

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	3272.0	880.0	0.0	0.0	79.9	100.0	44.0	0.0	4380	51.8
1985	5247.4	880.0	74.6	74.6	72.5	72.5	68.1	68.1	6557	74.9
1986	5967.1	880.0	89.5	82.1	89.2	80.9	77.4	72.7	7456	85.1
1987	4721.4	880.0	75.7	79.9	75.1	79.0	61.2	68.9	6013	68.6
1988	4773.0	880.0	99.9	84.9	98.6	83.9	61.7	67.1	6679	76.0
1989	5577.9	880.0	74.2	82.8	72.8	81.7	72.4	68.2	6571	75.0
1990	6129.2	915.0	87.5	83.6	85.2	82.3	76.5	69.6	7499	85.6
1991	6003.2	915.0	85.2	83.8	84.7	82.6	74.9	70.4	7374	84.2
1992	5174.6	915.0	73.2	82.5	71.0	81.1	64.4	69.6	6323	72.0
1993	5715.3	915.0	85.7	82.8	73.9	80.3	71.3	69.8	7232	82.6
1994	5014.0	915.0	78.9	82.4	78.1	80.1	62.6	69.1	6428	73.4
1995	6032.7	915.0	89.6	83.1	84.3	80.5	75.3	69.6	7525	85.9
1996	5882.2	915.0	99.7	84.5	91.9	81.5	73.2	69.9	7724	87.9
1997	5347.8	915.0	86.1	84.6	80.2	81.4	66.7	69.7	6961	79.5
1998	6281.4	915.0	81.7	84.4	78.7	81.2	78.4	70.3	7758	88.6
1999	6316.7	915.0	89.8	84.8	87.8	81.6	78.8	70.9	7654	87.4
2000	5494.0	915.0	81.4	84.5	79.0	81.4	68.4	70.7	6914	78.7
2001	5867.9	915.0	82.1	84.4	79.6	81.3	73.2	70.9	7254	82.8
2002	6052.0	915.0	82.1	84.3	80.9	81.3	75.5	71.1	7307	83.4
2003	5779.4	915.0	79.2	84.0	76.8	81.1	72.1	71.2	7146	81.6



## FR-44 CRUAS-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
03 Jan	190.0	6.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
03 Jan	25.0	1.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
03 Feb	38.0	12.0	UP3	A31	VARIOUS, CONDENSERS
15 Feb	23.0	21.0	UF3	A32	HP WATER CIRCUIT
01 Mar	1111.0	119.0	XP	T	LOAD LIMITATION DURING STRETCH-OUT
03 Mar	31.0	9.0	UP3	A31	MAIN CONDENSER
15 Apr	21.0	7.0	UP3	A31	MAIN CONDENSER
18 Apr	1104.0	1011.0	PF	C	REFUELLING WITH NO INSPECTION
04 Jun	104.0	96.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
08 Jun	148.0	135.0	UF3	A31	LUBRICATION SYSTEM (EXCLUDING JACKING SYSTEM)
09 Jun	11.0	10.0	UF3	Z	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
09 Jun	340.0	106.0	PP	E	START-UP TESTS AFTER REFUELLING
15 Jun	25.0	23.0	UF3	A31	CONTROL AND PROTECTION SYSTEMS
01 Jul	272.0	8.0	PP	E	START-UP TESTS AFTER REFUELLING
07 Jul	53.0	48.0	UF3	A31	MAIN CONDENSER
14 Jul	168.0	60.0	XP	K	LOAD VARIATION WITH REMOTE LOAD DISPATCH CONTROL
25 Jul	26.0	24.0	UF3	B	HUMAN ERRORS DURING TESTING
01 Aug	312.0	94.0	XP	K	LOAD VARIATION
01 Sep	269.0	68.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
28 Sep	21.0	20.0	UF3	A31	LUBRICATION SYSTEM (EXCLUDING JACKING SYSTEM)
01 Oct	244.0	46.0	XP	K	LOAD VARIATION
01 Nov	151.0	37.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT BELOW MAXIMUM SET POINT PCOMAX
09 Nov	11.0	10.0	UF3	A31	MAIN CONDENSER
01 Dec	189.0	43.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
02 Dec	68.0	62.0	XF	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
05 Dec	10.0	9.0	UF3	A	GENERAL VALVES AND FITTINGS
09 Dec	21.0	8.0	UP3	A31	MAIN CONDENSER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		291			153	
B. Refuelling without a maintenance		26			0	
C. Inspection, maintenance or repair combined with refuelling	1104			878	42	
D. Inspection, maintenance or repair without refuelling					7	
E. Testing of plant systems or components				7		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					25	25
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)			68			
Z. Others		115				
Subtotal	1104	432	68	885	227	25
Total		1604			1137	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		7
13. Reactor Auxiliary Systems		1
14. Safety Systems		2
15. Reactor Cooling Systems		67
16. Steam generation systems		16
31. Turbine and auxiliaries	258	25
32. Feedwater and Main Steam System	23	6
41. Main Generator Systems		0
42. Electrical Power Supply Systems		11
XX. Miscellaneous Systems		0
Total	281	135

**FR-45 CRUAS-4**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 915.0 MW(e)  
 Design Net Capacity: 880.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 6296.7 GW(e).h  
 Energy Availability Factor: 81.6%  
 Load Factor: 78.6%  
 Operating Factor: 84.1%  
 Energy Unavailability Factor: 18.4%  
 Total Off-line Time: 1389 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	622.0	555.3	651.6	613.8	608.8	438.0	602.9	569.5	0.0	449.6	623.0	561.9	6296.7
EAF (%)	94.0	90.7	98.4	97.1	94.1	72.3	92.3	86.9	0.0	66.0	99.9	86.8	81.6
UCF (%)	94.0	90.8	98.4	97.2	95.2	73.0	92.3	88.4	0.0	66.0	99.9	98.0	82.9
LF (%)	91.4	90.3	95.8	93.2	89.4	66.5	88.6	83.7	0.0	66.0	94.6	82.5	78.6
OF (%)	94.6	92.4	100.0	100.0	98.0	73.9	95.6	90.5	0.0	75.2	100.0	88.4	84.1
EU (%)	6.0	9.3	1.6	2.9	5.9	27.7	7.7	13.1	100.0	34.0	0.1	13.2	18.4
PU (%)	0.0	0.1	0.1	0.1	2.2	0.0	0.6	6.2	100.0	33.7	0.1	0.1	11.9
UCLF (%)	6.0	9.2	1.5	2.8	2.6	27.0	7.1	5.4	0.0	0.3	0.0	1.9	5.3
XUF (%)	0.0	0.0	0.0	0.1	1.1	0.6	0.0	1.5	0.0	0.0	0.0	11.1	1.2

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Oct 1979      Lifetime Generation: 109161.4 GW(e).h  
 Date of First Criticality: 01 Oct 1984      Cumulative Energy Availability Factor: 80.2%  
 Date of Grid Connection: 27 Oct 1984      Cumulative Load Factor: 72.4%  
 Date of Commercial Operation: 11 Feb 1985      Cumulative Unit Capability Factor: 77.8%  
    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 (%)
1984	671.0	880.0	0.0	0.0	90.2	100.0	9.4	0.0	1158	14.2
1985	5773.6	880.0	0.0	0.0	85.8	100.0	74.9	0.0	7434	84.9
1986	5452.6	880.0	80.3	80.3	76.7	76.7	70.7	70.7	6816	77.8
1987	5313.4	880.0	85.1	82.7	84.2	80.5	68.9	69.8	6888	78.6
1988	3247.0	880.0	76.0	80.5	74.2	78.4	42.0	60.5	4271	48.6
1989	4852.2	880.0	71.4	78.2	71.3	76.6	62.9	61.1	6025	68.8
1990	6215.3	880.0	86.4	79.8	86.0	78.5	80.6	65.0	7607	86.8
1991	6005.4	880.0	83.9	80.5	81.1	78.9	77.9	67.2	7259	82.9
1992	4953.6	880.0	66.0	78.5	65.0	76.9	64.1	66.7	5862	66.7
1993	5280.0	880.0	84.9	79.3	77.1	76.9	68.5	67.0	6653	75.9
1994	5552.1	915.0	86.8	80.1	83.8	77.7	69.3	67.2	6856	78.3
1995	6280.3	915.0	86.0	80.7	82.1	78.2	78.4	68.4	7375	84.2
1996	5886.5	915.0	80.7	80.7	79.4	78.3	73.2	68.8	7180	81.7
1997	5976.6	915.0	84.1	81.0	80.2	78.5	74.6	69.3	7334	83.7
1998	6629.2	915.0	88.7	81.6	85.5	79.0	82.7	70.4	7885	90.0
1999	5829.8	915.0	85.4	81.9	81.9	79.2	72.7	70.5	7159	81.7
2000	6630.7	915.0	89.7	82.4	88.4	79.9	82.5	71.4	7915	90.1
2001	5915.8	915.0	83.3	82.5	80.6	79.9	73.8	71.5	7172	81.9
2002	6399.6	915.0	83.4	82.5	82.9	80.1	79.8	72.0	7474	85.3
2003	6296.7	915.0	82.9	82.5	81.6	80.2	78.6	72.4	7371	84.1

## FR-45 CRUAS-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	77.0	22.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT BELOW MAXIMUM SET POINT PCOMAX
30 Jan	16.0	15.0	UF3	A31	VARIOUS, CONDENSERS
31 Jan	24.0	22.0	UF3	A32	CHEMICAL CHARACTERISTICS OF THE SECONDARY SYSTEM
01 Feb	49.0	45.0	UF3	A32	CHEMICAL CHARACTERISTICS OF THE SECONDARY SYSTEM
02 Mar	146.0	11.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Apr	301.0	22.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
03 Apr	40.0	16.0	UP3	A31	MAIN CONDENSER
01 May	298.0	31.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
10 May	30.0	13.0	UP3	A31	MAIN CONDENSER
23 May	15.0	14.0	PF	E	PERIODIC TESTING WITHOUT LOAD REDUCTION OR SHUTDOWN
01 Jun	340.0	19.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
04 Jun	118.0	108.0	UF3	A41	HYDROGEN COOLING SYSTEM
10 Jun	46.0	43.0	UF3	A31	CONTROL AND PROTECTION SYSTEMS
12 Jun	17.0	15.0	UF3	A31	MOISTURE SEPARATOR-REHEATERS
17 Jun	115.0	12.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Jul	610.0	23.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
02 Jul	43.0	17.0	UP3	A31	MAIN CONDENSER
15 Jul	33.0	30.0	UF3	A41	STATOR BAR WATER COOLING CIRCUIT
01 Aug	412.0	20.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
04 Aug	33.0	13.0	UP3	A31	MAIN CONDENSER
19 Aug	217.0	11.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
29 Aug	26.0	24.0	UF3	A12	MALFUNCTION OF REGULATION, CONTROL AND PROTECTION SYSTEM
30 Aug	950.0	869.0	PF	B	REFUELLING WITH NO INSPECTION
08 Oct	20.0	18.0	PF	E	START-UP TESTS AFTER REFUELLING
01 Nov	214.0	37.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCOMAX
01 Dec	113.0	103.0	XP	K	LOAD VARIATION WITH REMOTE LOAD DISPATCH CONTROL A
05 Dec	4.0	3.0	UF3	A31	MOISTURE SEPARATOR-REHEATERS

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		333			211	
B. Refuelling without a maintenance	950				3	
C. Inspection, maintenance or repair combined with refuelling				819	69	
D. Inspection, maintenance or repair without refuelling				12		
E. Testing of plant systems or components	35			13		3
J. Grid failure or grid unavailability					1	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					14	57
Subtotal	985	333	0	844	298	60
Total		1318			1202	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	26	7
13. Reactor Auxiliary Systems		23
14. Safety Systems		3
15. Reactor Cooling Systems		28
16. Steam generation systems		16
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		4
31. Turbine and auxiliaries	83	25
32. Feedwater and Main Steam System	73	11
41. Main Generator Systems	151	34
42. Electrical Power Supply Systems		6
XX. Miscellaneous Systems		1
Total	333	158

# FR-22 DAMPIERRE-1

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 890.0 MW(e)  
**Design Net Capacity:** 890.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5733.3 GW(e).h  
**Energy Availability Factor:** 76.8%  
**Load Factor:** 73.5%  
**Operating Factor:** 79.5%  
**Energy Unavailability Factor:** 23.2%  
**Total Off-line Time:** 1796 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	648.0	538.2	197.6	0.0	62.6	580.2	623.1	601.4	599.3	639.7	612.0	631.1	5733.3
<b>EAF (%)</b>	97.9	90.2	30.6	0.0	11.2	97.3	99.2	99.1	98.5	98.8	99.7	99.9	76.8
<b>UCF (%)</b>	99.5	100.0	37.3	0.0	11.2	98.2	99.2	99.1	98.5	98.8	99.7	99.9	78.3
<b>LF (%)</b>	97.9	90.0	29.9	0.0	9.5	90.5	94.1	90.8	93.5	96.5	95.5	95.3	73.5
<b>OF (%)</b>	100.0	100.0	37.4	0.0	17.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	79.5
<b>EUf (%)</b>	2.1	9.8	69.4	100.0	88.8	2.7	0.8	0.9	1.5	1.2	0.3	0.1	23.2
<b>PUF (%)</b>	0.1	0.0	54.5	86.7	6.8	0.4	0.0	0.4	0.1	0.0	0.1	0.0	12.4
<b>UCLF (%)</b>	0.4	0.0	8.2	13.3	82.0	1.4	0.8	0.5	1.4	1.2	0.2	0.1	9.3
<b>XUF (%)</b>	1.6	9.7	6.7	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	1.5

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1975      **Lifetime Generation:** 127791.2 GW(e).h  
**Date of First Criticality:** 15 Mar 1980      **Cumulative Energy Availability Factor:** 74.4%  
**Date of Grid Connection:** 23 Mar 1980      **Cumulative Load Factor:** 69.6%  
**Date of Commercial Operation:** 10 Sep 1980      **Cumulative Unit Capability Factor:** 77.4%  
**Cumulative Energy Unavailability Factor:** 25.6%

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	5043.9	890.0	65.9	60.9	65.6	60.7	64.7	59.7	5994	68.4
1983	6263.0	890.0	85.9	69.2	85.9	69.1	80.3	66.6	7847	89.6
1984	5391.0	890.0	75.1	70.7	73.6	70.2	69.0	67.2	6777	77.2
1985	5738.5	890.0	80.9	72.7	80.6	72.3	73.6	68.5	7223	82.5
1986	5157.4	890.0	75.9	73.2	75.7	72.9	66.2	68.1	6673	76.2
1987	4780.2	890.0	67.9	72.5	65.9	71.9	61.3	67.1	6245	71.3
1988	3920.0	890.0	61.1	71.0	59.6	70.3	50.1	65.0	5239	59.6
1989	6467.6	890.0	98.7	74.1	97.9	73.4	83.0	67.0	8207	93.7
1990	2187.1	890.0	36.3	70.3	34.0	69.5	28.1	63.1	3110	35.5
1991	6390.9	890.0	82.3	71.4	81.8	70.6	82.0	64.8	7305	83.4
1992	6305.1	890.0	81.7	72.3	80.7	71.4	80.7	66.1	7293	83.0
1993	6702.8	890.0	86.6	73.4	86.4	72.6	86.0	67.7	7676	87.6
1994	5299.2	890.0	69.7	73.1	68.9	72.3	68.0	67.7	6185	70.6
1995	6194.0	890.0	84.4	73.9	82.9	73.0	79.4	68.5	7413	84.6
1996	5895.5	890.0	83.1	74.5	82.2	73.6	75.4	68.9	7378	84.0
1997	5172.1	890.0	72.3	74.3	71.9	73.5	66.3	68.7	6465	73.8
1998	6042.7	890.0	81.9	74.7	80.5	73.9	77.5	69.2	7294	83.3
1999	5492.4	890.0	76.8	74.8	75.3	74.0	70.4	69.3	6815	77.8
2000	6153.8	890.0	87.0	75.5	85.4	74.5	78.7	69.8	7676	87.4
2001	4125.1	890.0	56.8	74.6	56.7	73.7	52.9	69.0	5152	58.8
2002	6249.6	890.0	87.6	75.2	86.8	74.3	80.2	69.5	7586	86.6
2003	5733.3	890.0	78.3	75.3	76.8	74.4	73.5	69.6	6964	79.5

# FR-22 DAMPIERRE-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	329.0	3.0	UP3	A	VARIOUS, SECONDARY CIRCUIT (SOME NOT EXPLAINED)
15 Jan	1333.0	113.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
12 Mar	60.0	53.0	UF3	A14	STEAM GENERATOR EMERGENCY FEED SYSTEMS
15 Mar	1029.0	915.0	PF	C	REFUELLING AND PARTIAL INSPECTION
27 Apr	24.0	21.0	UF3	A	VALVE ACCESSORIES
28 Apr	48.0	43.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
30 Apr	336.0	299.0	UF3	L	HUMAN OPERATING ERRORS
14 May	298.0	265.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
26 May	170.0	46.0	PP	E	START-UP TESTS AFTER REFUELLING
02 Jun	428.0	9.0	UP3	A31	VARIOUS, CONDENSERS
08 Jun	94.0	33.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Jul	306.0	6.0	UP3	A31	VARIOUS, CONDENSERS
05 Jul	376.0	28.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Aug	259.0	46.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Aug	248.0	3.0	UP3	A31	VARIOUS, CONDENSERS
01 Sep	188.0	29.0	XP	K	LOAD VARIATION
03 Sep	131.0	2.0	UP3	A32	VARIOUS, VENTILATION, TRANSFER AND COOLING SYSTEMS
26 Sep	628.0	11.0	UP3	A31	MAIN CONDENSER
12 Oct	230.0	12.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Nov	354.0	26.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Dec	238.0	30.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1980 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		84			331	
B. Refuelling without a maintenance					8	
C. Inspection, maintenance or repair combined with refuelling	1029			1168	43	
D. Inspection, maintenance or repair without refuelling				78	0	
E. Testing of plant systems or components				2	1	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					185	49
L. Human factor related		336				
Z. Others		346				
Subtotal	1029	766	0	1248	568	49
Total		1795			1865	

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

System	2003 Hours Lost	1980 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		4
12. Reactor I&C Systems		46
13. Reactor Auxiliary Systems		14
14. Safety Systems	60	7
15. Reactor Cooling Systems		54
16. Steam generation systems		64
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System		23
33. Circulating Water System		0
41. Main Generator Systems		69
42. Electrical Power Supply Systems		10
Total	60	305

# FR-29 DAMPIERRE-2

Operator: EDF (ELECTRICITE DE FRANCE)  
 Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Maximum Net Capacity at the beginning of 2003: 890.0 MW(e)  
 Design Net Capacity: 890.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

## 2. Production Summary 2003

Energy Production: 6268.3 GW(e).h  
 Energy Availability Factor: 81.3%  
 Load Factor: 80.4%  
 Operating Factor: 87.1%  
 Energy Unavailability Factor: 18.7%  
 Total Off-line Time: 1129 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	303.6	562.6	532.3	614.1	636.7	604.4	623.1	619.0	244.0	257.0	619.9	651.8	6268.3
EAF (%)	46.3	94.1	80.9	96.6	97.3	96.4	95.7	95.9	38.9	39.7	96.8	98.7	81.3
UCF (%)	46.3	94.1	81.0	96.6	97.3	96.4	95.7	95.9	39.4	39.7	96.8	98.7	81.4
LF (%)	45.8	94.1	80.5	95.8	96.1	94.3	94.1	93.5	38.1	38.8	96.7	98.4	80.4
OF (%)	68.0	100.0	91.4	100.0	100.0	100.0	100.0	100.0	39.6	47.4	100.0	100.0	87.1
EUf (%)	53.7	5.9	19.1	3.4	2.7	3.6	4.3	4.1	61.1	60.3	3.2	1.3	18.7
PUF (%)	19.0	0.6	0.1	0.0	0.0	0.0	0.4	0.2	59.8	56.1	0.2	0.0	11.4
UCLF (%)	34.7	5.4	19.0	3.4	2.7	3.6	3.9	3.9	0.8	4.1	3.0	1.3	7.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Apr 1975      Lifetime Generation: 121390.0 GW(e).h  
 Date of First Criticality: 05 Dec 1980      Cumulative Energy Availability Factor: 75.3%  
 Date of Grid Connection: 10 Dec 1980      Cumulative Load Factor: 67.3%  
 Date of Commercial Operation: 16 Feb 1981      Cumulative Unit Capability Factor: 77.4%  
    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 (%)
1982	4110.8	890.0	53.0	53.0	53.0	53.0	52.7	52.7	4848	55.3
1983	5191.0	890.0	67.7	60.4	67.7	60.4	66.6	59.7	6139	70.1
1984	5781.0	890.0	76.6	65.8	76.1	65.6	73.9	64.4	6884	78.4
1985	6056.9	890.0	84.5	70.5	84.3	70.3	77.7	67.7	7400	84.5
1986	5658.5	890.0	82.2	72.8	82.0	72.6	72.6	68.7	6983	79.7
1987	4856.0	890.0	78.8	73.8	76.4	73.3	62.3	67.6	5715	65.2
1988	4583.0	890.0	95.1	76.8	92.4	76.0	58.6	66.3	6153	70.0
1989	5485.3	890.0	79.7	77.2	77.0	76.1	70.4	66.8	6927	79.1
1990	4869.5	890.0	70.0	76.4	67.8	75.2	62.5	66.4	6292	71.8
1991	4201.9	890.0	67.6	75.5	63.3	74.0	53.9	65.1	5407	61.7
1992	5049.8	890.0	75.9	75.5	74.7	74.1	64.6	65.1	6429	73.2
1993	5976.6	890.0	87.4	76.5	79.6	74.5	76.7	66.0	7625	87.0
1994	4445.0	890.0	84.8	77.2	84.8	75.3	57.0	65.3	5328	60.8
1995	5562.0	890.0	95.5	78.5	95.0	76.7	71.3	65.8	6952	79.4
1996	5761.0	890.0	84.2	78.9	81.5	77.0	73.7	66.3	7437	84.7
1997	4966.6	890.0	69.3	78.3	67.5	76.4	63.7	66.1	6204	70.8
1998	5855.9	890.0	80.3	78.4	78.3	76.6	75.1	66.7	7192	82.1
1999	5312.9	890.0	72.6	78.1	69.2	76.1	68.1	66.7	6688	76.3
2000	5866.1	890.0	77.5	78.0	76.0	76.1	75.0	67.2	7121	81.1
2001	5355.9	890.0	75.1	77.9	72.4	76.0	68.7	67.3	6593	75.3
2002	4307.5	890.0	56.3	76.9	56.0	75.0	55.3	66.7	5196	59.3
2003	6268.3	890.0	81.4	77.1	81.3	75.3	80.4	67.3	7631	87.1

## FR-29 DAMPIERRE-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	183.0	163.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
08 Jan	327.0	90.0	PP	E	START-UP TESTS AFTER REFUELLING
09 Jan	54.0	48.0	UF3	A41	HYDROGEN COOLING SYSTEM
16 Jan	161.0	44.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
01 Feb	55.0	3.0	PP	E	START-UP TESTS AFTER REFUELLING
03 Feb	777.0	79.0	UP3	A32	ROTATING BUTTERFLY VALVES
02 Mar	4119.0	135.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
27 Mar	64.0	57.0	UF3	A32	HIGH-PRESSURE HEATING
28 Jul	40.0	3.0	PP	E	EQUIPMENT PERFORMANCE TEST (SPECIAL)
01 Sep	208.0	5.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
10 Sep	66.0	3.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
13 Sep	790.0	703.0	PF	B	REFUELLING WITH NO INSPECTION
16 Oct	24.0	22.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
17 Oct	13.0	11.0	PF	E	START-UP TESTS AFTER REFUELLING
17 Oct	107.0	40.0	PP	E	START-UP TESTS AFTER REFUELLING
22 Oct	1618.0	30.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
27 Nov	19.0	4.0	UP3	A12	CONTROL ROD ASSEMBLIES AND DRIVE MECHANISMS
18 Dec	51.0	1.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		118			374	
B. Refuelling without a maintenance	790				5	
C. Inspection, maintenance or repair combined with refuelling				1123	20	
D. Inspection, maintenance or repair without refuelling				98		
E. Testing of plant systems or components	13			2	0	
H. Nuclear regulatory requirements					5	
J. Grid failure or grid unavailability					1	1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					113	27
Z. Others		207				
Subtotal	803	325	0	1223	518	28
Total		1128			1769	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		13
13. Reactor Auxiliary Systems		18
14. Safety Systems		29
15. Reactor Cooling Systems		56
16. Steam generation systems		37
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries		78
32. Feedwater and Main Steam System	64	12
41. Main Generator Systems	54	46
42. Electrical Power Supply Systems		33
Total	118	322

# FR-30 DAMPIERRE-3

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 890.0 MW(e)  
**Design Net Capacity:** 890.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5346.9 GW(e).h  
**Energy Availability Factor:** 68.9%  
**Load Factor:** 68.6%  
**Operating Factor:** 70.2%  
**Energy Unavailability Factor:** 31.1%  
**Total Off-line Time:** 2608 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	658.7	594.1	654.1	632.5	37.4	0.0	0.0	195.1	615.7	659.2	638.2	661.8	5346.9
<b>EAF (%)</b>	99.4	99.2	99.0	99.0	6.3	0.0	0.0	31.5	97.4	99.6	99.6	99.6	68.9
<b>UCF (%)</b>	99.4	99.2	99.7	99.1	6.3	0.0	0.0	31.5	97.4	99.6	99.6	99.6	69.0
<b>LF (%)</b>	99.5	99.3	98.9	98.7	5.7	0.0	0.0	29.5	96.1	99.4	99.6	100.0	68.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	6.7	0.0	0.0	39.5	100.0	100.0	100.0	100.0	70.2
<b>EUf (%)</b>	0.6	0.8	1.0	1.0	93.7	100.0	100.0	68.5	2.6	0.4	0.4	0.4	31.1
<b>PUF (%)</b>	0.0	0.5	0.1	0.0	93.6	100.0	100.0	33.3	0.3	0.0	0.0	0.3	27.6
<b>UCLF (%)</b>	0.6	0.3	0.2	0.9	0.1	0.0	0.0	35.2	2.3	0.4	0.4	0.1	3.4
<b>XUF (%)</b>	0.0	0.0	0.8	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1975      **Lifetime Generation:** 126606.8 GW(e).h  
**Date of First Criticality:** 25 Jan 1981      **Cumulative Energy Availability Factor:** 75.8%  
**Date of Grid Connection:** 30 Jan 1981      **Cumulative Load Factor:** 70.8%  
**Date of Commercial Operation:** 27 May 1981      **Cumulative Unit Capability Factor:** 77.4%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	3767.6	890.0	48.7	48.7	48.7	48.7	48.3	48.3	4632	52.9
1983	5517.0	890.0	72.7	60.7	72.7	60.7	70.8	59.5	6638	75.8
1984	6206.0	890.0	79.8	67.1	79.7	67.0	79.4	66.2	7121	81.1
1985	6364.4	890.0	85.1	71.6	84.9	71.5	81.6	70.0	7523	85.9
1986	6717.2	890.0	99.9	77.2	99.5	77.1	86.2	73.3	8330	95.1
1987	5019.5	890.0	82.4	78.1	79.3	77.5	64.4	71.8	6269	71.6
1988	4964.0	890.0	72.9	77.3	68.5	76.2	63.5	70.6	6435	73.3
1989	5912.9	890.0	82.2	78.0	78.4	76.5	75.8	71.2	7242	82.7
1990	5996.5	890.0	82.5	78.5	79.8	76.8	76.9	71.9	7348	83.9
1991	5124.1	890.0	70.0	77.6	69.6	76.1	65.7	71.3	6244	71.3
1992	4875.1	890.0	65.5	76.5	65.5	75.1	62.4	70.5	5814	66.2
1993	6148.8	890.0	82.8	77.0	82.8	75.8	78.9	71.2	7333	83.7
1994	5537.6	890.0	86.2	77.7	82.7	76.3	71.0	71.1	7013	80.1
1995	4773.5	890.0	83.4	78.1	80.2	76.6	61.2	70.4	6343	72.4
1996	5575.1	890.0	77.6	78.1	77.1	76.6	71.3	70.5	6940	79.0
1997	5720.9	890.0	81.0	78.3	78.3	76.7	73.4	70.7	7211	82.3
1998	5905.8	890.0	82.7	78.5	81.4	77.0	75.8	71.0	7210	82.3
1999	5779.4	890.0	80.9	78.7	78.2	77.1	74.1	71.1	7186	82.0
2000	4308.3	890.0	59.8	77.7	57.6	76.0	55.1	70.3	5378	61.2
2001	5993.0	890.0	77.8	77.7	77.4	76.1	76.9	70.6	7060	80.6
2002	5929.8	890.0	77.4	77.7	76.8	76.1	76.1	70.9	6877	78.5
2003	5346.9	890.0	69.0	77.3	68.9	75.8	68.6	70.8	6152	70.2



## FR-30 DAMPIERRE-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	501.0	4.0	UP3	A31	MAIN CONDENSER
14 Feb	540.0	2.0	UP3	A31	MAIN CONDENSER
09 Mar	215.0	5.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Apr	320.0	2.0	UP3	A12	REACTOR CONTROL
22 Apr	200.0	4.0	UP3	A31	MAIN CONDENSER
02 May	2348.0	2091.0	PF	C	REFUELLING AND 10-YEARLY INSPECTION
08 Aug	208.0	185.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
17 Aug	39.0	34.0	UF3	A42	COMMAND AND CONTROL OF THE MAIN TRANSFORMERS
17 Aug	134.0	51.0	PP	E	START-UP TESTS AFTER REFUELLING
19 Aug	13.0	12.0	UF3	A31	INSTRUMENTATION AND CONTROL OF TURBINE AND FEEDWATER PLANT
25 Aug	800.0	4.0	UP3	A32	VARIOUS, SECONDARY CIRCUIT (SOME NOT EXPLAINED)
07 Sep	17.0	9.0	UP3	A31	BYPASS DEPRESSURIZATION COOLING
11 Sep	5.0	2.0	UP3	A41	HYDROGEN COOLING SYSTEM
02 Oct	439.0	3.0	UP3	A31	VARIOUS, CONDENSERS
16 Nov	248.0	1.0	UP3	A32	VARIOUS, SECONDARY CIRCUIT (SOME NOT EXPLAINED)

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		52			327	
B. Refuelling without a maintenance					17	
C. Inspection, maintenance or repair combined with refuelling	2348			1187	12	
D. Inspection, maintenance or repair without refuelling				36	2	
E. Testing of plant systems or components				5	1	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					89	
Z. Others		208				
Subtotal	2348	260	0	1228	448	0
Total		2608			1676	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		10
14. Safety Systems		50
15. Reactor Cooling Systems		82
16. Steam generation systems		59
31. Turbine and auxiliaries	13	35
32. Feedwater and Main Steam System		9
33. Circulating Water System		1
41. Main Generator Systems		37
42. Electrical Power Supply Systems	39	5
Total	52	293

# FR-31 DAMPIERRE-4

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 890.0 MW(e)  
**Design Net Capacity:** 890.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5547.4 GW(e).h  
**Energy Availability Factor:** 73.4%  
**Load Factor:** 71.2%  
**Operating Factor:** 77.2%  
**Energy Unavailability Factor:** 26.6%  
**Total Off-line Time:** 2001 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	555.4	101.7	0.0	205.5	640.5	614.1	637.3	600.8	333.5	647.6	588.0	623.1	5547.4
<b>EAF (%)</b>	83.9	17.7	0.0	34.2	97.6	97.6	97.5	93.7	54.2	98.9	99.7	99.7	73.4
<b>UCF (%)</b>	100.0	23.5	0.0	34.2	97.6	97.6	97.5	93.7	81.0	98.9	99.8	99.7	77.4
<b>LF (%)</b>	83.9	17.0	0.0	32.1	96.7	95.8	96.2	90.7	52.0	97.7	91.8	94.1	71.2
<b>OF (%)</b>	100.0	23.7	0.0	44.4	99.7	100.0	100.0	96.2	56.3	100.0	100.0	100.0	77.2
<b>EUf (%)</b>	16.1	82.3	100.0	65.8	2.4	2.4	2.5	6.3	45.8	1.1	0.3	0.3	26.6
<b>PUF (%)</b>	0.0	76.5	74.3	9.9	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.1	13.0
<b>UCLF (%)</b>	0.0	0.0	25.7	55.9	2.4	2.4	2.5	6.3	18.9	1.1	0.2	0.2	9.6
<b>XUF (%)</b>	16.1	5.8	0.0	0.0	0.0	0.0	0.0	0.0	26.8	0.0	0.0	0.0	4.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Dec 1975      **Lifetime Generation:** 122153.5 GW(e).h  
**Date of First Criticality:** 05 Aug 1981      **Cumulative Energy Availability Factor:** 76.3%  
**Date of Grid Connection:** 18 Aug 1981      **Cumulative Load Factor:** 70.3%  
**Date of Commercial Operation:** 20 Nov 1981      **Cumulative Unit Capability Factor:** 77.4%  
**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 (%)
1982	5745.6	890.0	81.8	81.8	81.8	81.8	73.7	73.7	7413	84.6
1983	4156.0	890.0	57.6	69.7	57.6	69.7	53.3	63.5	5207	59.4
1984	6276.0	890.0	87.1	75.5	85.1	74.8	80.3	69.1	7765	88.4
1985	5859.9	890.0	83.5	77.5	78.9	75.9	75.2	70.6	7387	84.3
1986	6664.9	890.0	88.8	79.8	88.5	78.4	85.5	73.6	7862	89.7
1987	5447.8	890.0	78.4	79.5	78.1	78.3	69.9	73.0	6795	77.6
1988	5086.0	890.0	82.9	80.0	79.9	78.6	65.1	71.8	6645	75.6
1989	5392.4	890.0	73.7	79.2	72.9	77.9	69.2	71.5	6621	75.6
1990	5153.0	890.0	91.2	80.6	87.3	78.9	66.1	70.9	6792	77.5
1991	6062.8	890.0	88.3	81.3	86.7	79.7	77.8	71.6	7612	86.9
1992	5331.5	890.0	76.7	80.9	74.5	79.2	68.2	71.3	6832	77.8
1993	4827.7	890.0	69.3	79.9	63.4	77.9	61.9	70.5	6103	69.7
1994	5264.0	890.0	80.7	80.0	79.5	78.0	67.5	70.3	7103	81.1
1995	5488.0	890.0	78.8	79.9	75.4	77.8	70.4	70.3	6997	79.9
1996	6118.5	890.0	83.7	80.2	82.9	78.2	78.3	70.8	7596	86.5
1997	5918.6	890.0	80.9	80.2	80.5	78.3	75.9	71.1	7178	81.9
1998	4506.5	890.0	60.6	79.1	59.0	77.2	57.8	70.3	5435	62.0
1999	4642.5	890.0	64.8	78.3	64.1	76.5	59.5	69.7	5770	65.9
2000	5598.7	890.0	76.0	78.2	75.2	76.4	71.6	69.8	6752	76.9
2001	5361.8	890.0	70.9	77.8	70.1	76.1	68.8	69.8	6422	73.3
2002	6134.5	890.0	85.3	78.1	83.8	76.4	78.7	70.2	7576	86.5
2003	5547.4	890.0	77.4	78.1	73.4	76.3	71.2	70.3	6759	77.2

## FR-31 DAMPIERRE-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	901.0	142.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
07 Feb	993.0	884.0	PF	C	REFUELLING AND PARTIAL INSPECTION
21 Mar	72.0	64.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
24 Mar	310.0	276.0	UF3	A	NON-RETURN AND STOP VALVES
05 Apr	246.0	219.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
16 Apr	67.0	21.0	UP3	A41	GENERATOR ELECTRICAL PROTECTION
16 Apr	35.0	31.0	UF3	A41	GENERATOR ELECTRICAL PROTECTION
17 Apr	114.0	43.0	PP	E	START-UP TESTS AFTER REFUELLING
25 Apr	100.0	2.0	UP3	A12	REACTOR CONTROL
01 May	144.0	2.0	UP3	A31	INSTRUMENTATION AND CONTROL OF TURBINE AND FEEDWATER PLANT
07 May	330.0	5.0	UP3	A12	REACTOR CONTROL
21 May	2415.0	53.0	UP3	A31	MAIN CONDENSER
29 Aug	26.0	4.0	UP3	A12	REACTOR INSTRUMENTATION AND CONTROL
30 Aug	216.0	193.0	XF	K	LOAD LIMITATION OR SHUTDOWN TO OPTIMIZE SHUTDOWN
08 Sep	127.0	113.0	UF3	A41	ALTERNATOR ROTOR
08 Sep	14.0	5.0	UP3	A41	ALTERNATOR ROTOR
14 Sep	68.0	1.0	UP3	A12	REACTOR CONTROL
17 Sep	11.0	1.0	PP	E	EQUIPMENT PERFORMANCE TEST (SPECIAL)
18 Sep	98.0	2.0	UP3	A31	MAIN CONDENSER
21 Sep	330.0	16.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
02 Oct	597.0	7.0	UP3	A31	MAIN CONDENSER
01 Nov	349.0	49.0	XP	K	LOAD VARIATION
01 Dec	290.0	35.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		472			498	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	993			996	36	
D. Inspection, maintenance or repair without refuelling				6		
E. Testing of plant systems or components				6	1	
H. Nuclear regulatory requirements					2	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)			216		94	4
Z. Others		318				
Subtotal	993	790	216	1008	632	4
Total		1999			1644	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		66
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		68
14. Safety Systems		7
15. Reactor Cooling Systems		11
16. Steam generation systems		135
31. Turbine and auxiliaries		33
32. Feedwater and Main Steam System		36
33. Circulating Water System		2
41. Main Generator Systems	162	67
42. Electrical Power Supply Systems		5
Total	162	436

# FR-11 FESSENHEIM-1

Operator: EDF (ELECTRICITE DE FRANCE)  
 Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Maximum Net Capacity at the beginning of 2003: 880.0 MW(e)  
 Design Net Capacity: 880.0 MW(e)  
 Design Discharge Burnup: 33700 MW.d/t

## 2. Production Summary 2003

Energy Production: 6985.2 GW(e).h  
 Energy Availability Factor: 96.5%  
 Load Factor: 90.6%  
 Operating Factor: 97.2%  
 Energy Unavailability Factor: 3.5%  
 Total Off-line Time: 242 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	626.2	568.5	590.6	580.0	586.4	608.3	559.6	545.4	601.4	512.1	594.4	612.2	6985.2
EAF (%)	99.8	99.9	98.8	99.1	99.5	99.3	96.7	90.0	99.5	80.7	95.5	99.3	96.5
UCF (%)	99.8	99.9	98.8	99.1	99.6	99.7	96.7	90.0	99.7	96.0	99.4	99.9	98.2
LF (%)	95.6	96.1	90.3	91.5	89.6	96.0	85.5	83.3	94.9	78.1	93.8	93.5	90.6
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.5	100.0	82.7	96.4	94.8	97.2
EUf (%)	0.2	0.1	1.2	0.9	0.5	0.7	3.3	10.0	0.5	19.3	4.5	0.7	3.5
PUF (%)	0.0	0.0	1.0	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.1	0.3
UCLF (%)	0.2	0.1	0.2	0.9	0.4	0.3	3.3	7.7	0.3	4.0	0.6	0.0	1.5
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.2	15.3	3.9	0.6	1.7

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Sep 1971      Lifetime Generation: 136208.8 GW(e).h  
 Date of First Criticality: 07 Mar 1977      Cumulative Energy Availability Factor: 71.0%  
 Date of Grid Connection: 06 Apr 1977      Cumulative Load Factor: 67.3%  
 Date of Commercial Operation: 01 Jan 1978      Cumulative Unit Capability Factor: 77.2%  
    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 (%)
1982	1848.2	880.0	24.0	72.1	24.0	59.5	24.0	59.2	2138	24.4
1983	5690.0	880.0	75.3	72.7	75.3	62.1	73.8	61.6	6701	76.5
1984	6503.0	880.0	86.1	74.6	85.2	65.4	84.1	64.8	7731	88.0
1985	6044.6	880.0	80.4	75.3	79.8	67.2	78.4	66.5	7105	81.1
1986	5661.3	880.0	75.1	75.3	74.7	68.0	73.4	67.3	6702	76.5
1987	5029.6	880.0	74.1	75.2	73.6	68.6	65.2	67.1	6147	70.2
1988	5399.0	880.0	86.5	76.2	77.9	69.4	69.8	67.3	7069	80.5
1989	3253.3	880.0	46.1	73.7	43.4	67.3	42.2	65.2	4108	46.9
1990	5036.7	880.0	79.6	74.1	74.6	67.8	65.3	65.3	6481	74.0
1991	4053.5	880.0	55.8	72.8	55.5	66.9	52.6	64.4	4900	55.9
1992	4867.1	880.0	67.1	72.5	66.8	66.9	63.1	64.3	6079	69.4
1993	5548.7	880.0	81.0	73.0	74.6	67.4	72.0	64.8	7161	81.7
1994	6186.1	880.0	87.4	73.8	86.5	68.5	80.2	65.7	7508	85.7
1995	5856.1	880.0	85.5	74.5	84.7	69.4	76.0	66.2	6990	79.8
1996	6165.0	880.0	85.3	75.0	85.2	70.3	79.8	66.9	7544	85.9
1997	5826.8	880.0	81.6	75.4	81.5	70.8	75.6	67.4	7209	82.3
1998	4617.1	880.0	64.3	74.8	61.7	70.4	59.9	67.0	5727	65.4
1999	5228.8	880.0	71.2	74.7	70.8	70.4	67.8	67.1	6283	71.7
2000	5782.6	880.0	81.1	75.0	80.8	70.9	74.8	67.4	7145	81.3
2001	5507.5	880.0	79.6	75.2	78.4	71.2	71.4	67.6	7095	81.0
2002	2989.7	880.0	42.9	73.9	41.1	70.0	38.8	66.4	3832	43.7
2003	6985.2	880.0	98.2	74.8	96.5	71.0	90.6	67.3	8518	97.2

# FR-11 FESSENHEIM-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	114.0	4.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
07 Jan	1154.0	2.0	UP3	Z	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
08 Mar	28.0	3.0	PP	E	EQUIPMENT PERFORMANCE TEST (SPECIAL)
15 Mar	2.0	2.0	PF	E	TEST OF HOUSE LOAD OPERATION
01 Apr	3325.0	18.0	UP3	Z	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
10 Jun	76.0	2.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
03 Jul	38.0	18.0	UP3	A21	FUEL
15 Aug	15.0	13.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
16 Aug	33.0	29.0	UF3	A13	VENTILATION OF INSTALLATIONS
18 Aug	49.0	18.0	UP3	A32	FEEDWATER PUMP (EXCLUDING TURBINE-DRIVEN FEEDWATER PUMP)
01 Sep	1456.0	5.0	UP3	Z	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
07 Sep	82.0	1.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
11 Oct	113.0	100.0	XF	K	OUTAGE AGREED WITH INTERREGIONAL ELECTRICITY DISPATCHING CENTRE
15 Oct	16.0	14.0	UF3	A41	STATIC EXCITATION SYSTEM
16 Oct	102.0	6.0	UP3	A	MISCELLANEOUS
21 Oct	96.0	3.0	UP3	A32	HIGH-PRESSURE HEATING
15 Nov	30.0	25.0	XF	K	LOAD LIMITATION OR SHUTDOWN TO OPTIMIZE SHUTDOWN
20 Nov	264.0	1.0	UP3	A31	MOISTURE SEPARATOR-REHEATERS
05 Dec	100.0	36.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
16 Dec	321.0	4.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1977 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		49			718	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling				1319	14	
D. Inspection, maintenance or repair without refuelling				62	12	
E. Testing of plant systems or components	17			7	1	
H. Nuclear regulatory requirements					63	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)			143		8	0
Subtotal	17	49	143	1388	819	0
Total		209			2207	

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

System	2003 Hours Lost	1977 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		338
12. Reactor I&C Systems		29
13. Reactor Auxiliary Systems	33	5
14. Safety Systems		15
15. Reactor Cooling Systems		38
16. Steam generation systems		34
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries		91
32. Feedwater and Main Steam System		32
41. Main Generator Systems	16	90
42. Electrical Power Supply Systems		6
XX. Miscellaneous Systems		0
Total	49	678

# FR-12 FESSENHEIM-2

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

**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 880.0 MW(e)  
**Design Net Capacity:** 880.0 MW(e)  
**Design Discharge Burnup:** 33700 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4589.5 GW(e).h  
**Energy Availability Factor:** 60.7%  
**Load Factor:** 59.5%  
**Operating Factor:** 62.0%  
**Energy Unavailability Factor:** 39.3%  
**Total Off-line Time:** 3326 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	571.2	581.6	632.5	409.6	262.6	384.1	0.0	0.0	0.0	500.4	614.3	633.1	4589.5
<b>EAF (%)</b>	87.8	99.0	98.5	65.7	42.1	63.4	0.0	0.0	0.0	77.7	98.8	98.3	60.7
<b>UCF (%)</b>	87.8	99.0	98.5	65.7	42.1	63.5	0.0	0.0	0.0	77.7	98.8	98.3	60.7
<b>LF (%)</b>	87.2	98.4	96.7	64.7	40.1	60.6	0.0	0.0	0.0	76.3	97.0	96.7	59.5
<b>OF (%)</b>	89.4	100.0	100.0	66.8	41.3	64.4	0.0	0.0	0.0	85.6	100.0	100.0	62.0
<b>EUF (%)</b>	12.2	1.0	1.5	34.3	57.9	36.6	100.0	100.0	100.0	22.3	1.2	1.7	39.3
<b>PUF (%)</b>	3.4	0.0	0.0	0.0	0.0	33.3	100.0	56.5	10.9	20.5	0.0	0.0	19.0
<b>UCLF (%)</b>	8.7	1.0	1.5	34.3	57.9	3.3	0.0	43.6	89.1	1.8	1.2	1.8	20.4
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1972      **Lifetime Generation:** 139838.4 GW(e).h  
**Date of First Criticality:** 27 Jun 1977      **Cumulative Energy Availability Factor:** 74.3%  
**Date of Grid Connection:** 07 Oct 1977      **Cumulative Load Factor:** 69.3%  
**Date of Commercial Operation:** 01 Apr 1978      **Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1982	6047.9	880.0	93.1	86.2	93.1	75.8	78.5	71.4	8247	94.1
1983	4315.0	880.0	58.5	80.7	58.5	72.4	56.0	68.4	5206	59.4
1984	6459.0	880.0	88.4	82.0	88.4	75.0	83.6	70.9	7860	89.5
1985	5917.2	880.0	80.0	81.7	78.6	75.6	76.8	71.7	7248	82.7
1986	5522.5	880.0	73.4	80.7	73.2	75.3	71.6	71.7	6573	75.0
1987	6150.1	880.0	83.6	81.0	82.6	76.1	79.8	72.6	7335	83.7
1988	4830.0	880.0	72.4	80.1	69.8	75.5	62.5	71.6	6158	70.1
1989	5643.4	880.0	97.0	81.7	96.2	77.3	73.2	71.7	6944	79.3
1990	3552.4	880.0	52.0	79.2	49.6	75.0	46.1	69.6	4612	52.6
1991	5308.4	880.0	73.3	78.8	72.8	74.9	68.9	69.5	6537	74.6
1992	2202.0	880.0	29.7	75.3	29.7	71.6	28.6	66.6	2699	30.8
1993	5775.1	880.0	81.0	75.6	77.6	72.0	74.9	67.2	7167	81.8
1994	5294.9	880.0	98.5	77.1	98.2	73.7	68.7	67.3	6807	77.7
1995	5098.3	880.0	71.5	76.7	70.5	73.5	66.1	67.2	6305	72.0
1996	6192.1	880.0	84.9	77.2	84.4	74.1	80.1	67.9	7515	85.6
1997	5808.6	880.0	80.6	77.4	80.0	74.4	75.3	68.3	6982	79.7
1998	5597.0	880.0	75.9	77.3	73.7	74.4	72.6	68.5	6797	77.6
1999	6392.6	880.0	87.1	77.8	86.4	74.9	82.9	69.2	7708	88.0
2000	3730.4	880.0	51.4	76.6	51.1	73.8	48.3	68.3	4514	51.4
2001	6699.9	880.0	88.6	77.1	87.3	74.4	86.9	69.1	7876	89.9
2002	6562.6	880.0	87.1	77.5	85.6	74.9	85.1	69.7	7729	88.2
2003	4589.5	880.0	60.7	76.8	60.7	74.3	59.5	69.3	5434	62.0

## FR-12 FESSENHEIM-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	633.0	6.0	UP3	Z	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
01 Jan	23.0	21.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
02 Jan	56.0	49.0	UF3	A	GENERAL CONTROL AND REGULATION CHANNELS
01 Feb	1856.0	23.0	UP3	Z	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
21 Apr	663.0	583.0	UF3	A41	ALTERNATOR ROTOR
01 May	32.0	3.0	UP3	A41	ALTERNATOR ROTOR
20 May	740.0	5.0	UP3	Z	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
18 Jun	18.0	15.0	UF3	A31	INSTRUMENTATION AND CONTROL OF TURBINE AND FEEDWATER PLANT
21 Jun	1403.0	1234.0	PF	C	REFUELLING AND PARTIAL INSPECTION
18 Aug	324.0	285.0	UF3	A41	ALTERNATOR ROTOR
01 Sep	570.0	501.0	UF3	A	NON-RETURN AND STOP VALVES
22 Sep	72.0	63.0	UF3	A22	FRESH AND IRRADIATED FUEL HANDLING
27 Sep	185.0	163.0	PF	C	REFUELLING AND PARTIAL INSPECTION
05 Oct	12.0	10.0	PF	E	START-UP TESTS AFTER REFUELLING
05 Oct	185.0	30.0	PP	E	START-UP TESTS AFTER REFUELLING
13 Oct	403.0	5.0	UP3	A31	MAIN CONDENSER
23 Oct	12.0	6.0	UP3	A12	REACTOR INSTRUMENTATION AND CONTROL
03 Nov	1005.0	11.0	UP3	A31	MAIN CONDENSER
14 Dec	215.0	1.0	UP3	A31	VACUUM CIRCUIT
24 Dec	186.0	4.0	UP3	A32	HIGH-PRESSURE HEATING

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1977 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		1703			464	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1588			1208		8
D. Inspection, maintenance or repair without refuelling				64		
E. Testing of plant systems or components	35			13		1
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling				1		
H. Nuclear regulatory requirements					3	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					7	33
Subtotal	1623	1703	0	1286	484	33
Total		3326			1803	

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

System	2003	1977 to 2003
	Hours Lost	Average Hours Lost Per Year
11. Reactor and Accessories		58
12. Reactor I&C Systems		16
13. Reactor Auxiliary Systems		16
14. Safety Systems		16
15. Reactor Cooling Systems		28
16. Steam generation systems		131
31. Turbine and auxiliaries	18	38
32. Feedwater and Main Steam System		46
33. Circulating Water System		5
41. Main Generator Systems	987	40
42. Electrical Power Supply Systems		6
XX. Miscellaneous Systems		2
Total	1005	402

**FR-46 FLAMANVILLE-1**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1330.0 MW(e)  
 Design Net Capacity: 1330.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 7510.8 GW(e).h  
 Energy Availability Factor: 67.8%  
 Load Factor: 64.5%  
 Operating Factor: 69.5%  
 Energy Unavailability Factor: 32.2%  
 Total Off-line Time: 2670 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	947.6	864.1	866.6	747.9	897.8	863.1	744.5	0.0	0.0	0.0	643.0	936.2	7510.8
EAF (%)	98.5	100.0	92.6	82.4	97.3	97.3	80.1	0.0	0.0	0.0	68.6	99.6	67.8
UCF (%)	98.5	100.0	92.6	82.4	99.6	98.9	80.4	0.0	0.0	0.0	68.6	99.6	68.2
LF (%)	95.8	96.7	87.7	78.1	90.7	90.1	75.2	0.0	0.0	0.0	67.1	94.6	64.5
OF (%)	99.2	100.0	93.3	82.8	100.0	99.3	80.8	0.0	0.0	0.0	81.5	100.0	69.5
EUf (%)	1.5	0.0	7.4	17.6	2.7	2.7	19.9	100.0	100.0	100.0	31.4	0.4	32.2
PUF (%)	0.1	0.0	0.0	0.0	0.0	0.0	19.5	100.0	100.0	35.4	12.0	0.0	22.4
UCLF (%)	1.5	0.0	7.4	17.5	0.4	1.1	0.1	0.0	0.0	64.6	19.4	0.4	9.5
XUF (%)	0.0	0.0	0.0	0.0	2.3	1.7	0.3	0.0	0.0	0.0	0.0	0.0	0.4

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Dec 1979      Lifetime Generation: 138693.7 GW(e).h  
 Date of First Criticality: 29 Sep 1985      Cumulative Energy Availability Factor: 72.7%  
 Date of Grid Connection: 04 Dec 1985      Cumulative Load Factor: 67.4%  
 Date of Commercial Operation: 01 Dec 1986      Cumulative Unit Capability Factor: 78.1%  
    Cumulative Energy Unavailability Factor: 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 (%)
1985	0.0	1290.0	0.0	0.0	100.0	100.0	0.0	0.0	0	0.0
1986	5273.0	1290.0	0.0	0.0	46.4	100.0	46.7	0.0	4840	55.3
1987	7150.8	1290.0	63.2	63.2	62.2	62.2	63.3	63.3	5656	64.6
1988	7175.0	1330.0	67.4	65.4	66.0	64.1	61.4	62.3	5757	65.5
1989	8775.2	1330.0	81.0	70.6	80.6	69.7	75.3	66.7	7146	81.6
1990	7090.0	1330.0	67.0	69.7	65.7	68.7	60.9	65.2	6360	72.6
1991	5882.9	1330.0	68.3	69.5	59.4	66.8	50.5	62.3	5481	62.6
1992	7606.8	1330.0	66.2	68.9	66.2	66.7	65.1	62.7	5901	67.2
1993	9301.8	1330.0	96.8	72.9	87.2	69.6	79.8	65.2	7936	90.6
1994	7145.8	1330.0	80.1	73.8	75.3	70.3	61.3	64.7	6515	74.4
1995	7665.1	1330.0	77.4	74.2	73.2	70.7	65.8	64.8	6654	76.0
1996	8598.3	1330.0	84.6	75.3	77.8	71.4	73.6	65.7	7050	80.3
1997	6853.9	1330.0	63.9	74.2	62.3	70.6	58.8	65.1	5529	63.1
1998	9469.4	1330.0	86.7	75.3	86.7	71.9	81.3	66.4	7855	89.7
1999	6979.4	1330.0	66.1	74.6	64.4	71.3	59.9	65.9	5906	67.4
2000	8035.3	1330.0	75.5	74.6	74.5	71.6	68.8	66.1	6607	75.2
2001	10038.5	1330.0	92.6	75.8	92.5	73.0	86.2	67.5	8126	92.8
2002	8141.8	1330.0	75.5	75.8	73.1	73.0	69.9	67.6	6736	76.9
2003	7510.8	1330.0	68.2	75.4	67.8	72.7	64.5	67.4	6090	69.5



# FR-46 FLAMANVILLE-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	177.0	21.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Jan	414.0	5.0	UP3	K	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
18 Jan	6.0	8.0	UF3	A31	CONTROL AND PROTECTION SYSTEMS
29 Jan	479.0	30.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Mar	253.0	40.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
29 Mar	13.0	18.0	UF3	A	VALVE DRIVE SYSTEM
30 Mar	158.0	210.0	UF3	A41	STATIC EXCITATION SYSTEM
06 Apr	278.0	34.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 May	324.0	64.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
12 May	49.0	23.0	XP	R	LOAD LIMITATION OR SHUTDOWN CAUSED BY INDUSTRIAL ACTION
01 Jun	285.0	76.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Jul	311.0	41.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
22 Jul	37.0	1.0	UP3	Z	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
25 Jul	1871.0	2489.0	PF	C	REFUELLING AND PARTIAL INSPECTION
12 Oct	48.0	64.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
14 Oct	72.0	96.0	UF3	A14	LOW-HEAD SAFETY INJECTION SYSTEM
17 Oct	72.0	96.0	UF3	A13	CHEMICAL AND VOLUME CONTROL SYSTEM WITHOUT PUMP
20 Oct	236.0	314.0	UF3	A	PARALLEL AND TAPER-SEAT VALVES
29 Oct	48.0	64.0	UF3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
01 Nov	85.0	112.0	UF3	A	CONTROL AND ISOLATING VALVES
04 Nov	48.0	64.0	UF3	A	VALVE DRIVE SYSTEM
05 Nov	337.0	115.0	PP	E	START-UP TESTS AFTER REFUELLING
20 Nov	584.0	8.0	UP3	A	VARIOUS, SECONDARY CIRCUIT (SOME NOT EXPLAINED)
06 Dec	183.0	42.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		738			804	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	1871			931		
D. Inspection, maintenance or repair without refuelling				41		
E. Testing of plant systems or components				14	2	
J. Grid failure or grid unavailability						2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					26	41
Z. Others		48				
Subtotal	1871	786	0	986	834	43
Total		2657			1863	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		155
12. Reactor I&C Systems		45
13. Reactor Auxiliary Systems	72	17
14. Safety Systems	72	12
15. Reactor Cooling Systems		29
16. Steam generation systems	48	1
31. Turbine and auxiliaries	6	196
32. Feedwater and Main Steam System		64
33. Circulating Water System		4
41. Main Generator Systems	158	165
42. Electrical Power Supply Systems		53
XX. Miscellaneous Systems		5
Total	356	746

**FR-47 FLAMANVILLE-2**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1330.0 MW(e)  
 Design Net Capacity: 1330.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 10065.3 GW(e).h  
 Energy Availability Factor: 93.4%  
 Load Factor: 86.4%  
 Operating Factor: 95.5%  
 Energy Unavailability Factor: 6.6%  
 Total Off-line Time: 395 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	859.7	825.7	880.1	790.3	735.9	759.4	686.4	917.5	767.0	951.5	926.0	965.9	10065.3
EAF (%)	98.8	100.0	98.2	87.9	89.2	89.6	73.7	99.3	84.6	99.7	100.0	100.0	93.4
UCF (%)	98.8	100.0	98.2	87.9	89.2	91.5	73.8	99.7	85.0	100.0	100.0	100.0	93.6
LF (%)	86.9	92.4	89.1	82.5	74.4	79.3	69.4	92.7	80.1	96.0	96.7	97.6	86.4
OF (%)	96.0	100.0	100.0	100.0	89.4	94.4	80.8	100.0	85.7	100.0	100.0	100.0	95.5
EUf (%)	1.2	0.0	1.8	12.1	10.8	10.4	26.3	0.7	15.4	0.3	0.0	0.0	6.6
PUF (%)	0.0	0.0	0.0	0.0	0.0	8.4	4.3	0.0	0.0	0.0	0.0	0.0	1.1
UCLF (%)	1.2	0.0	1.8	12.1	10.8	0.1	21.9	0.3	15.0	0.0	0.0	0.0	5.3
XUF (%)	0.0	0.0	0.0	0.0	0.0	1.9	0.1	0.4	0.4	0.2	0.0	0.0	0.2

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 May 1980      Lifetime Generation: 138575.1 GW(e).h  
 Date of First Criticality: 12 Jun 1986      Cumulative Energy Availability Factor: 75.5%  
 Date of Grid Connection: 18 Jul 1986      Cumulative Load Factor: 69.6%  
 Date of Commercial Operation: 09 Mar 1987      Cumulative Unit Capability Factor: 78.2%  
    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	1665.0	1310.0	0.0	0.0	42.3	100.0	28.8	0.0	1915	43.4
1987	7140.2	1290.0	0.0	0.0	87.6	100.0	63.2	0.0	6310	72.0
1988	7106.0	1330.0	67.4	67.4	65.4	65.4	60.8	60.8	5674	64.6
1989	4824.5	1330.0	50.6	59.0	48.7	57.0	41.4	51.1	3836	43.8
1990	7819.6	1330.0	76.6	64.9	75.7	63.3	67.1	56.5	6392	73.0
1991	7965.7	1330.0	72.3	66.7	70.6	65.1	68.4	59.4	6432	73.4
1992	8842.4	1330.0	78.2	69.0	78.0	67.7	75.7	62.7	6962	79.3
1993	7985.2	1330.0	71.4	69.4	69.1	67.9	68.5	63.7	6338	72.4
1994	8384.3	1330.0	75.4	70.3	75.3	69.0	72.0	64.8	6711	76.6
1995	8962.4	1330.0	82.1	71.8	81.4	70.5	76.9	66.4	7264	82.9
1996	9387.5	1330.0	87.5	73.5	86.6	72.3	80.4	67.9	7685	87.5
1997	8546.0	1330.0	95.4	75.7	95.3	74.6	73.4	68.5	7351	83.9
1998	5656.6	1330.0	55.4	73.9	55.4	72.9	48.6	66.6	4880	55.7
1999	7248.9	1330.0	67.4	73.3	65.2	72.2	62.2	66.3	6034	68.9
2000	9907.9	1330.0	94.2	74.9	93.7	73.9	84.8	67.7	8122	92.5
2001	8565.1	1330.0	77.9	75.1	76.2	74.1	73.5	68.1	6863	78.3
2002	8502.3	1330.0	78.0	75.3	77.9	74.3	73.0	68.4	6839	78.1
2003	10065.3	1330.0	93.6	76.5	93.4	75.5	86.4	69.6	8365	95.5

## FR-47 FLAMANVILLE-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
02 Jan	280.0	73.0	XP	K	LOAD VARIATION
01 Feb	254.0	71.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Mar	270.0	93.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCOMAX
01 Apr	196.0	51.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
12 Apr	178.0	116.0	UP3	A32	HIGH-PRESSURE HEATING
01 May	180.0	144.0	XP	K	LOAD VARIATION
12 May	70.0	93.0	UF3	A42	MISCELLANEOUS ELECTRICAL PRODUCTION FOR AUXILIARIES
01 Jun	217.0	96.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCOMAX
07 Jun	40.0	26.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
07 Jun	38.0	51.0	PF	G	UPGRADING WORK OR EXTENSION OF PLANT
01 Jul	167.0	36.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCOMAX
05 Jul	28.0	38.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
18 Jul	115.0	153.0	UF3	A42	MAIN TRANSFORMER WITH FIRE PROTECTION
22 Jul	99.0	62.0	UP3	A32	HIGH-PRESSURE HEATING
01 Aug	321.0	65.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
04 Aug	220.0	4.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Sep	162.0	35.0	XP	K	LOAD VARIATION
01 Sep	284.0	4.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
17 Sep	88.0	117.0	UF3	A32	CHEMICAL CHARACTERISTICS OF THE SECONDARY SYSTEM
22 Sep	106.0	1.0	UP3	A31	MOISTURE SEPARATOR-REHEATERS
22 Sep	14.0	19.0	UF3	L	HUMAN OPERATING ERRORS
01 Oct	254.0	2.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
03 Oct	203.0	27.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
21 Oct	235.0	2.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Nov	320.0	30.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Dec	310.0	24.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		273			666	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling				897	41	
D. Inspection, maintenance or repair without refuelling				121		
E. Testing of plant systems or components	28			27	2	0
G. Major back-fitting, refurbishment or upgrading activities without refuelling	38					
H. Nuclear regulatory requirements					19	
J. Grid failure or grid unavailability						3
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					24	3
L. Human factor related		14				
Subtotal	66	287	0	1045	756	6
Total		353			1807	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		13
12. Reactor I&C Systems		24
13. Reactor Auxiliary Systems		49
14. Safety Systems		26
15. Reactor Cooling Systems		241
16. Steam generation systems		47
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		100
32. Feedwater and Main Steam System	88	38
41. Main Generator Systems		68
42. Electrical Power Supply Systems	185	23
XX. Miscellaneous Systems		5
Total	273	634

**FR-61 GOLFECH-1**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1310.0 MW(e)  
 Design Net Capacity: 1310.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 10342.7 GW(e).h  
 Energy Availability Factor: 93.9%  
 Load Factor: 90.1%  
 Operating Factor: 94.2%  
 Energy Unavailability Factor: 6.1%  
 Total Off-line Time: 508 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	952.1	885.0	971.2	936.5	957.0	860.3	922.3	401.9	701.9	911.7	917.8	925.1	10342.7
EAF (%)	97.0	99.9	100.0	99.9	99.3	94.8	97.4	45.3	99.7	100.0	99.9	95.0	93.9
UCF (%)	97.0	99.9	100.0	99.9	99.8	96.8	97.4	99.9	99.7	100.0	99.9	100.0	99.2
LF (%)	97.7	100.5	99.8	99.3	98.2	91.2	94.6	41.2	74.4	93.4	97.3	94.9	90.1
OF (%)	97.2	100.0	100.0	100.0	100.0	98.8	100.0	45.4	90.0	100.0	100.0	100.0	94.2
EUF (%)	3.0	0.1	0.0	0.1	0.7	5.2	2.6	54.7	0.3	0.0	0.1	5.0	6.1
PUF (%)	0.0	0.1	0.0	0.1	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
UCLF (%)	3.0	0.0	0.0	0.0	0.0	3.1	2.6	0.0	0.3	0.0	0.1	0.0	0.8
XUF (%)	0.0	0.0	0.0	0.0	0.5	2.0	0.0	54.6	0.0	0.0	0.0	5.0	5.3

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 17 Nov 1982      Lifetime Generation: 112383.2 GW(e).h  
 Date of First Criticality: 24 Apr 1990      Cumulative Energy Availability Factor: 80.3%  
 Date of Grid Connection: 07 Jun 1990      Cumulative Load Factor: 73.3%  
 Date of Commercial Operation: 01 Feb 1991      Cumulative Unit Capability Factor: 79.8%  
    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 (%)
1990	1820.6	1310.0	0.0	0.0	60.3	100.0	15.9	0.0	2092	23.9
1991	9536.9	1310.0	0.0	0.0	93.8	100.0	83.1	0.0	8167	93.2
1992	7065.9	1310.0	67.9	67.9	64.3	64.3	61.4	61.4	6128	69.8
1993	7925.6	1310.0	82.6	75.2	72.7	68.5	69.1	65.2	7143	81.5
1994	7756.1	1310.0	81.3	77.3	77.8	71.6	67.6	66.0	7215	82.4
1995	7897.8	1310.0	83.5	78.8	75.6	72.6	68.8	66.7	7005	80.0
1996	8862.4	1310.0	84.8	80.0	83.2	74.7	77.0	68.8	7598	86.5
1997	9151.6	1310.0	94.6	82.5	94.5	78.0	79.7	70.6	8000	91.3
1998	8576.6	1310.0	84.8	82.8	81.1	78.5	74.7	71.2	7472	85.3
1999	7926.3	1310.0	80.8	82.5	77.2	78.3	69.1	70.9	6837	78.0
2000	8766.3	1310.0	94.1	83.8	93.9	80.0	76.2	71.5	7901	89.9
2001	7511.9	1310.0	69.1	82.3	68.4	78.9	65.5	70.9	6147	70.2
2002	9242.4	1310.0	82.5	82.4	81.4	79.1	80.5	71.8	7301	83.3
2003	10342.7	1310.0	99.2	83.8	93.9	80.3	90.1	73.3	8252	94.2

# FR-61 GOLFECH-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
25 Jan	21.0	27.0	UF3	Z	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
04 Mar	1671.0	21.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
11 May	8.0	2.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
01 Jun	631.0	33.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
02 Jun	31.0	19.0	XP	S	LOAD LIMITATION OR SHUTDOWN CAUSED BY INDUSTRIAL ACTION
13 Jun	16.0	7.0	UP3	A33	AIR COOLANT
22 Jun	9.0	12.0	UF3	A33	CIRCULATING PUMP
23 Jun	14.0	9.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
01 Jul	697.0	27.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
04 Jul	39.0	25.0	UP3	A32	FEEDWATER PUMP (EXCLUDING TURBINE-DRIVEN FEEDWATER PUMP)
01 Aug	335.0	20.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
15 Aug	406.0	532.0	XF	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
01 Sep	216.0	3.0	UP3	K	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
10 Sep	178.0	91.0	XP	K	LOAD VARIATION
16 Sep	81.0	4.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Oct	258.0	59.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
02 Oct	167.0	5.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Nov	476.0	20.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
02 Nov	25.0	3.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
03 Nov	176.0	2.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
04 Dec	672.0	49.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1990 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		9			222	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling				897	3	
D. Inspection, maintenance or repair without refuelling				81		
E. Testing of plant systems or components				85		
H. Nuclear regulatory requirements					3	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					13	
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)			406			
Z. Others		21				
Subtotal	0	30	406	1063	245	0
Total		436			1308	

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

System	2003 Hours Lost	1990 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		9
14. Safety Systems		15
15. Reactor Cooling Systems		36
16. Steam generation systems		9
21. Fuel Handling and Storage Facilities		26
31. Turbine and auxiliaries		11
32. Feedwater and Main Steam System		8
33. Circulating Water System	9	7
35. All other I&C Systems		0
41. Main Generator Systems		53
42. Electrical Power Supply Systems		2
Total	9	186

# FR-68 GOLFECH-2

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1310.0 MW(e)  
**Design Net Capacity:** 1310.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7614.9 GW(e).h  
**Energy Availability Factor:** 75.2%  
**Load Factor:** 66.4%  
**Operating Factor:** 81.2%  
**Energy Unavailability Factor:** 24.8%  
**Total Off-line Time:** 1645 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	763.6	0.0	159.5	832.9	722.2	491.3	704.6	569.1	792.1	836.0	849.0	894.5	7614.9
<b>EAF (%)</b>	99.8	0.0	17.8	95.7	91.7	69.5	81.0	66.9	93.5	94.3	94.0	92.9	75.2
<b>UCF (%)</b>	99.8	0.0	17.8	95.7	91.7	69.5	81.0	95.8	93.5	94.3	94.0	92.9	77.7
<b>LF (%)</b>	78.3	0.0	16.4	88.3	74.1	52.1	72.3	58.4	84.0	85.7	90.0	91.8	66.4
<b>OF (%)</b>	100.0	0.0	29.5	100.0	96.9	75.0	100.0	66.9	100.0	100.0	100.0	100.0	81.2
<b>EUf (%)</b>	0.2	100.0	82.2	4.3	8.3	30.5	19.0	33.1	6.5	5.7	6.0	7.1	24.8
<b>PUF (%)</b>	0.0	100.0	54.7	0.9	0.0	0.9	0.2	0.3	0.1	0.0	0.0	0.0	12.5
<b>UCLF (%)</b>	0.2	0.0	27.5	3.5	8.2	29.6	18.7	3.9	6.4	5.7	5.9	7.1	9.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.9	0.0	0.0	0.0	0.0	2.5

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1984      **Lifetime Generation:** 87332.4 GW(e).h  
**Date of First Criticality:** 21 May 1993      **Cumulative Energy Availability Factor:** 82.9%  
**Date of Grid Connection:** 18 Jun 1993      **Cumulative Load Factor:** 75.4%  
**Date of Commercial Operation:** 04 Mar 1994      **Cumulative Unit Capability Factor:** 81.2%  
**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 (%)
1993	2180.0	1310.0	0.0	0.0	65.5	100.0	19.0	0.0	2577	29.4
1994	7281.5	1310.0	0.0	0.0	90.5	100.0	63.5	0.0	6577	75.1
1995	7030.1	1310.0	66.7	66.7	62.9	62.9	61.3	61.3	6002	68.5
1996	9016.4	1310.0	84.7	75.7	83.6	73.3	78.4	69.8	7549	85.9
1997	8649.9	1310.0	83.7	78.3	80.2	75.6	75.4	71.7	7414	84.6
1998	8359.6	1310.0	85.1	80.0	82.9	77.4	72.8	72.0	7222	82.4
1999	9516.9	1310.0	98.0	83.6	97.7	81.5	82.9	74.2	8407	96.0
2000	8877.6	1310.0	84.5	83.8	81.8	81.5	77.1	74.7	7535	85.8
2001	8958.3	1310.0	85.3	84.0	84.3	81.9	78.1	75.1	7586	86.6
2002	9847.1	1310.0	97.3	85.7	97.3	83.8	85.8	76.5	8553	97.6
2003	7614.9	1310.0	77.7	84.8	75.2	82.9	66.4	75.4	7115	81.2

## FR-68 GOLFECH-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	744.0	2.0	UP3	A32	HIGH-PRESSURE HEATING
01 Feb	990.0	1296.0	PF	C	REFUELLING AND PARTIAL INSPECTION
14 Mar	88.0	115.0	UF3	S	INDUSTRIAL ACTION DURING PROGRAMMED OUTAGE, EXTENSION
18 Mar	32.0	42.0	UF3	A42	EMERGENCY GENERATOR
19 Mar	31.0	41.0	UF3	A15	METAL DIAPHRAGM - BELLOWS SEAL VALVES
20 Mar	23.0	30.0	UF3	A13	CONTROL/MONITORING OF REACTOR AUXILIARIES
21 Mar	11.0	15.0	UF3	A	MISCELLANEOUS
22 Mar	219.0	113.0	PP	E	START-UP TESTS AFTER REFUELLING
23 Mar	19.0	25.0	UF3	A	CONTROL AND ISOLATING VALVES
01 Apr	107.0	8.0	PP	E	START-UP TESTS AFTER REFUELLING
05 Apr	84.0	5.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
09 Apr	1231.0	77.0	UP3	A33	AIR COOLANT
30 May	14.0	19.0	UF3	A42	LETDOWN AUXILIARY TRANSFORMER
01 Jun	174.0	227.0	UF3	A	MISCELLANEOUS
07 Jun	7.0	9.0	PF	E	TEST OF HOUSE LOAD OPERATION
08 Jun	532.0	46.0	UP3	A33	AIR COOLANT
01 Jul	739.0	182.0	UP3	A33	AIR COOLANT
01 Aug	485.0	40.0	UP3	A33	AIR COOLANT
03 Aug	214.0	281.0	XF	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
01 Sep	2902.0	228.0	UP3	A33	AIR COOLANT
17 Dec	20.0	13.0	UP3	A32	FEEDWATER PUMP (EXCLUDING TURBINE-DRIVEN FEEDWATER PUMP)

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1993 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		304			348	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	990			611		3
E. Testing of plant systems or components	7			70		
H. Nuclear regulatory requirements					1	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					68	
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)			214			
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)		88				
Subtotal	997	392	214	681	421	0
Total		1603			1102	

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

System	2003 Hours Lost	1993 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		53
13. Reactor Auxiliary Systems	23	5
15. Reactor Cooling Systems	31	13
16. Steam generation systems		4
31. Turbine and auxiliaries		14
32. Feedwater and Main Steam System		1
33. Circulating Water System		2
41. Main Generator Systems		228
42. Electrical Power Supply Systems	46	15
XX. Miscellaneous Systems		1
Total	100	337

# FR-20 GRAVELINES-1

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 910.0 MW(e)  
**Design Net Capacity:** 910.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5919.5 GW(e).h  
**Energy Availability Factor:** 85.1%  
**Load Factor:** 74.3%  
**Operating Factor:** 84.7%  
**Energy Unavailability Factor:** 14.9%  
**Total Off-line Time:** 1340 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	535.9	563.3	584.8	567.8	627.5	621.1	561.9	283.8	0.0	474.5	564.6	534.4	5919.5
<b>EAF (%)</b>	92.3	99.9	100.0	95.2	99.3	97.8	94.8	70.5	0.0	71.3	99.7	99.7	85.1
<b>UCF (%)</b>	100.0	99.9	100.0	95.2	99.3	97.9	94.8	70.5	0.0	71.3	99.7	99.8	85.7
<b>LF (%)</b>	79.1	92.1	86.5	86.7	92.7	94.8	83.0	41.9	0.0	70.0	86.2	78.9	74.3
<b>OF (%)</b>	87.1	100.0	100.0	95.6	100.0	100.0	96.5	57.1	0.0	85.0	100.0	95.3	84.7
<b>EUf (%)</b>	7.7	0.1	0.0	4.8	0.7	2.2	5.2	29.5	100.0	28.7	0.3	0.3	14.9
<b>PUF (%)</b>	0.0	0.1	0.0	4.7	0.1	0.1	0.1	28.8	100.0	27.8	0.0	0.0	13.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.7	2.1	5.2	0.8	0.0	0.9	0.3	0.2	0.9
<b>XUF (%)</b>	7.7	0.0	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1975      **Lifetime Generation:** 127838.7 GW(e).h  
**Date of First Criticality:** 21 Feb 1980      **Cumulative Energy Availability Factor:** 74.8%  
**Date of Grid Connection:** 13 Mar 1980      **Cumulative Load Factor:** 68.8%  
**Date of Commercial Operation:** 25 Nov 1980      **Cumulative Unit Capability Factor:** 77.4%  
**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 (%)
1982	2987.5	910.0	38.2	50.8	38.2	50.8	37.5	49.8	3602	41.1
1983	5537.0	910.0	69.9	57.2	69.9	57.2	69.5	56.4	6237	71.2
1984	6617.0	910.0	86.2	64.4	86.2	64.4	82.8	63.0	7654	87.1
1985	6211.7	910.0	81.3	67.8	80.3	67.6	77.9	65.9	7218	82.4
1986	5725.5	910.0	74.8	69.0	73.4	68.6	71.8	66.9	6508	74.3
1987	4650.1	910.0	89.3	71.9	89.0	71.5	58.3	65.7	5895	67.3
1988	4289.0	910.0	57.6	70.1	57.0	69.7	53.7	64.2	5306	60.4
1989	5109.6	910.0	67.7	69.8	67.7	69.4	64.1	64.2	6224	71.1
1990	4463.6	910.0	61.3	69.0	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	64.8	7250	82.5
1993	5866.9	910.0	93.8	72.4	80.5	70.7	73.6	65.5	7794	89.0
1994	4657.7	910.0	68.6	72.1	67.7	70.5	58.4	65.0	5729	65.4
1995	6123.1	910.0	83.8	72.9	82.8	71.3	76.8	65.8	7461	85.2
1996	6089.2	910.0	83.5	73.6	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	66.8	7236	82.6
1998	6321.4	910.0	87.0	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	75.8	88.1	74.1	81.7	68.5	7705	87.7
2001	5289.4	910.0	67.6	75.4	66.7	73.7	66.4	68.4	6034	68.9
2002	5769.3	915.0	88.7	76.0	86.4	74.3	72.0	68.6	7057	80.6
2003	5919.5	910.0	85.7	76.4	85.1	74.8	74.3	68.8	7420	84.7



## FR-20 GRAVELINES-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
05 Jan	57.0	52.0	XF	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
02 Feb	59.0	2.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
02 Feb	285.0	46.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Mar	313.0	91.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT BELOW MAXIMUM SET POINT PCOMAX
02 Apr	255.0	54.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
20 Apr	32.0	30.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
02 May	91.0	9.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
03 May	54.0	14.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
12 May	1888.0	27.0	UP3	A32	VARIOUS, SECONDARY CIRCUIT (SOME NOT EXPLAINED)
06 Jul	26.0	24.0	UF3	A33	RAW WATER SYSTEM
01 Aug	427.0	5.0	UP3	A	VARIOUS, SECONDARY CIRCUIT (SOME NOT EXPLAINED)
14 Aug	103.0	81.0	XF	K	LOAD LIMITATION OR SHUTDOWN TO OPTIMIZE SHUTDOWN
23 Aug	1046.0	951.0	PF	C	REFUELLING AND PARTIAL INSPECTION
05 Oct	144.0	59.0	PP	E	START-UP TESTS AFTER REFUELLING
05 Oct	30.0	28.0	PF	E	START-UP TESTS AFTER REFUELLING
13 Oct	25.0	5.0	UP3	A32	FEEDWATER PUMP (EXCLUDING TURBINE-DRIVEN FEEDWATER PUMP)
01 Nov	262.0	88.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT BELOW MAXIMUM SET POINT PCOMAX
01 Dec	443.0	109.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1980 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		26			555	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1046			1168	20	
D. Inspection, maintenance or repair without refuelling				13	5	
E. Testing of plant systems or components	62			12	6	
H. Nuclear regulatory requirements					6	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)			160		37	5
Subtotal	1108	26	160	1193	630	5
Total		1294			1828	

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

System	2003 Hours Lost	1980 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		180
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		18
14. Safety Systems		10
15. Reactor Cooling Systems		123
16. Steam generation systems		117
31. Turbine and auxiliaries		24
32. Feedwater and Main Steam System		23
33. Circulating Water System	26	0
41. Main Generator Systems		12
42. Electrical Power Supply Systems		39
Total	26	548

# FR-21 GRAVELINES-2

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 910.0 MW(e)  
**Design Net Capacity:** 910.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6553.9 GW(e).h  
**Energy Availability Factor:** 89.2%  
**Load Factor:** 82.2%  
**Operating Factor:** 91.2%  
**Energy Unavailability Factor:** 10.8%  
**Total Off-line Time:** 774 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	654.3	597.9	625.6	585.7	156.0	394.4	619.0	615.8	572.7	593.9	583.5	555.2	6553.9
<b>EAF (%)</b>	99.9	99.9	93.4	97.8	28.4	61.4	97.0	98.6	97.1	99.2	99.1	99.6	89.2
<b>UCF (%)</b>	99.9	99.9	93.5	97.8	28.4	62.2	98.4	99.9	98.3	99.5	99.1	99.6	89.6
<b>LF (%)</b>	96.6	97.8	92.5	89.4	23.0	60.2	91.4	90.9	87.4	87.6	89.1	82.0	82.2
<b>OF (%)</b>	100.0	100.0	95.8	100.0	29.3	71.9	100.0	100.0	97.9	100.0	100.0	100.0	91.2
<b>EUf (%)</b>	0.1	0.1	6.6	2.2	71.6	38.6	3.0	1.4	2.9	0.8	0.9	0.4	10.8
<b>PUF (%)</b>	0.1	0.1	0.0	0.0	71.0	34.4	0.1	0.0	0.1	0.0	0.1	0.0	8.9
<b>UCLF (%)</b>	0.0	0.1	6.5	2.2	0.6	3.4	1.6	0.1	1.7	0.5	0.8	0.4	1.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.7	1.4	1.3	1.2	0.3	0.0	0.0	0.4

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Mar 1975      **Lifetime Generation:** 134303.0 GW(e).h  
**Date of First Criticality:** 02 Aug 1980      **Cumulative Energy Availability Factor:** 78.6%  
**Date of Grid Connection:** 26 Aug 1980      **Cumulative Load Factor:** 72.5%  
**Date of Commercial Operation:** 01 Dec 1980      **Cumulative Unit Capability Factor:** 77.4%  
**Cumulative Energy Unavailability Factor:** 21.4%

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	2118.5	910.0	29.2	64.8	29.2	55.4	26.6	50.3	2732	31.2
1983	6130.0	910.0	78.6	69.4	77.9	62.8	76.9	59.2	6917	79.0
1984	5749.0	910.0	82.0	72.5	82.0	67.6	71.9	62.3	6751	76.9
1985	6829.7	910.0	90.2	76.1	89.7	72.0	85.7	67.0	7950	90.8
1986	6422.0	910.0	96.6	79.5	96.4	76.1	80.6	69.3	7956	90.8
1987	5357.9	910.0	77.4	79.2	75.2	76.0	67.2	69.0	6807	77.7
1988	5577.0	910.0	81.3	79.4	77.2	76.1	69.8	69.1	7227	82.3
1989	6412.9	910.0	84.6	80.0	83.6	76.9	80.4	70.3	7460	85.2
1990	6143.1	910.0	80.6	80.1	79.6	77.2	77.1	71.0	7164	81.8
1991	4915.9	910.0	63.5	78.6	63.0	75.9	61.7	70.2	5648	64.5
1992	6124.2	910.0	80.6	78.7	78.2	76.1	76.6	70.7	7149	81.4
1993	6219.9	910.0	82.3	79.0	79.3	76.3	78.0	71.3	7297	83.3
1994	6293.7	910.0	86.3	79.5	82.7	76.8	79.0	71.8	7638	87.2
1995	5599.7	910.0	75.6	79.3	74.6	76.7	70.2	71.7	6735	76.9
1996	5235.9	910.0	70.7	78.7	69.7	76.2	65.5	71.3	6361	72.4
1997	6641.2	910.0	98.0	79.9	97.8	77.5	83.3	72.0	8006	91.4
1998	5531.4	910.0	82.2	80.0	82.1	77.7	69.4	71.9	6896	78.7
1999	6394.4	910.0	87.8	80.4	85.3	78.1	80.2	72.3	7705	88.0
2000	5582.7	910.0	80.5	80.4	77.3	78.1	69.8	72.2	6952	79.1
2001	5984.5	910.0	85.5	80.7	85.0	78.4	75.1	72.3	7601	86.8
2002	5254.3	915.0	74.4	80.4	72.4	78.2	65.6	72.0	6658	76.0
2003	6553.9	910.0	89.6	80.8	89.2	78.6	82.2	72.5	7986	91.2

## FR-21 GRAVELINES-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	272.0	22.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT BELOW MAXIMUM SET POINT PCOMAX
02 Feb	150.0	14.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Mar	111.0	3.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
08 Mar	31.0	28.0	UF3	A42	6.6 KV OR 5.5 KV EQUIPMENT
10 Mar	491.0	9.0	UP3	A32	HIGH-PRESSURE HEATING
01 Apr	934.0	18.0	UP3	A32	HIGH-PRESSURE HEATING
09 May	708.0	645.0	PF	C	REFUELLING WITH NO INSPECTION
08 Jun	15.0	14.0	UF3	A12	REACTOR INSTRUMENTATION AND CONTROL
09 Jun	242.0	49.0	PP	E	START-UP TESTS AFTER REFUELLING
21 Jun	240.0	5.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Jul	363.0	9.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
05 Jul	26.0	5.0	UP3	A12	REACTOR CONTROL
07 Jul	209.0	35.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Aug	366.0	39.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
01 Aug	333.0	9.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Sep	356.0	70.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Oct	251.0	74.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Oct	152.0	2.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Nov	1259.0	7.0	UP3	A32	VARIOUS, SECONDARY CIRCUIT (SOME NOT EXPLAINED)
24 Dec	121.0	38.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1980 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		46			158	
C. Inspection, maintenance or repair combined with refuelling	708			1093	53	
D. Inspection, maintenance or repair without refuelling				81		
E. Testing of plant systems or components				31		
J. Grid failure or grid unavailability						2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				25	56	68
Subtotal	708	46	0	1230	267	70
Total		754			1567	

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

System	2003 Hours Lost	1980 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		9
12. Reactor I&C Systems	15	7
13. Reactor Auxiliary Systems		8
14. Safety Systems		3
15. Reactor Cooling Systems		29
16. Steam generation systems		27
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries		12
32. Feedwater and Main Steam System		8
41. Main Generator Systems		28
42. Electrical Power Supply Systems	31	11
Total	46	143

# FR-27 GRAVELINES-3

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 910.0 MW(e)  
**Design Net Capacity:** 910.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6045.5 GW(e).h  
**Energy Availability Factor:** 85.8%  
**Load Factor:** 75.8%  
**Operating Factor:** 85.4%  
**Energy Unavailability Factor:** 14.2%  
**Total Off-line Time:** 1278 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	614.1	245.4	0.0	587.8	592.8	593.6	612.6	559.4	531.2	573.9	566.8	567.8	6045.5
<b>EAF (%)</b>	99.2	50.0	0.0	93.5	94.8	99.1	98.0	98.5	98.3	98.1	99.0	98.8	85.8
<b>UCF (%)</b>	99.2	50.0	0.0	93.5	94.8	99.1	98.0	98.5	98.3	98.1	99.0	98.8	85.8
<b>LF (%)</b>	90.7	40.1	0.0	89.7	87.6	90.6	90.5	82.6	81.1	84.6	86.5	83.9	75.8
<b>OF (%)</b>	100.0	50.3	0.0	99.0	95.2	100.0	100.0	96.9	99.7	96.4	95.6	90.1	85.4
<b>EUf (%)</b>	0.8	50.0	100.0	6.5	5.2	0.9	2.0	1.5	1.7	1.9	1.0	1.2	14.2
<b>PUF (%)</b>	0.0	49.7	96.8	5.2	0.0	0.0	0.7	0.6	0.1	0.0	0.0	0.1	12.6
<b>UCLF (%)</b>	0.8	0.3	3.2	1.3	5.2	0.9	1.3	1.0	1.6	1.9	1.0	1.1	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Dec 1975      **Lifetime Generation:** 133991.0 GW(e).h  
**Date of First Criticality:** 30 Nov 1980      **Cumulative Energy Availability Factor:** 79.2%  
**Date of Grid Connection:** 12 Dec 1980      **Cumulative Load Factor:** 73.3%  
**Date of Commercial Operation:** 01 Jun 1981      **Cumulative Unit Capability Factor:** 77.4%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	3445.0	910.0	47.6	47.6	47.6	47.6	43.2	43.2	4260	48.6
1983	6006.0	910.0	81.3	64.5	81.4	64.5	75.3	59.3	7194	82.1
1984	6746.0	910.0	83.9	71.0	83.9	71.0	84.4	67.7	7505	85.4
1985	6294.4	910.0	80.1	73.3	80.1	73.2	79.0	70.5	7151	81.6
1986	6504.5	910.0	81.7	74.9	81.7	74.9	81.6	72.7	7335	83.7
1987	5382.9	910.0	75.5	75.0	74.3	74.8	67.5	71.8	6188	70.6
1988	4819.0	910.0	96.2	78.1	95.4	77.8	60.3	70.2	6724	76.5
1989	6307.7	910.0	82.3	78.6	79.5	78.0	79.1	71.3	7320	83.6
1990	6121.5	910.0	80.7	78.8	77.6	78.0	76.8	71.9	7114	81.2
1991	6306.3	910.0	81.3	79.1	80.5	78.2	79.1	72.6	7086	80.9
1992	4772.4	910.0	60.4	77.4	60.0	76.5	59.7	71.5	5388	61.3
1993	6588.1	910.0	85.2	78.0	82.9	77.1	82.6	72.4	7567	86.4
1994	6308.9	910.0	83.8	78.5	83.0	77.5	79.1	72.9	7116	81.2
1995	6221.7	910.0	84.3	78.9	83.0	77.9	78.0	73.3	7326	83.6
1996	5937.2	910.0	85.9	79.4	83.0	78.3	74.3	73.3	7377	84.0
1997	5752.7	910.0	81.1	79.5	78.9	78.3	72.2	73.3	6938	79.2
1998	6152.4	910.0	83.9	79.7	83.0	78.6	77.2	73.5	7330	83.7
1999	5412.9	910.0	79.1	79.7	76.9	78.5	67.9	73.2	6709	76.6
2000	6112.4	910.0	84.6	80.0	82.9	78.7	76.5	73.4	7396	84.2
2001	6198.0	910.0	92.6	80.6	83.9	79.0	77.8	73.6	7597	86.7
2002	5282.5	915.0	76.8	80.4	76.8	78.9	65.9	73.2	6401	73.1
2003	6045.5	910.0	85.8	80.7	85.8	79.2	75.8	73.3	7482	85.4

## FR-27 GRAVELINES-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	1082.0	7.0	UP3	A32	VARIOUS, SECONDARY CIRCUIT (SOME NOT EXPLAINED)
15 Feb	1029.0	937.0	PF	C	REFUELLING AND PARTIAL INSPECTION
29 Mar	14.0	12.0	PF	E	START-UP TESTS AFTER REFUELLING
30 Mar	32.0	29.0	UF3	A31	LUBRICATION SYSTEM (EXCLUDING JACKING SYSTEM)
01 Apr	152.0	34.0	PP	E	START-UP TESTS AFTER REFUELLING
13 Apr	224.0	18.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 May	308.0	46.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
30 May	36.0	33.0	UF3	A	CONTROL AND ISOLATING VALVES
01 Jun	1436.0	9.0	UP3	A31	MAIN CONDENSER
01 Aug	10.0	3.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
01 Aug	2718.0	16.0	UP3	A31	MAIN CONDENSER
19 Sep	20.0	6.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
03 Oct	26.0	8.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
19 Nov	36.0	3.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Dec	219.0	1.0	UP3	A31	MAIN CONDENSER
11 Dec	320.0	66.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
31 Dec	10.0	4.0	UP3	A33	VARIOUS, PUMPHOUSE-CIRCULATING WATER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		68			315	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	1029			1038	33	
D. Inspection, maintenance or repair without refuelling				1		
E. Testing of plant systems or components	14			7	1	3
H. Nuclear regulatory requirements						1
J. Grid failure or grid unavailability						9
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					30	77
Subtotal	1043	68	0	1046	381	90
Total		1111			1517	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		14
12. Reactor I&C Systems		10
13. Reactor Auxiliary Systems		14
14. Safety Systems		5
15. Reactor Cooling Systems		35
16. Steam generation systems		52
31. Turbine and auxiliaries	32	24
32. Feedwater and Main Steam System		14
41. Main Generator Systems		86
42. Electrical Power Supply Systems		20
XX. Miscellaneous Systems		8
Total	32	282

# FR-28 GRAVELINES-4

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 910.0 MW(e)  
**Design Net Capacity:** 910.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5701.9 GW(e).h  
**Energy Availability Factor:** 74.2%  
**Load Factor:** 71.5%  
**Operating Factor:** 75.2%  
**Energy Unavailability Factor:** 25.8%  
**Total Off-line Time:** 2171 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	661.4	600.1	646.0	612.7	622.8	628.9	81.6	0.0	0.0	574.9	625.1	648.5	5701.9
<b>EAF (%)</b>	98.3	100.0	99.9	98.8	99.2	99.2	12.9	0.0	0.0	85.2	99.5	99.7	74.2
<b>UCF (%)</b>	98.3	100.0	99.9	98.8	99.2	99.2	12.9	0.0	0.0	85.2	99.5	99.8	74.2
<b>LF (%)</b>	97.7	98.1	95.5	93.5	92.0	96.0	12.1	0.0	0.0	84.8	95.4	95.8	71.5
<b>OF (%)</b>	98.5	100.0	100.0	100.0	100.0	100.0	12.4	0.0	0.0	94.1	100.0	100.0	75.2
<b>EU (%)</b>	1.7	0.0	0.1	1.2	0.8	0.8	87.1	100.0	100.0	14.8	0.5	0.3	25.8
<b>PU (%)</b>	0.1	0.0	0.0	0.0	0.2	0.2	87.1	100.0	100.0	8.3	0.0	0.0	24.8
<b>UCLF (%)</b>	1.6	0.0	0.1	1.2	0.6	0.6	0.1	0.0	0.0	6.5	0.5	0.3	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1976      **Lifetime Generation:** 130086.9 GW(e).h  
**Date of First Criticality:** 31 May 1981      **Cumulative Energy Availability Factor:** 77.7%  
**Date of Grid Connection:** 14 Jun 1981      **Cumulative Load Factor:** 72.6%  
**Date of Commercial Operation:** 01 Oct 1981      **Cumulative Unit Capability Factor:** 77.4%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	5498.2	910.0	80.8	80.8	80.8	80.8	69.0	69.0	7193	82.1
1983	4062.0	910.0	55.4	68.1	55.4	68.1	51.0	60.0	4986	56.9
1984	6006.0	910.0	82.8	73.0	82.8	73.0	75.1	65.0	7173	81.7
1985	6178.8	910.0	83.6	75.6	80.9	74.9	77.5	68.1	7387	84.3
1986	6556.6	910.0	88.7	78.2	88.6	77.7	82.2	71.0	7862	89.7
1987	5472.8	910.0	77.2	78.1	75.8	77.4	68.7	70.6	6787	77.5
1988	6221.0	910.0	87.8	79.5	85.9	78.6	77.8	71.6	7789	88.7
1989	4982.3	910.0	67.4	78.0	66.9	77.1	62.5	70.5	6025	68.8
1990	6151.7	910.0	79.4	78.1	77.2	77.1	77.2	71.2	7058	80.6
1991	6262.0	910.0	81.8	78.5	80.5	77.5	78.6	72.0	7067	80.7
1992	6419.8	910.0	81.0	78.7	80.2	77.7	80.3	72.7	7137	81.3
1993	4680.6	910.0	76.5	78.5	75.3	77.5	58.7	71.6	6112	69.8
1994	6039.3	910.0	83.3	78.9	82.5	77.9	75.8	71.9	6824	77.9
1995	6289.5	910.0	86.4	79.4	85.4	78.4	78.9	72.4	7313	83.5
1996	6288.4	910.0	85.5	79.8	83.2	78.7	78.7	72.8	7552	86.0
1997	5986.7	910.0	81.3	79.9	80.5	78.9	75.1	72.9	7206	82.3
1998	6519.3	910.0	85.4	80.3	84.1	79.2	81.8	73.5	7570	86.4
1999	5550.9	910.0	76.4	80.0	74.3	78.9	69.6	73.2	6734	76.9
2000	4563.6	910.0	69.5	79.5	57.7	77.8	57.1	72.4	5453	62.1
2001	5990.7	910.0	79.8	79.5	78.3	77.8	75.2	72.5	7094	81.0
2002	6028.1	915.0	81.2	79.6	80.1	77.9	75.2	72.7	7219	82.4
2003	5701.9	910.0	74.2	79.3	74.2	77.7	71.5	72.6	6589	75.2

## FR-28 GRAVELINES-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
03 Jan	11.0	10.0	UF3	L	HUMAN ERRORS DURING TESTING
07 Jan	177.0	7.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
02 Feb	224.0	7.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Mar	281.0	18.0	XP	K	LOAD VARIATION
01 Apr	2095.0	13.0	UP3	A31	MAIN CONDENSER
08 Apr	17.0	2.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
04 Jul	2103.0	1914.0	PF	C	REFUELLING AND 10-YEARLY INSPECTION
30 Sep	13.0	13.0	PF	E	START-UP TESTS AFTER REFUELLING
01 Oct	124.0	49.0	PP	E	START-UP TESTS AFTER REFUELLING
06 Oct	375.0	2.0	UP3	A32	VARIOUS, SECONDARY CIRCUIT (SOME NOT EXPLAINED)
08 Oct	44.0	40.0	UF3	A14	STEAM GENERATOR EMERGENCY FEED SYSTEMS
01 Nov	544.0	2.0	UP3	A32	VARIOUS, SECONDARY CIRCUIT (SOME NOT EXPLAINED)
18 Nov	62.0	4.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Dec	384.0	1.0	UP3	A32	VARIOUS, SECONDARY CIRCUIT (SOME NOT EXPLAINED)
05 Dec	61.0	1.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
05 Dec	21.0	1.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		44			418	
C. Inspection, maintenance or repair combined with refuelling	2103			1066	12	
D. Inspection, maintenance or repair without refuelling				8	16	
E. Testing of plant systems or components	13			2	1	1
H. Nuclear regulatory requirements					12	
J. Grid failure or grid unavailability						2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					14	41
L. Human factor related		11				
Subtotal	2116	55	0	1076	473	44
Total		2171			1593	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		25
12. Reactor I&C Systems		64
13. Reactor Auxiliary Systems		4
14. Safety Systems	44	9
15. Reactor Cooling Systems		42
16. Steam generation systems		78
21. Fuel Handling and Storage Facilities		3
31. Turbine and auxiliaries		36
32. Feedwater and Main Steam System		31
33. Circulating Water System		0
41. Main Generator Systems		41
42. Electrical Power Supply Systems		71
Total	44	404

## FR-51 GRAVELINES-5

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 910.0 MW(e)  
 Design Net Capacity: 910.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

### 2. Production Summary 2003

Energy Production: 6473.4 GW(e).h  
 Energy Availability Factor: 84.3%  
 Load Factor: 81.2%  
 Operating Factor: 85.8%  
 Energy Unavailability Factor: 15.7%  
 Total Off-line Time: 1242 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	648.7	614.2	656.2	341.5	0.0	459.2	650.6	656.0	634.9	617.2	595.8	599.2	6473.4
EAF (%)	99.1	99.9	97.8	52.5	0.0	75.0	99.4	98.2	99.4	97.1	94.7	99.7	84.3
UCF (%)	99.1	99.9	100.0	60.1	0.0	75.2	99.5	98.3	99.4	97.1	94.7	99.7	85.1
LF (%)	95.8	100.4	97.1	52.1	0.0	70.1	96.1	96.9	96.9	91.0	90.9	88.5	81.2
OF (%)	96.6	100.0	100.0	60.4	0.0	85.7	100.0	100.0	100.0	100.0	95.6	92.9	85.8
EUf (%)	0.9	0.1	2.2	47.5	100.0	25.0	0.6	1.8	0.6	2.9	5.3	0.3	15.7
PUF (%)	0.0	0.1	0.0	39.9	100.0	24.2	0.0	0.0	0.1	0.0	0.1	0.0	13.8
UCLF (%)	0.9	0.0	0.0	0.0	0.0	0.6	0.5	1.8	0.5	2.9	5.3	0.3	1.1
XUF (%)	0.0	0.0	2.2	7.5	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.8

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Oct 1979      Lifetime Generation: 113327.1 GW(e).h  
 Date of First Criticality: 05 Aug 1984      Cumulative Energy Availability Factor: 80.5%  
 Date of Grid Connection: 28 Aug 1984      Cumulative Load Factor: 74.2%  
 Date of Commercial Operation: 15 Jan 1985      Cumulative Unit Capability Factor: 77.8%  
    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 (%)
1984	876.0	910.0	0.0	0.0	75.3	100.0	11.9	0.0	1573	19.4
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	82.7	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



## FR-51 GRAVELINES-5

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	6.0	5.0	UF3	A31	BYPASS DEPRESSURIZATION COOLING
01 Jan	145.0	9.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
02 Feb	117.0	3.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Mar	160.0	6.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
08 Mar	880.0	64.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
19 Apr	1132.0	1029.0	PF	C	REFUELLING AND PARTIAL INSPECTION
05 Jun	147.0	61.0	PP	E	START-UP TESTS AFTER REFUELLING
19 Jun	127.0	26.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
20 Jun	21.0	4.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
01 Jul	30.0	3.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
04 Jul	2561.0	11.0	UP3	A31	MAIN CONDENSER
02 Oct	743.0	23.0	UP3	A32	HIGH-PRESSURE HEATING
01 Nov	32.0	29.0	UF3	A32	HIGH-PRESSURE HEATING
01 Dec	238.0	29.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
24 Dec	85.0	2.0	UP3	A32	HIGH-PRESSURE HEATING

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		38			340	
C. Inspection, maintenance or repair combined with refuelling	1132			921	31	
D. Inspection, maintenance or repair without refuelling				4		
E. Testing of plant systems or components				2	0	
H. Nuclear regulatory requirements					1	
J. Grid failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					12	0
Subtotal	1132	38	0	927	384	1
Total		1170			1312	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		16
12. Reactor I&C Systems		12
13. Reactor Auxiliary Systems		22
14. Safety Systems		1
15. Reactor Cooling Systems		112
16. Steam generation systems		9
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries	6	18
32. Feedwater and Main Steam System	32	9
33. Circulating Water System		2
41. Main Generator Systems		51
42. Electrical Power Supply Systems		51
Total	38	304

## FR-52 GRAVELINES-6

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 910.0 MW(e)  
 Design Net Capacity: 910.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

### 2. Production Summary 2003

Energy Production: 6462.6 GW(e).h  
 Energy Availability Factor: 82.5%  
 Load Factor: 81.1%  
 Operating Factor: 84.6%  
 Energy Unavailability Factor: 17.5%  
 Total Off-line Time: 1350 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	676.9	619.4	647.8	572.9	652.0	569.5	647.8	602.4	638.3	323.7	0.0	511.8	6462.6
EAF (%)	99.1	99.9	100.0	88.8	99.3	92.6	98.4	91.0	97.6	48.2	0.0	75.2	82.5
UCF (%)	99.1	99.9	100.0	88.8	99.3	92.6	98.4	91.0	100.0	54.7	0.0	75.2	83.3
LF (%)	100.0	101.3	95.8	87.4	96.3	86.9	95.7	89.0	97.4	47.8	0.0	75.6	81.1
OF (%)	100.0	100.0	100.0	91.0	100.0	93.6	100.0	91.5	100.0	53.7	0.0	85.1	84.6
EUf (%)	0.9	0.1	0.0	11.2	0.7	7.4	1.6	9.0	2.4	51.8	100.0	24.8	17.5
PUF (%)	0.0	0.1	0.0	0.1	0.0	7.3	0.1	5.0	0.0	45.3	100.0	22.8	15.1
UCLF (%)	0.9	0.0	0.0	11.1	0.7	0.1	1.5	4.0	0.0	0.0	0.0	2.0	1.7
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	6.5	0.0	0.0	0.8

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Oct 1979      Lifetime Generation: 110190.2 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: 75.1%  
 Date of Commercial Operation: 25 Oct 1985      Cumulative Unit Capability Factor: 77.8%  
    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	2337.1	910.0	0.0	0.0	88.0	100.0	29.3	0.0	3111	35.5
1986	5540.4	910.0	76.3	76.3	75.9	75.9	69.5	69.5	6677	76.2
1987	5583.9	910.0	80.6	78.4	80.1	78.0	70.0	69.8	7031	80.3
1988	6490.0	910.0	83.8	80.2	81.4	79.2	81.2	73.6	7453	84.8
1989	5177.3	910.0	71.2	78.0	71.1	77.1	64.9	71.4	6274	71.6
1990	6120.3	910.0	87.6	79.9	87.1	79.1	76.8	72.5	7553	86.2
1991	5888.2	910.0	78.5	79.7	77.5	78.8	73.9	72.7	6953	79.4
1992	5085.1	910.0	70.3	78.3	69.0	77.4	63.6	71.4	6246	71.1
1993	5293.6	910.0	82.0	78.8	73.4	76.9	66.4	70.8	6751	77.1
1994	6053.7	910.0	86.0	79.6	83.9	77.7	75.9	71.4	7487	85.5
1995	6769.4	910.0	89.8	80.6	88.8	78.8	84.9	72.7	7922	90.4
1996	6609.5	910.0	86.8	81.2	86.4	79.5	82.7	73.6	7755	88.3
1997	4545.4	910.0	60.6	79.5	59.5	77.8	57.0	72.2	5437	62.1
1998	6531.8	910.0	88.5	80.2	86.1	78.5	81.9	73.0	7746	88.4
1999	6141.4	910.0	80.9	80.2	80.3	78.6	77.0	73.3	7222	82.4
2000	6720.9	910.0	88.7	80.8	87.0	79.2	84.1	74.0	7887	89.8
2001	6148.7	910.0	82.2	80.9	80.2	79.2	77.1	74.2	7265	82.9
2002	6690.9	915.0	87.5	81.3	86.0	79.6	83.5	74.7	7784	88.9
2003	6462.6	910.0	83.3	81.4	82.5	79.8	81.1	75.1	7410	84.6

## FR-52 GRAVELINES-6

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	118.0	5.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
25 Jan	23.0	6.0	UP3	A12	REACTOR CONTROL
03 Feb	128.0	6.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Mar	287.0	32.0	XP	K	LOAD VARIATION
05 Apr	196.0	9.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
16 Apr	65.0	59.0	UF3	A42	6.6 KV OR 5.5 KV EQUIPMENT
20 Apr	27.0	2.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
01 May	157.0	25.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT BELOW MAXIMUM SET POINT PCOMAX
01 Jun	241.0	37.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT BELOW MAXIMUM SET POINT PCOMAX
13 Jun	47.0	42.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
01 Jul	220.0	19.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
04 Jul	25.0	10.0	UP3	A32	FEEDWATER PUMP (EXCLUDING TURBINE-DRIVEN FEEDWATER PUMP)
01 Aug	167.0	12.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Aug	27.0	25.0	UF3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
16 Aug	34.0	31.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
07 Sep	114.0	3.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
10 Sep	796.0	60.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
17 Oct	1153.0	1050.0	PF	C	REFUELLING AND PARTIAL INSPECTION
05 Dec	11.0	10.0	PF	E	START-UP TESTS AFTER REFUELLING
05 Dec	158.0	52.0	PP	E	START-UP TESTS AFTER REFUELLING
05 Dec	13.0	12.0	UF3	A42	MISCELLANEOUS ELECTRICAL PRODUCTION FOR AUXILIARIES
15 Dec	61.0	2.0	UP3	A32	HIGH-PRESSURE HEATING
25 Dec	12.0	4.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		105			346	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	1153			905	39	
D. Inspection, maintenance or repair without refuelling					28	
E. Testing of plant systems or components	92			6		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					45	3
Subtotal	1245	105	0	911	461	3
Total		1350			1375	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		21
13. Reactor Auxiliary Systems		13
14. Safety Systems		20
15. Reactor Cooling Systems		44
16. Steam generation systems	27	1
31. Turbine and auxiliaries		102
32. Feedwater and Main Steam System		20
33. Circulating Water System		0
41. Main Generator Systems		27
42. Electrical Power Supply Systems	78	52
XX. Miscellaneous Systems		0
Total	105	302

**FR-58 NOGENT-1**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1310.0 MW(e)  
 Design Net Capacity: 1310.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 9974.4 GW(e).h  
 Energy Availability Factor: 98.0%  
 Load Factor: 86.9%  
 Operating Factor: 98.4%  
 Energy Unavailability Factor: 2.0%  
 Total Off-line Time: 139 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	881.7	827.2	823.4	808.0	886.9	682.6	815.3	774.8	844.3	911.9	875.7	842.6	9974.4
EAF (%)	100.0	100.0	99.4	99.9	98.9	91.6	99.9	93.3	99.4	100.0	99.9	94.2	98.0
UCF (%)	100.0	100.0	100.0	99.9	100.0	92.8	99.9	93.3	99.4	100.0	99.9	94.4	98.3
LF (%)	90.5	94.0	84.6	85.7	91.0	72.4	83.7	79.5	89.5	93.4	92.8	86.5	86.9
OF (%)	100.0	100.0	100.0	100.0	100.0	93.3	100.0	93.7	99.4	100.0	100.0	94.6	98.4
EUf (%)	0.0	0.0	0.6	0.1	1.1	8.4	0.1	6.7	0.6	0.0	0.1	5.8	2.0
PUF (%)	0.0	0.0	0.0	0.1	0.0	0.0	0.1	6.5	0.6	0.0	0.0	0.0	0.6
UCLF (%)	0.0	0.0	0.0	0.0	0.0	7.2	0.0	0.2	0.0	0.0	0.1	5.6	1.1
XUF (%)	0.0	0.0	0.6	0.0	1.1	1.2	0.0	0.0	0.0	0.0	0.0	0.1	0.3

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 26 May 1981      Lifetime Generation: 126331.4 GW(e).h  
 Date of First Criticality: 12 Sep 1987      Cumulative Energy Availability Factor: 74.9%  
 Date of Grid Connection: 21 Oct 1987      Cumulative Load Factor: 68.6%  
 Date of Commercial Operation: 24 Feb 1988      Cumulative Unit Capability Factor: 78.4%  
    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 (%)
1987	486.0	1310.0	0.0	0.0	84.5	100.0	4.5	0.0	893	10.8
1988	7715.0	1310.0	0.0	0.0	86.2	100.0	67.0	0.0	7324	83.4
1989	3172.7	1310.0	30.3	30.3	28.3	28.3	27.6	27.6	2663	30.4
1990	6614.1	1310.0	67.7	49.0	67.5	47.9	57.6	42.6	5590	63.8
1991	6868.6	1310.0	64.2	54.0	62.9	52.9	59.9	48.4	5768	65.8
1992	7812.5	1310.0	71.5	58.4	70.4	57.3	67.9	53.3	6386	72.7
1993	7705.6	1310.0	72.2	61.2	68.5	59.5	67.1	56.0	6432	73.4
1994	8292.3	1310.0	83.2	64.8	80.1	62.9	72.3	58.7	7429	84.8
1995	7358.3	1310.0	84.3	67.6	83.9	65.9	64.1	59.5	6946	79.3
1996	8227.9	1310.0	81.1	69.3	79.6	67.6	71.5	61.0	7222	82.2
1997	8571.6	1310.0	83.7	70.9	81.1	69.1	74.7	62.5	7488	85.5
1998	6585.5	1310.0	59.2	69.7	57.2	67.9	57.4	62.0	5334	60.9
1999	9705.0	1310.0	92.5	71.8	91.8	70.1	84.6	64.1	8284	94.6
2000	9088.3	1310.0	85.2	72.9	83.0	71.2	79.0	65.3	7626	86.8
2001	9142.7	1310.0	84.7	73.8	83.8	72.2	79.7	66.4	7580	86.5
2002	9011.0	1310.0	87.3	74.8	87.1	73.2	78.5	67.3	7738	88.3
2003	9974.4	1310.0	98.3	76.3	98.0	74.9	86.9	68.6	8621	98.4

# FR-58 NOGENT-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	249.0	90.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Feb	242.0	52.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Mar	343.0	142.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Apr	317.0	129.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT BELOW MAXIMUM SET POINT PCOMAX
01 May	420.0	88.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Jun	248.0	189.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
17 Jun	15.0	19.0	UF3	A13	NUCLEAR SAMPLING SYSTEM
21 Jun	33.0	44.0	UF3	A42	ELECTRICAL PROTECTION OF MAIN TRANSFORMER
01 Jul	288.0	156.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Aug	338.0	116.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
02 Aug	47.0	62.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
01 Sep	262.0	92.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Oct	348.0	53.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Nov	238.0	66.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Dec	251.0	74.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
12 Dec	40.0	52.0	UF3	A42	LETDOWN AUXILIARY TRANSFORMER

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		88			611	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling				971	2	
D. Inspection, maintenance or repair without refuelling				103		
E. Testing of plant systems or components	47			82		3
H. Nuclear regulatory requirements					15	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					23	
Subtotal	47	88	0	1156	665	3
Total		135			1824	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		97
12. Reactor I&C Systems		58
13. Reactor Auxiliary Systems	15	
14. Safety Systems		1
15. Reactor Cooling Systems		37
16. Steam generation systems		151
31. Turbine and auxiliaries		70
32. Feedwater and Main Steam System		22
33. Circulating Water System		60
41. Main Generator Systems		68
42. Electrical Power Supply Systems	73	1
Total	88	565

## FR-59 NOGENT-2

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Maximum Net Capacity at the beginning of 2003: 1310.0 MW(e)  
 Design Net Capacity: 1310.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

### 2. Production Summary 2003

Energy Production: 9447.1 GW(e).h  
 Energy Availability Factor: 91.5%  
 Load Factor: 82.3%  
 Operating Factor: 90.8%  
 Energy Unavailability Factor: 8.5%  
 Total Off-line Time: 806 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	233.4	866.9	942.3	904.2	778.7	837.1	838.6	590.2	773.5	894.0	849.5	938.7	9447.1
EAF (%)	27.5	99.8	99.9	99.7	85.3	99.6	99.6	99.8	92.9	99.6	95.8	100.0	91.5
UCF (%)	27.5	99.8	99.9	99.7	85.3	99.9	99.6	99.8	92.9	99.6	95.9	100.0	91.5
LF (%)	24.0	98.5	96.8	95.9	79.9	88.7	86.0	60.6	82.0	91.6	90.1	96.3	82.3
OF (%)	44.9	100.0	100.0	100.0	86.6	100.0	100.0	70.4	93.3	100.0	96.1	100.0	90.8
EUf (%)	72.5	0.2	0.1	0.3	14.7	0.4	0.4	0.2	7.1	0.4	4.2	0.0	8.5
PUF (%)	72.5	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	4.2	0.0	6.5
UCLF (%)	0.0	0.0	0.0	0.2	14.7	0.1	0.4	0.2	7.0	0.4	0.0	0.0	1.9
XUF (%)	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. 2003 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Jan 1982  
 Date of First Criticality: 04 Oct 1988  
 Date of Grid Connection: 14 Dec 1988  
 Date of Commercial Operation: 01 May 1989

Lifetime Generation: 125810.4 GW(e).h  
 Cumulative Energy Availability Factor: 81.6%  
 Cumulative Load Factor: 73.6%  
 Cumulative Unit Capability Factor: 78.8%  
 Cumulative Energy Unavailability Factor: 18.4%

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	50.0	1310.0	0.0	0.0	95.5	100.0	0.5	0.0	198	2.3
1989	7470.1	1310.0	0.0	0.0	69.4	100.0	65.1	0.0	6660	76.0
1990	7532.9	1310.0	69.4	69.4	68.3	68.3	65.6	65.6	6094	69.6
1991	8331.1	1310.0	78.8	74.1	73.5	70.9	72.6	69.1	7008	80.0
1992	8312.3	1310.0	77.4	75.2	74.1	72.0	72.2	70.2	6937	79.0
1993	9191.7	1310.0	85.8	77.9	80.8	74.2	80.1	72.6	7594	86.7
1994	6483.0	1310.0	98.0	81.9	94.8	78.3	56.5	69.4	6027	68.8
1995	7545.4	1310.0	78.5	81.3	75.9	77.9	65.8	68.8	6862	78.3
1996	8477.0	1310.0	80.5	81.2	77.0	77.8	73.7	69.5	7229	82.3
1997	8925.8	1310.0	86.0	81.8	82.0	78.3	77.8	70.5	7656	87.4
1998	8830.0	1310.0	98.0	83.6	97.8	80.4	76.9	71.2	7386	84.3
1999	7957.3	1310.0	76.2	82.9	74.7	79.9	69.3	71.1	6732	76.8
2000	9672.1	1310.0	85.9	83.1	84.6	80.3	84.1	72.2	7654	87.1
2001	9379.0	1310.0	85.2	83.3	83.4	80.6	81.7	73.0	7589	86.6
2002	8205.5	1310.0	84.2	83.4	84.2	80.8	71.5	72.9	7241	82.7
2003	9447.1	1310.0	91.5	84.0	91.5	81.6	82.3	73.6	7954	90.8

## FR-59 NOGENT-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	336.0	440.0	PF	C	REFUELLING AND PARTIAL INSPECTION
15 Jan	110.0	145.0	PF	E	START-UP TESTS AFTER REFUELLING
15 Jan	265.0	122.0	PP	E	START-UP TESTS AFTER REFUELLING
01 Feb	5299.0	935.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
28 Apr	138.0	15.0	UP3	A33	AIR COOLANT
01 May	100.0	131.0	UF3	A33	AIR COOLANT
15 Jul	110.0	4.0	UP3	A33	AIR COOLANT
12 Aug	32.0	2.0	UP3	A33	AIR COOLANT
06 Sep	49.0	64.0	UF3	A33	AIR COOLANT
09 Oct	136.0	4.0	UP3	A33	AIR COOLANT
01 Nov	28.0	36.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		149			256	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	336			894		
E. Testing of plant systems or components	138			23		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					29	
Subtotal	474	149	0	917	287	0
Total		623			1204	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		13
12. Reactor I&C Systems		27
13. Reactor Auxiliary Systems		11
14. Safety Systems		47
15. Reactor Cooling Systems		27
16. Steam generation systems		50
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		28
32. Feedwater and Main Steam System		14
33. Circulating Water System	149	
41. Main Generator Systems		14
42. Electrical Power Supply Systems		8
XX. Miscellaneous Systems		1
Total	149	240

# FR-36 PALUEL-1

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1330.0 MW(e)  
**Design Net Capacity:** 1330.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8526.2 GW(e).h  
**Energy Availability Factor:** 77.2%  
**Load Factor:** 73.2%  
**Operating Factor:** 78.6%  
**Energy Unavailability Factor:** 22.8%  
**Total Off-line Time:** 1878 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	931.9	855.5	599.0	430.3	893.9	893.0	121.9	110.1	896.9	937.8	905.6	950.2	8526.2
<b>EAF (%)</b>	97.8	100.0	64.1	48.3	96.8	99.2	13.3	12.8	99.3	99.5	99.8	98.7	77.2
<b>UCF (%)</b>	97.8	100.0	64.1	51.7	97.4	99.9	13.3	12.8	99.4	99.8	99.8	98.7	77.6
<b>LF (%)</b>	94.2	95.7	60.6	44.9	90.3	93.3	12.3	11.1	93.7	94.6	94.6	96.0	73.2
<b>OF (%)</b>	98.0	100.0	65.3	49.4	97.6	100.0	13.4	22.2	100.0	100.0	100.0	100.0	78.6
<b>EUf (%)</b>	2.2	0.0	35.9	51.7	3.2	0.8	86.7	87.2	0.7	0.5	0.2	1.3	22.8
<b>PUF (%)</b>	0.0	0.0	4.4	0.0	0.0	0.0	86.7	53.5	0.5	0.2	0.1	0.0	12.4
<b>UCLF (%)</b>	2.2	0.0	31.5	48.4	2.6	0.1	0.0	33.8	0.1	0.0	0.1	1.3	10.1
<b>XUF (%)</b>	0.0	0.0	0.0	3.3	0.6	0.7	0.0	0.0	0.1	0.3	0.0	0.0	0.4

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 15 Aug 1977  
**Date of First Criticality:** 13 May 1984  
**Date of Grid Connection:** 22 Jun 1984  
**Date of Commercial Operation:** 01 Dec 1985

**Lifetime Generation:** 150473.5 GW(e).h  
**Cumulative Energy Availability Factor:** 75.1%  
**Cumulative Load Factor:** 68.7%  
**Cumulative Unit Capability Factor:** 77.8%  
**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	1805.0	1306.0	0.0	0.0	61.9	100.0	16.7	0.0	2608	31.6
1985	4685.8	1290.0	0.0	0.0	41.0	100.0	41.5	0.0	4104	46.8
1986	5169.7	1290.0	52.3	52.3	50.2	50.2	45.7	45.7	4455	50.9
1987	8184.8	1330.0	77.0	64.8	76.6	63.6	70.3	58.2	6527	74.5
1988	9291.0	1330.0	96.8	75.6	95.3	74.3	79.5	65.4	7332	83.5
1989	7902.8	1330.0	72.6	74.8	70.4	73.3	67.8	66.0	6567	75.0
1990	7323.9	1330.0	70.1	73.9	66.4	71.9	62.9	65.4	6288	71.8
1991	7159.9	1330.0	66.7	72.7	63.2	70.5	61.5	64.7	5987	68.3
1992	8640.4	1330.0	76.6	73.3	76.6	71.3	74.0	66.0	6858	78.1
1993	8068.1	1330.0	77.2	73.8	70.9	71.3	69.2	66.4	6906	78.8
1994	6549.9	1330.0	77.1	74.1	76.9	71.9	56.2	65.3	5790	66.1
1995	8768.2	1330.0	82.2	74.9	79.6	72.7	75.3	66.3	7292	83.2
1996	5483.2	1330.0	52.7	72.9	48.7	70.5	46.9	64.5	4763	54.2
1997	9019.7	1330.0	84.5	73.9	83.8	71.6	77.4	65.6	7537	86.0
1998	9718.1	1330.0	91.3	75.2	91.2	73.1	83.4	67.0	8132	92.8
1999	8181.9	1330.0	78.6	75.5	76.2	73.3	70.2	67.2	6938	79.2
2000	9089.0	1330.0	84.0	76.0	83.5	74.0	77.8	67.9	7533	85.8
2001	9752.2	1330.0	98.3	77.4	97.6	75.5	83.7	68.9	8382	95.7
2002	7153.9	1330.0	68.3	76.9	66.6	75.0	61.4	68.5	6081	69.4
2003	8526.2	1330.0	77.6	76.9	77.2	75.1	73.2	68.7	6882	78.6



# FR-36 PALUEL-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	481.0	34.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
02 Jan	15.0	21.0	UF3	Z	MALFUNCTION OF REGULATION, CONTROL AND PROTECTION SYSTEM
01 Feb	430.0	32.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Mar	67.0	4.0	UP3	Z	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
03 Mar	299.0	22.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
07 Mar	32.0	42.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
16 Mar	227.0	301.0	UF3	A12	REACTOR INSTRUMENTATION AND CONTROL
01 Apr	45.0	60.0	UF3	A12	REACTOR INSTRUMENTATION AND CONTROL
02 Apr	24.0	32.0	XP	R	LOAD LIMITATION OR SHUTDOWN CAUSED BY INDUSTRIAL ACTION
04 Apr	218.0	13.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
15 Apr	295.0	393.0	UF3	A11	REACTOR EXTERNAL EQUIPMENT
01 May	245.0	63.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
04 May	18.0	24.0	UF3	A11	REACTOR EXTERNAL EQUIPMENT
01 Jun	230.0	63.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
05 Jul	972.0	1293.0	PF	C	REFUELLING WITH NO INSPECTION
14 Aug	35.0	47.0	UF3	A12	CONTROL ROD ASSEMBLIES AND DRIVE MECHANISMS
16 Aug	54.0	72.0	UF3	A22	FRESH AND IRRADIATED FUEL HANDLING
18 Aug	26.0	35.0	UF3	A13	CHEMICAL AND VOLUME CONTROL SYSTEM WITHOUT PUMP
18 Aug	14.0	19.0	UF3	A13	COMPONENT COOLING SYSTEM
20 Aug	14.0	19.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
20 Aug	108.0	144.0	UF3	A41	STATIC EXCITATION SYSTEM
25 Aug	256.0	98.0	PP	E	START-UP TESTS AFTER REFUELLING
04 Sep	274.0	53.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Oct	77.0	3.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Oct	313.0	46.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Nov	392.0	51.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Dec	585.0	25.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCOMAX
27 Dec	29.0	13.0	UP3	A31	MAIN CONDENSER

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		822			430	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	972			1016	70	
D. Inspection, maintenance or repair without refuelling				178		
E. Testing of plant systems or components	32			30	1	
H. Nuclear regulatory requirements					19	
J. Grid failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					62	1
Z. Others		29				
Subtotal	1004	851	0	1224	585	2
Total		1855			1811	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	313	14
12. Reactor I&C Systems	307	48
13. Reactor Auxiliary Systems	40	35
14. Safety Systems		2
15. Reactor Cooling Systems		12
16. Steam generation systems		18
31. Turbine and auxiliaries		45
32. Feedwater and Main Steam System		44
33. Circulating Water System		26
41. Main Generator Systems	108	145
42. Electrical Power Supply Systems		18
XX. Miscellaneous Systems		2
Total	768	409

# FR-37 PALUEL-2

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1330.0 MW(e)  
**Design Net Capacity:** 1330.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8814.9 GW(e).h  
**Energy Availability Factor:** 81.1%  
**Load Factor:** 75.7%  
**Operating Factor:** 85.5%  
**Energy Unavailability Factor:** 18.9%  
**Total Off-line Time:** 1270 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	942.2	805.6	832.1	854.7	842.7	833.8	849.1	897.4	804.0	831.6	0.0	321.7	8814.9
<b>EAF (%)</b>	100.0	95.2	90.4	96.5	93.6	96.7	92.7	99.3	88.7	87.0	0.0	33.6	81.1
<b>UCF (%)</b>	100.0	95.3	90.4	98.9	95.2	99.9	93.4	100.0	90.0	88.6	0.0	33.6	82.1
<b>LF (%)</b>	95.2	90.1	84.2	89.2	85.2	87.1	85.8	90.7	84.0	83.9	0.0	32.5	75.7
<b>OF (%)</b>	100.0	97.8	91.8	99.0	96.1	100.0	93.8	100.0	95.3	92.6	0.0	59.3	85.5
<b>EUf (%)</b>	0.0	4.8	9.6	3.5	6.4	3.3	7.3	0.7	11.3	13.0	100.0	66.4	18.9
<b>PUF (%)</b>	0.0	0.0	0.2	0.0	0.0	0.0	6.6	0.0	0.0	0.2	99.9	39.7	12.2
<b>UCLF (%)</b>	0.0	4.7	9.4	1.1	4.8	0.1	0.0	0.0	9.9	11.2	0.1	26.7	5.7
<b>XUF (%)</b>	0.0	0.0	0.0	2.5	1.5	3.1	0.7	0.7	1.4	1.6	0.0	0.0	1.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1978  
**Date of First Criticality:** 11 Aug 1984  
**Date of Grid Connection:** 14 Sep 1984  
**Date of Commercial Operation:** 01 Dec 1985

**Lifetime Generation:** 147711.1 GW(e).h  
**Cumulative Energy Availability Factor:** 73.0%  
**Cumulative Load Factor:** 67.3%  
**Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1984	1000.0	1316.0	0.0	0.0	79.4	100.0	9.0	0.0	1785	21.1
1985	5997.8	1290.0	0.0	0.0	52.5	100.0	53.1	0.0	5548	63.3
1986	6040.9	1290.0	52.3	52.3	52.2	52.2	53.5	53.5	4804	54.8
1987	8859.6	1290.0	77.3	64.8	76.8	64.5	78.4	65.9	6837	78.0
1988	7725.0	1330.0	75.5	68.5	73.5	67.6	66.1	66.0	6017	68.5
1989	8956.4	1330.0	83.3	72.2	80.1	70.8	76.9	68.8	7358	84.0
1990	6496.3	1330.0	59.1	69.6	59.1	68.4	55.8	66.1	5328	60.8
1991	6140.3	1330.0	55.1	67.1	54.9	66.1	52.7	63.9	4996	57.0
1992	6906.9	1330.0	63.6	66.6	61.7	65.5	59.1	63.2	5618	64.0
1993	7954.4	1330.0	87.9	69.3	76.9	66.9	68.3	63.8	7217	82.4
1994	7115.2	1330.0	77.6	70.2	74.5	67.8	61.1	63.5	6671	76.2
1995	6934.5	1330.0	70.5	70.3	65.8	67.6	59.5	63.1	6252	71.4
1996	8407.4	1330.0	83.8	71.5	78.5	68.6	72.0	63.9	7195	81.9
1997	8139.8	1330.0	83.9	72.5	83.5	69.8	69.9	64.4	7182	82.0
1998	7300.4	1330.0	73.1	72.6	69.1	69.8	62.7	64.3	6583	75.1
1999	9243.8	1330.0	85.6	73.5	84.1	70.8	79.3	65.4	7705	88.0
2000	9849.9	1330.0	96.0	75.0	94.4	72.4	84.3	66.6	8271	94.2
2001	7843.1	1330.0	76.7	75.1	76.0	72.6	67.3	66.7	6861	78.3
2002	7984.4	1330.0	73.2	75.0	72.0	72.6	68.5	66.8	6569	75.0
2003	8814.9	1330.0	82.1	75.4	81.1	73.0	75.7	67.3	7490	85.5

## FR-37 PALUEL-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	529.0	46.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Feb	430.0	45.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
11 Feb	35.0	21.0	UP3	A31	MAIN CONDENSER
19 Feb	15.0	20.0	UF3	A12	REACTOR INSTRUMENTATION AND CONTROL
01 Mar	211.0	56.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
06 Mar	61.0	82.0	UF3	A12	REACTOR INSTRUMENTATION AND CONTROL
01 Apr	271.0	68.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 May	235.0	99.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
24 May	29.0	38.0	UF3	A32	CHEMICAL CHARACTERISTICS OF THE SECONDARY SYSTEM
01 Jun	294.0	114.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
03 Jun	138.0	8.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Jul	369.0	65.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
02 Jul	119.0	7.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
12 Jul	46.0	61.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
01 Aug	312.0	86.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
06 Aug	88.0	7.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Sep	177.0	42.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
03 Sep	203.0	13.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
06 Sep	70.0	48.0	UP3	A31	MAIN CONDENSER
09 Sep	25.0	34.0	UF3	A12	REACTOR INSTRUMENTATION AND CONTROL
30 Sep	62.0	83.0	UF3	A13	CHEMICAL AND VOLUME CONTROL SYSTEM WITHOUT PUMP
03 Oct	206.0	16.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
15 Oct	359.0	21.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Nov	912.0	1213.0	PF	B	REFUELLING WITH NO INSPECTION
09 Dec	40.0	53.0	UF3	A22	REFUELLING MACHINE
10 Dec	31.0	41.0	UF3	M	SHUTDOWN PROLONGATION AWAITING SAFETY AUTHORITY
12 Dec	26.0	35.0	UF3	A13	NUCLEAR SAMPLING SYSTEM
13 Dec	169.0	127.0	PP	E	START-UP TESTS AFTER REFUELLING
20 Dec	241.0	110.0	UP3	A12	REACTOR INSTRUMENTATION AND CONTROL

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		258			633	
B. Refuelling without a maintenance	912				6	
C. Inspection, maintenance or repair combined with refuelling				995	144	
D. Inspection, maintenance or repair without refuelling				54		
E. Testing of plant systems or components	46			22	1	
J. Grid failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					30	0
M. Governmental requirements or court decisions		31				
Subtotal	958	289	0	1071	814	0
Total		1247			1885	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		25
12. Reactor I&C Systems	101	121
13. Reactor Auxiliary Systems	88	5
14. Safety Systems		26
15. Reactor Cooling Systems		95
16. Steam generation systems		43
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		42
32. Feedwater and Main Steam System	29	7
33. Circulating Water System		80
41. Main Generator Systems		125
42. Electrical Power Supply Systems		23
Total	218	593

# FR-38 PALUEL-3

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1330.0 MW(e)  
**Design Net Capacity:** 1330.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8181.7 GW(e).h  
**Energy Availability Factor:** 74.3%  
**Load Factor:** 70.2%  
**Operating Factor:** 75.0%  
**Energy Unavailability Factor:** 25.7%  
**Total Off-line Time:** 2193 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	851.3	758.7	0.0	348.1	38.1	830.0	938.3	919.0	876.2	799.6	862.4	960.0	8181.7
<b>EAF (%)</b>	90.1	87.5	0.0	38.9	5.1	95.2	99.5	99.3	97.1	87.0	93.5	100.0	74.3
<b>UCF (%)</b>	90.1	87.5	0.0	38.9	5.1	96.4	100.0	99.8	97.8	91.3	93.5	100.0	74.9
<b>LF (%)</b>	86.0	84.9	0.0	36.4	3.9	86.7	94.8	92.9	91.5	80.7	90.1	97.0	70.2
<b>OF (%)</b>	90.7	88.1	0.0	39.6	5.4	96.5	100.0	100.0	98.2	89.1	94.0	100.0	75.0
<b>EUf (%)</b>	9.9	12.5	100.0	61.1	94.9	4.8	0.5	0.7	2.9	13.0	6.5	0.0	25.7
<b>PUF (%)</b>	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	2.2	6.3	0.0	0.0	0.7
<b>UCLF (%)</b>	9.8	12.3	100.0	61.1	94.9	3.6	0.0	0.2	0.0	2.4	6.5	0.0	24.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	1.2	0.5	0.5	0.7	4.3	0.0	0.0	0.6

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1979      **Lifetime Generation:** 146550.4 GW(e).h  
**Date of First Criticality:** 07 Aug 1985      **Cumulative Energy Availability Factor:** 75.2%  
**Date of Grid Connection:** 30 Sep 1985      **Cumulative Load Factor:** 69.1%  
**Date of Commercial Operation:** 01 Feb 1986      **Cumulative Unit Capability Factor:** 78.1%  
**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 (%)
1985	1605.4	1316.0	0.0	0.0	88.1	100.0	15.1	0.0	1747	21.7
1986	8321.7	1290.0	0.0	0.0	73.9	100.0	73.6	0.0	6503	74.2
1987	7716.6	1290.0	78.3	78.3	78.3	78.3	68.3	68.3	6104	69.7
1988	6763.0	1330.0	68.7	73.5	59.2	68.6	57.9	63.0	5413	61.6
1989	8124.4	1330.0	70.7	72.5	70.2	69.1	69.7	65.3	6288	71.8
1990	7322.0	1330.0	67.2	71.2	66.2	68.4	62.8	64.7	6008	68.6
1991	9587.1	1330.0	86.5	74.3	86.3	72.0	82.3	68.2	7634	87.1
1992	6886.6	1330.0	63.2	72.4	63.0	70.5	58.9	66.6	5671	64.6
1993	8459.0	1330.0	77.5	73.1	73.4	70.9	72.6	67.5	6951	79.3
1994	6703.6	1330.0	63.4	71.9	61.8	69.8	57.5	66.3	5590	63.8
1995	8733.3	1330.0	85.5	73.4	84.1	71.4	75.0	67.2	7598	86.7
1996	8027.7	1330.0	84.9	74.6	84.6	72.7	68.7	67.4	7261	82.7
1997	7618.8	1330.0	73.2	74.5	72.8	72.7	65.4	67.2	6494	74.1
1998	8327.0	1330.0	77.6	74.7	76.1	73.0	71.5	67.5	6913	78.9
1999	7636.7	1330.0	76.1	74.8	73.7	73.0	65.5	67.4	6505	74.3
2000	9819.8	1330.0	94.7	76.3	94.4	74.6	84.1	68.6	8199	93.3
2001	7815.9	1330.0	81.6	76.6	79.6	74.9	67.1	68.5	6796	77.6
2002	8900.5	1330.0	82.3	77.0	80.4	75.2	76.4	69.0	7366	84.1
2003	8181.7	1330.0	74.9	76.8	74.3	75.2	70.2	69.1	6567	75.0

## FR-38 PALUEL-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	240.0	3.0	UP3	A31	MOISTURE SEPARATOR-REHEATERS
13 Jan	225.0	12.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
24 Jan	46.0	61.0	UF3	A41	HYDROGEN COOLING SYSTEM
31 Jan	22.0	30.0	UF3	A13	NUCLEAR SAMPLING SYSTEM
01 Feb	44.0	59.0	UF3	A13	NUCLEAR SAMPLING SYSTEM
02 Feb	281.0	16.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
27 Feb	897.0	1193.0	UF3	A41	ALTERNATOR STATOR
10 Apr	46.0	61.0	UF3	A13	CHEMICAL CHARACTERISTICS OF THE PRIMARY SYSTEM
12 Apr	131.0	10.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
19 Apr	975.0	1298.0	UF3	A15	PRESSURIZER, LOAD TANK
01 Jun	216.0	77.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
03 Jun	98.0	2.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
26 Jun	11.0	15.0	UF3	A12	REACTOR INSTRUMENTATION AND CONTROL
26 Jun	13.0	17.0	UF3	A12	INSTRUMENTATION AND CONTROL OF PRIMARY CIRCUIT (INCLUDING SG)
01 Jul	162.0	5.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Jul	351.0	46.0	XP	K	LOAD VARIATION
01 Aug	140.0	5.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
03 Aug	255.0	61.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Sep	338.0	53.0	XP	K	LOAD VARIATION
01 Sep	104.0	3.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Oct	322.0	50.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
03 Oct	38.0	50.0	PF	E	EQUIPMENT PERFORMANCE TEST (SPECIAL)
06 Oct	64.0	47.0	XP	K	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
18 Oct	11.0	14.0	UF3	A42	DIRECT CURRENT EQUIPMENT
01 Nov	654.0	30.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
22 Nov	37.0	49.0	UF3	A12	REACTOR INSTRUMENTATION AND CONTROL
01 Dec	388.0	29.0	XP	K	LOAD VARIATION WITHOUT

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		2102			525	
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling				1030	50	
D. Inspection, maintenance or repair without refuelling				52		
E. Testing of plant systems or components	38			42	1	13
H. Nuclear regulatory requirements					6	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					4	26
Subtotal	38	2102	0	1124	592	39
Total		2140			1755	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		56
12. Reactor I&C Systems	61	86
13. Reactor Auxiliary Systems	112	43
14. Safety Systems		45
15. Reactor Cooling Systems	975	46
16. Steam generation systems		4
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		30
32. Feedwater and Main Steam System		92
33. Circulating Water System		0
41. Main Generator Systems	943	14
42. Electrical Power Supply Systems	11	48
XX. Miscellaneous Systems		1
Total	2102	466

# FR-39 PALUEL-4

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1330.0 MW(e)  
**Design Net Capacity:** 1330.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7960.7 GW(e).h  
**Energy Availability Factor:** 81.9%  
**Load Factor:** 68.3%  
**Operating Factor:** 83.4%  
**Energy Unavailability Factor:** 18.1%  
**Total Off-line Time:** 1453 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	0.0	422.1	711.5	791.7	698.8	731.2	829.1	771.6	797.5	838.7	654.2	714.2	7960.7
<b>EAF (%)</b>	0.0	48.9	84.9	100.0	87.3	98.7	99.3	95.0	97.0	97.7	79.4	93.2	81.9
<b>UCF (%)</b>	0.0	48.9	84.9	100.0	88.6	99.6	99.7	99.5	98.0	100.0	79.4	93.2	82.8
<b>LF (%)</b>	0.0	47.2	72.0	82.7	70.6	76.4	83.8	78.0	83.3	84.6	68.3	72.2	68.3
<b>OF (%)</b>	0.0	67.9	86.3	100.0	93.0	100.0	100.0	96.6	98.2	96.1	77.4	85.3	83.4
<b>EUf (%)</b>	100.0	51.1	15.1	0.0	12.7	1.3	0.7	5.0	3.0	2.3	20.6	6.8	18.1
<b>PUF (%)</b>	80.9	16.2	0.0	0.0	8.9	0.4	0.0	0.3	0.0	0.0	2.8	0.0	9.2
<b>UCLF (%)</b>	19.1	34.9	15.1	0.0	2.5	0.0	0.3	0.3	2.1	0.0	17.8	6.8	8.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	1.3	0.9	0.4	4.4	0.9	2.3	0.0	0.0	0.9

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1980  
**Date of First Criticality:** 29 Mar 1986  
**Date of Grid Connection:** 11 Apr 1986  
**Date of Commercial Operation:** 01 Jun 1986

**Lifetime Generation:** 143959.5 GW(e).h  
**Cumulative Energy Availability Factor:** 75.9%  
**Cumulative Load Factor:** 69.7%  
**Cumulative Unit Capability Factor:** 78.1%  
**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	6118.6	1300.0	0.0	0.0	85.4	100.0	55.2	0.0	5343	62.7
1987	8014.6	1290.0	69.8	69.8	69.7	69.7	70.9	70.9	6289	71.8
1988	5909.0	1330.0	54.0	61.8	53.6	61.5	50.6	60.6	4812	54.8
1989	8268.3	1330.0	72.1	65.3	71.0	64.7	71.0	64.1	6349	72.5
1990	8067.7	1330.0	78.7	68.7	78.5	68.2	69.2	65.4	6770	77.3
1991	8325.6	1330.0	74.5	69.8	74.2	69.4	71.5	66.6	6677	76.2
1992	5553.3	1330.0	48.9	66.3	48.6	65.9	47.5	63.4	4529	51.6
1993	8683.8	1330.0	77.8	68.0	75.3	67.3	74.5	65.0	6938	79.2
1994	8329.7	1330.0	77.3	69.1	76.5	68.4	71.5	65.8	6945	79.3
1995	8346.8	1330.0	88.5	71.3	88.1	70.6	71.6	66.5	7354	83.9
1996	7848.1	1330.0	75.2	71.7	72.4	70.8	67.2	66.5	6745	76.8
1997	8633.7	1330.0	81.9	72.6	78.2	71.5	74.1	67.2	7219	82.4
1998	7776.7	1330.0	71.2	72.5	68.3	71.2	66.7	67.2	6506	74.3
1999	9879.7	1330.0	96.1	74.3	94.6	73.0	84.8	68.5	8345	95.3
2000	8358.8	1330.0	86.0	75.2	84.4	73.8	71.5	68.8	7532	85.7
2001	8581.0	1330.0	84.5	75.8	82.1	74.4	73.7	69.1	7489	85.5
2002	9303.3	1330.0	95.7	77.0	92.7	75.5	79.9	69.8	8216	93.8
2003	7960.7	1330.0	82.8	77.4	81.9	75.9	68.3	69.7	7307	83.4

## FR-39 PALUEL-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	602.0	801.0	PF	C	REFUELLING WITH NO INSPECTION
26 Jan	190.0	253.0	UF3	A22	REFUELLING MACHINE
03 Feb	168.0	224.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
10 Feb	276.0	145.0	PP	E	START-UP TESTS AFTER REFUELLING
22 Feb	125.0	6.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Mar	207.0	123.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
02 Mar	46.0	62.0	UF3	A31	MAIN CONDENSER
09 Mar	23.0	30.0	UF3	A32	FEEDWATER PUMP (EXCLUDING TURBINE-DRIVEN FEEDWATER PUMP)
22 Mar	33.0	44.0	UF3	A11	REACTOR EXTERNAL EQUIPMENT
01 Apr	264.0	165.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
01 May	177.0	143.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
02 May	38.0	23.0	UP3	A31	MAIN CONDENSER
08 May	52.0	69.0	PF	E	EQUIPMENT PERFORMANCE TEST (SPECIAL)
01 Jun	300.0	221.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Jul	270.0	154.0	XP	K	LOAD VARIATION
01 Aug	195.0	168.0	XP	K	LOAD VARIATION
05 Aug	194.0	44.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Sep	305.0	131.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
02 Sep	92.0	5.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
23 Sep	13.0	18.0	UF3	A12	INSTRUMENTATION AND CONTROL OF PRIMARY CIRCUIT (INCLUDING SG)
01 Oct	266.0	90.0	XP	K	LOAD VARIATION
02 Oct	166.0	16.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Nov	305.0	38.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
08 Nov	19.0	25.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
08 Nov	95.0	126.0	UF3	A	PARALLEL AND TAPER-SEAT VALVES
11 Nov	17.0	23.0	UF3	A31	BYPASS DEPRESSURIZATION COOLING
01 Dec	288.0	79.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
15 Dec	18.0	24.0	UF3	A	VALVE ACCESSORIES
25 Dec	146.0	41.0	UP3	A41	STATOR BAR WATER COOLING CIRCUIT

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1986 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		435			600	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	602			983	17	
D. Inspection, maintenance or repair without refuelling				49		
E. Testing of plant systems or components	71			21	0	
J. Grid failure or grid unavailability						7
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					32	1
Z. Others		168				
Subtotal	673	603	0	1053	653	8
Total		1276			1714	

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

System	2003 Hours Lost	1986 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	33	119
12. Reactor I&C Systems	13	18
13. Reactor Auxiliary Systems		11
14. Safety Systems		21
15. Reactor Cooling Systems		31
16. Steam generation systems		95
21. Fuel Handling and Storage Facilities		70
31. Turbine and auxiliaries	63	38
32. Feedwater and Main Steam System	23	13
41. Main Generator Systems		150
42. Electrical Power Supply Systems		23
Total	132	589

**FR-63 PENLY-1**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1330.0 MW(e)  
 Design Net Capacity: 1330.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 9290.8 GW(e).h  
 Energy Availability Factor: 84.6%  
 Load Factor: 79.7%  
 Operating Factor: 85.9%  
 Energy Unavailability Factor: 15.4%  
 Total Off-line Time: 1235 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	971.8	876.0	944.5	915.8	886.3	855.0	918.0	22.0	250.6	906.5	848.8	895.5	9290.8
EAF (%)	100.0	100.0	99.7	99.5	95.2	94.7	97.2	3.3	27.7	99.5	100.0	100.0	84.6
UCF (%)	100.0	100.0	99.7	99.5	95.2	94.7	97.2	3.3	27.7	99.5	100.0	100.0	84.6
LF (%)	98.2	98.0	95.6	95.6	89.6	89.3	92.8	2.2	26.2	91.5	88.6	90.5	79.7
OF (%)	100.0	100.0	100.0	100.0	95.8	95.6	96.8	2.7	41.1	100.0	100.0	100.0	85.9
EUf (%)	0.0	0.0	0.3	0.5	4.8	5.3	2.8	96.7	72.3	0.6	0.0	0.0	15.4
PUF (%)	0.0	0.0	0.0	0.0	4.2	0.0	0.0	96.7	45.3	0.0	0.0	0.0	12.3
UCLF (%)	0.0	0.0	0.3	0.5	0.6	5.3	2.8	0.0	27.0	0.5	0.0	0.0	3.1
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Sep 1982      Lifetime Generation: 114651.4 GW(e).h  
 Date of First Criticality: 01 Apr 1990      Cumulative Energy Availability Factor: 79.8%  
 Date of Grid Connection: 04 May 1990      Cumulative Load Factor: 73.7%  
 Date of Commercial Operation: 01 Dec 1990      Cumulative Unit Capability Factor: 79.3%  
    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 (%)
1990	2887.1	1330.0	0.0	0.0	59.2	100.0	24.8	0.0	3100	35.4
1991	8436.7	1330.0	74.3	74.3	74.2	74.2	72.4	72.4	6645	75.9
1992	7922.2	1330.0	71.2	72.8	70.9	72.6	67.8	70.1	6315	71.9
1993	8023.9	1330.0	84.6	76.7	71.9	72.3	68.9	69.7	7298	83.3
1994	7969.1	1330.0	86.1	79.0	85.0	75.5	68.4	69.4	6654	76.0
1995	8879.1	1330.0	81.9	79.6	80.8	76.6	76.2	70.7	7248	82.7
1996	9530.8	1330.0	85.7	80.6	85.2	78.0	81.6	72.5	7625	86.8
1997	8503.4	1330.0	77.5	80.2	76.7	77.8	73.0	72.6	6872	78.4
1998	9965.7	1330.0	98.0	82.4	97.9	80.3	85.5	74.2	8140	92.9
1999	7998.5	1330.0	74.4	81.5	71.5	79.4	68.7	73.6	6633	75.7
2000	8271.7	1330.0	73.8	80.7	73.7	78.8	70.8	73.3	6640	75.6
2001	9825.8	1330.0	98.7	82.4	98.4	80.6	84.3	74.3	8304	94.8
2002	7146.7	1330.0	67.2	81.1	66.9	79.4	61.3	73.2	5948	67.9
2003	9290.8	1330.0	84.6	81.4	84.6	79.8	79.7	73.7	7525	85.9



# FR-63 PENLY-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	305.0	18.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Feb	198.0	18.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
01 Mar	304.0	40.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
06 Mar	22.0	3.0	UP3	A31	STEAM VALVES
01 Apr	244.0	22.0	XP	K	OPERATION WITH POWER LIMITER BELOW MAXIMUM AVAILABLE POWER
23 Apr	9.0	4.0	UP3	K	MALFUNCTION OF REGULATION, CONTROL AND PROTECTION SYSTEM
01 May	701.0	6.0	UP3	A31	MAIN CONDENSER
15 May	31.0	41.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
25 May	11.0	1.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Jun	636.0	5.0	UP3	A31	MAIN CONDENSER
14 Jun	32.0	43.0	UF3	A12	CONTROL ROD ASSEMBLIES AND DRIVE MECHANISMS
01 Jul	726.0	6.0	UP3	A31	MAIN CONDENSER
12 Jul	14.0	18.0	UF3	A12	CONTROL ROD ASSEMBLIES AND DRIVE MECHANISMS
02 Aug	948.0	1261.0	PF	C	REFUELLING AND PARTIAL INSPECTION
10 Sep	35.0	47.0	UF3	A22	REFUELLING MACHINE
12 Sep	46.0	61.0	UF3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
13 Sep	28.0	37.0	UF3	A15	PRIMARY SYSTEM
15 Sep	60.0	80.0	UF3	A12	MISCELLANEOUS INDEPENDENT MEASUREMENTS
18 Sep	41.0	54.0	PF	E	START-UP TESTS AFTER REFUELLING
18 Sep	206.0	74.0	PP	E	START-UP TESTS AFTER REFUELLING
09 Oct	328.0	27.0	XP	K	LOAD VARIATION
11 Oct	89.0	26.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Nov	270.0	108.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Dec	280.0	94.0	XP	K	LOAD VARIATION

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1990 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		215			319	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	948			825		2
D. Inspection, maintenance or repair without refuelling				277		
E. Testing of plant systems or components	72			23		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					6	
Subtotal	1020	215	0	1125	330	0
Total		1235			1455	

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

System	2003 Hours Lost	1990 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		55
12. Reactor I&C Systems	106	3
13. Reactor Auxiliary Systems		28
14. Safety Systems		19
15. Reactor Cooling Systems	28	45
16. Steam generation systems	46	55
17. Safety I&C Systems (excluding reactor I&C)		6
31. Turbine and auxiliaries		19
32. Feedwater and Main Steam System		15
33. Circulating Water System		3
41. Main Generator Systems		39
42. Electrical Power Supply Systems		1
Total	180	288

# FR-64 PENLY-2

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1330.0 MW(e)  
**Design Net Capacity:** 1330.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 10207.8 GW(e).h  
**Energy Availability Factor:** 97.6%  
**Load Factor:** 87.6%  
**Operating Factor:** 98.2%  
**Energy Unavailability Factor:** 2.4%  
**Total Off-line Time:** 157 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	834.3	857.8	924.9	793.5	772.0	698.9	701.5	912.2	883.8	948.7	917.2	963.1	10207.8
<b>EAF (%)</b>	90.9	99.6	99.7	92.8	98.4	99.3	96.0	99.3	99.4	99.0	98.1	99.2	97.6
<b>UCF (%)</b>	90.9	99.6	99.7	92.8	98.4	99.4	96.0	99.4	99.4	99.0	98.1	99.2	97.7
<b>LF (%)</b>	84.3	96.0	93.6	82.9	78.0	73.0	70.9	92.2	92.3	95.8	95.8	97.3	87.6
<b>OF (%)</b>	94.8	100.0	100.0	92.5	98.4	99.3	93.7	100.0	100.0	100.0	100.0	100.0	98.2
<b>EUf (%)</b>	9.1	0.4	0.3	7.2	1.6	0.7	4.0	0.7	0.6	1.0	1.9	0.8	2.4
<b>PUF (%)</b>	0.0	0.0	0.0	1.9	0.1	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.5
<b>UCLF (%)</b>	9.1	0.4	0.3	5.2	1.6	0.6	0.6	0.6	0.6	0.9	1.9	0.8	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1984  
**Date of First Criticality:** 10 Jan 1992  
**Date of Grid Connection:** 04 Feb 1992  
**Date of Commercial Operation:** 01 Nov 1992

**Lifetime Generation:** 103105.2 GW(e).h  
**Cumulative Energy Availability Factor:** 82.9%  
**Cumulative Load Factor:** 76.4%  
**Cumulative Unit Capability Factor:** 80.4%  
**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	5149.8	1330.0	0.0	0.0	53.7	100.0	44.1	0.0	4796	54.6
1993	8611.8	1330.0	75.2	75.2	74.4	74.4	73.9	73.9	6658	76.0
1994	8759.7	1330.0	81.3	78.2	77.6	76.0	75.2	74.6	7228	82.5
1995	8169.7	1330.0	74.0	76.8	73.8	75.2	70.1	73.1	6574	75.0
1996	9758.0	1330.0	91.3	80.4	89.3	78.8	83.5	75.7	8025	91.4
1997	8068.9	1330.0	84.3	81.2	82.9	79.6	69.3	74.4	7186	82.0
1998	8877.5	1330.0	82.9	81.5	81.1	79.8	76.2	74.7	7318	83.5
1999	8637.0	1330.0	81.3	81.5	79.4	79.8	74.1	74.6	7203	82.2
2000	9584.5	1330.0	97.1	83.4	96.8	81.9	82.0	75.6	8393	95.5
2001	8816.2	1330.0	82.1	83.3	80.2	81.7	75.7	75.6	7333	83.7
2002	8464.3	1330.0	79.1	82.9	79.0	81.5	72.6	75.3	6890	78.7
2003	10207.8	1330.0	97.7	84.2	97.6	82.9	87.6	76.4	8603	98.2

## FR-64 PENLY-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
02 Jan	156.0	32.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
05 Jan	9.0	12.0	UF3	A31	CONTROL FLUID SYSTEM
05 Jan	175.0	5.0	UP3	A31	CONTROL FLUID SYSTEM
12 Jan	211.0	3.0	UP3	A31	VIBRATION OF TURBOGENERATOR SET WITHOUT DAMAGE
19 Jan	29.0	39.0	UF	A12	MISCELLANEOUS INDEPENDENT MEASUREMENTS
01 Feb	419.0	4.0	UP3	A	VIBRATION OF TURBOGENERATOR SET WITHOUT DAMAGE
03 Feb	151.0	17.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
09 Feb	35.0	1.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
23 Feb	32.0	3.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
01 Mar	452.0	4.0	UP3	A32	BLOWDOWNS AND MISCELLANEOUS SYSTEM
01 Mar	117.0	21.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Apr	263.0	2.0	UP3	A32	BLOWDOWNS AND MISCELLANEOUS SYSTEM
11 Apr	13.0	17.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
12 Apr	34.0	46.0	UF3	A	CONTROL AND ISOLATING VALVES
14 Apr	50.0	6.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
15 Apr	13.0	4.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
15 Apr	168.0	2.0	UP3	A	VIBRATION OF TURBOGENERATOR SET WITHOUT DAMAGE
01 May	733.0	6.0	UP3	A31	MAIN CONDENSER
16 May	2.0	3.0	UF3	Z	MALFUNCTION OF REGULATION, CONTROL AND PROTECTION SYSTEM
01 Jun	685.0	5.0	UP3	A31	MAIN CONDENSER
01 Jul	697.0	8.0	UP3	A31	MAIN CONDENSER
27 Jul	25.0	34.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
01 Aug	1937.0	15.0	UP3	A31	MAIN CONDENSER
20 Oct	1137.0	29.0	UP3	A31	VIBRATION OF TURBOGENERATOR SET WITHOUT DAMAGE
08 Dec	572.0	2.0	UP3	A31	MOISTURE SEPARATOR-REHEATERS

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1992 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		72			568	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling				782		
E. Testing of plant systems or components	38			60		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					8	
Z. Others		2				
Subtotal	38	74	0	842	576	0
Total		112			1418	

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

System	2003 Hours Lost	1992 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		55
12. Reactor I&C Systems	29	28
13. Reactor Auxiliary Systems		19
14. Safety Systems		7
15. Reactor Cooling Systems		70
16. Steam generation systems		19
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries	9	45
32. Feedwater and Main Steam System		20
33. Circulating Water System		1
41. Main Generator Systems		2
42. Electrical Power Supply Systems		259
Total	38	526

# FR-48 ST. ALBAN-1

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1335.0 MW(e)  
**Design Net Capacity:** 1335.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8691.9 GW(e).h  
**Energy Availability Factor:** 78.0%  
**Load Factor:** 74.3%  
**Operating Factor:** 80.2%  
**Energy Unavailability Factor:** 22.0%  
**Total Off-line Time:** 1731 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	973.5	882.0	952.7	847.5	939.1	177.0	0.0	318.0	774.3	922.0	937.4	968.5	8691.9
<b>EAF (%)</b>	99.9	100.0	99.8	91.7	99.4	19.9	0.0	50.3	83.0	94.1	99.7	99.9	78.0
<b>UCF (%)</b>	99.9	100.0	99.8	91.7	99.5	19.9	0.0	65.1	98.8	94.2	99.8	99.9	80.6
<b>LF (%)</b>	98.0	98.3	96.0	88.2	94.6	18.4	0.0	32.0	80.6	92.7	97.5	97.5	74.3
<b>OF (%)</b>	100.0	100.0	100.0	92.8	100.0	20.4	0.0	58.1	98.8	94.5	100.0	100.0	80.2
<b>EUf (%)</b>	0.1	0.0	0.2	8.3	0.6	80.1	100.0	49.7	17.0	5.9	0.3	0.1	22.0
<b>PUF (%)</b>	0.0	0.0	0.2	4.0	0.0	79.8	100.0	25.5	0.0	0.0	0.0	0.0	17.6
<b>UCLF (%)</b>	0.0	0.0	0.0	4.3	0.4	0.3	0.0	9.4	1.2	5.8	0.2	0.1	1.9
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.1	0.0	0.0	14.8	15.8	0.1	0.0	0.0	2.6

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 29 Jan 1979  
**Date of First Criticality:** 04 Aug 1985  
**Date of Grid Connection:** 30 Aug 1985  
**Date of Commercial Operation:** 01 May 1986

**Lifetime Generation:** 137015.0 GW(e).h  
**Cumulative Energy Availability Factor:** 74.4%  
**Cumulative Load Factor:** 64.9%  
**Cumulative Unit Capability Factor:** 78.1%  
**Cumulative Energy Unavailability Factor:** 25.6%

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	1290.3	1320.0	0.0	0.0	76.1	100.0	12.1	0.0	1698	21.1
1986	6722.9	1300.0	0.0	0.0	69.1	100.0	59.0	0.0	5449	62.2
1987	6101.6	1300.0	56.6	56.6	56.2	56.2	53.6	53.6	4944	56.4
1988	4562.0	1335.0	83.4	70.2	82.4	69.5	38.9	46.1	3721	42.4
1989	6781.3	1335.0	70.7	70.4	63.5	67.5	58.0	50.1	5907	67.4
1990	7799.1	1335.0	70.4	70.4	68.6	67.8	66.7	54.3	6295	71.9
1991	7935.3	1335.0	74.4	71.2	73.3	68.9	67.9	57.0	6380	72.8
1992	4812.2	1335.0	42.1	66.3	42.1	64.4	41.0	54.3	3775	43.0
1993	7376.0	1335.0	68.2	66.6	65.7	64.6	63.1	55.6	6010	68.6
1994	7575.6	1335.0	94.5	70.1	93.8	68.3	64.8	56.7	6777	77.4
1995	8535.7	1335.0	81.1	71.3	78.2	69.4	73.0	58.5	7197	82.2
1996	8126.6	1335.0	83.7	72.5	83.1	70.7	69.3	59.6	6950	79.1
1997	7112.8	1335.0	65.5	71.9	63.6	70.1	60.8	59.7	5833	66.6
1998	8255.9	1335.0	90.6	73.5	89.9	71.7	70.6	60.6	6802	77.6
1999	9240.6	1335.0	86.3	74.5	85.7	72.8	79.0	62.1	7656	87.4
2000	8027.8	1335.0	72.2	74.3	71.4	72.7	68.5	62.5	6494	73.9
2001	9298.5	1335.0	89.8	75.3	89.6	73.8	79.5	63.7	7843	89.5
2002	8768.8	1335.0	81.0	75.7	79.6	74.2	75.0	64.4	7275	83.0
2003	8691.9	1335.0	80.6	76.0	78.0	74.4	74.3	64.9	7029	80.2

# FR-48 ST. ALBAN-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	1128.0	132.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
02 Apr	127.0	1.0	UP3	A12	REACTOR CONTROL
06 Apr	26.0	35.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
11 Apr	26.0	34.0	UF3	A32	FEEDWATER PUMP (EXCLUDING TURBINE-DRIVEN FEEDWATER PUMP)
12 May	241.0	4.0	UP3	A31	MAIN CONDENSER
01 Jun	109.0	2.0	UP3	A31	MAIN CONDENSER
03 Jun	16.0	2.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
07 Jun	1506.0	2014.0	PF	C	REFUELLING AND PARTIAL INSPECTION
11 Aug	248.0	144.0	PP	E	START-UP TESTS AFTER REFUELLING
11 Aug	6.0	8.0	UF3	A31	CONTROL AND PROTECTION SYSTEMS
11 Aug	9.0	12.0	PF	E	START-UP TESTS AFTER REFUELLING
12 Aug	111.0	146.0	XF	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
26 Aug	82.0	2.0	UP3	A12	REACTOR CONTROL
01 Sep	263.0	151.0	XP	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
01 Sep	186.0	2.0	UP3	A12	REACTOR CONTROL
02 Sep	137.0	17.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
03 Sep	18.0	2.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
03 Sep	6.0	9.0	UF3	A31	CONTROL AND PROTECTION SYSTEMS
01 Oct	387.0	2.0	UP3	A12	REACTOR CONTROL
03 Oct	123.0	11.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
04 Oct	41.0	55.0	UF3	A31	LUBRICATION SYSTEM (EXCLUDING JACKING SYSTEM)
01 Nov	348.0	2.0	UP3	A12	REACTOR CONTROL
03 Nov	101.0	12.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Dec	212.0	20.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		79			702	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	1506			968	12	
D. Inspection, maintenance or repair without refuelling				86	0	
E. Testing of plant systems or components	35			34		
H. Nuclear regulatory requirements					48	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					37	1
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)			111			
Subtotal	1541	79	111	1088	803	1
Total		1731			1892	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		65
12. Reactor I&C Systems		20
13. Reactor Auxiliary Systems		14
14. Safety Systems		15
15. Reactor Cooling Systems		150
16. Steam generation systems		6
21. Fuel Handling and Storage Facilities		8
31. Turbine and auxiliaries	53	126
32. Feedwater and Main Steam System	26	48
33. Circulating Water System		3
35. All other I&C Systems		1
41. Main Generator Systems		108
42. Electrical Power Supply Systems		78
XX. Miscellaneous Systems		7
Total	79	649

# FR-49 ST. ALBAN-2

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1335.0 MW(e)  
**Design Net Capacity:** 1335.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9254.8 GW(e).h  
**Energy Availability Factor:** 83.0%  
**Load Factor:** 79.1%  
**Operating Factor:** 86.3%  
**Energy Unavailability Factor:** 17.0%  
**Total Off-line Time:** 1202 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	967.7	853.8	935.8	882.3	819.8	813.7	872.3	715.8	926.1	886.0	0.0	581.5	9254.8
<b>EAF (%)</b>	100.0	100.0	100.0	97.5	91.7	85.6	94.5	77.1	98.6	89.3	0.0	62.0	83.0
<b>UCF (%)</b>	100.0	100.0	100.0	97.5	94.0	99.9	99.9	99.9	99.7	99.7	0.2	62.0	87.8
<b>LF (%)</b>	97.4	95.2	94.3	91.8	82.5	84.7	87.8	72.1	96.3	89.1	0.0	58.5	79.1
<b>OF (%)</b>	100.0	100.0	100.0	97.8	94.4	85.8	97.6	77.6	100.0	100.0	0.0	81.6	86.3
<b>EUf (%)</b>	0.0	0.0	0.0	2.5	8.3	14.4	5.5	22.9	1.4	10.7	100.0	38.0	17.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.1	5.8	0.0	0.0	0.0	0.0	0.0	99.8	36.0	11.8
<b>UCLF (%)</b>	0.0	0.0	0.0	2.4	0.2	0.1	0.1	0.1	0.3	0.3	0.0	2.0	0.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	2.3	14.3	5.4	22.8	1.2	10.4	0.2	0.0	4.8

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 31 Jul 1979      **Lifetime Generation:** 127553.7 GW(e).h  
**Date of First Criticality:** 07 Jun 1986      **Cumulative Energy Availability Factor:** 72.7%  
**Date of Grid Connection:** 03 Jul 1986      **Cumulative Load Factor:** 63.8%  
**Date of Commercial Operation:** 01 Mar 1987      **Cumulative Unit Capability Factor:** 78.2%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1986	1084.6	1317.0	0.0	0.0	60.4	100.0	9.5	0.0	1485	17.1
1987	6952.2	1300.0	0.0	0.0	77.6	100.0	61.0	0.0	6094	69.6
1988	5185.0	1335.0	47.3	47.3	46.5	46.5	44.2	44.2	4308	49.0
1989	6126.5	1335.0	57.5	52.4	56.2	51.3	52.4	48.3	4806	54.9
1990	6070.6	1335.0	60.3	55.0	56.5	53.1	51.9	49.5	5146	58.7
1991	7962.6	1335.0	73.3	59.6	71.1	57.6	68.1	54.1	6484	74.0
1992	6375.1	1335.0	64.3	60.5	62.3	58.5	54.4	54.2	5405	61.5
1993	6433.1	1335.0	90.9	65.6	83.1	62.6	55.0	54.3	6121	69.9
1994	7125.8	1335.0	74.9	66.9	73.0	64.1	60.9	55.3	6074	69.3
1995	7751.4	1335.0	76.1	68.0	72.7	65.2	66.3	56.6	6763	77.2
1996	8344.6	1335.0	81.5	69.5	79.7	66.8	71.2	58.3	7247	82.5
1997	8049.7	1335.0	92.3	71.8	91.8	69.3	68.8	59.3	7072	80.7
1998	6555.7	1335.0	66.7	71.4	63.2	68.7	56.1	59.0	5654	64.5
1999	8607.0	1335.0	80.3	72.1	79.3	69.6	73.6	60.2	7188	82.1
2000	8729.6	1335.0	86.5	73.2	79.0	70.3	74.4	61.3	7202	82.0
2001	8654.8	1335.0	91.4	74.5	91.3	71.8	74.0	62.2	7657	87.4
2002	8290.6	1335.0	77.3	74.7	75.2	72.1	70.9	62.8	6950	79.3
2003	9254.8	1335.0	87.8	75.5	83.0	72.7	79.1	63.8	7558	86.3

## FR-49 ST. ALBAN-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	151.0	27.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
01 Feb	124.0	15.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Mar	295.0	56.0	XP	K	LOAD VARIATION
01 Apr	12.0	1.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
01 Apr	209.0	50.0	XP	K	LOAD VARIATION
22 Apr	16.0	22.0	UF3	L	HUMAN ERROR IN PADLOCKING
01 May	349.0	88.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
24 May	42.0	56.0	PF	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
01 Jun	102.0	137.0	XF	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
02 Jun	98.0	3.0	UP3	A12	REACTOR CONTROL
01 Jul	260.0	109.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
09 Jul	120.0	6.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Aug	152.0	39.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
02 Aug	167.0	224.0	XF	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
01 Sep	313.0	3.0	UP3	A12	REACTOR CONTROL
01 Sep	192.0	13.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
23 Sep	913.0	116.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
09 Oct	17.0	3.0	UP3	A42	INSTRUMENTATION AND CONTROL OF AUXILIARIES
01 Nov	854.0	1140.0	PF	C	REFUELLING AND PARTIAL INSPECTION
06 Dec	215.0	175.0	PP	E	START-UP TESTS AFTER REFUELLING
12 Dec	16.0	10.0	UP3	A31	CONTROL AND PROTECTION SYSTEMS
16 Dec	113.0	2.0	UP3	A12	REACTOR CONTROL
24 Dec	68.0	29.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1986 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					799	
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling	854			945	34	
D. Inspection, maintenance or repair without refuelling				108		
E. Testing of plant systems or components	42			69	2	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)			102		15	30
L. Human factor related		16				
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)			167			
Subtotal	896	16	269	1122	856	30
Total		1181			2008	

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

System	2003 Hours Lost	1986 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		59
12. Reactor I&C Systems		69
13. Reactor Auxiliary Systems		17
14. Safety Systems		5
15. Reactor Cooling Systems		67
16. Steam generation systems		137
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries		151
32. Feedwater and Main Steam System		53
33. Circulating Water System		1
35. All other I&C Systems		0
41. Main Generator Systems		138
42. Electrical Power Supply Systems		18
XX. Miscellaneous Systems		3
Total	0	718

# FR-17 ST. LAURENT-B-1

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Maximum Net Capacity at the beginning of 2003: 915.0 MW(e)  
 Design Net Capacity: 915.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

## 2. Production Summary 2003

Energy Production: 6630.4 GW(e).h  
 Energy Availability Factor: 82.8%  
 Load Factor: 82.7%  
 Operating Factor: 87.4%  
 Energy Unavailability Factor: 17.2%  
 Total Off-line Time: 1102 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	673.1	614.1	660.8	594.4	405.3	0.0	429.7	646.5	637.6	659.4	643.5	666.2	6630.4
EAF (%)	98.8	99.6	97.2	90.2	59.9	0.0	64.0	95.1	96.8	96.7	97.7	97.9	82.8
UCF (%)	99.7	100.0	99.8	99.8	74.2	0.0	66.1	99.9	99.9	98.9	99.9	99.9	86.5
LF (%)	98.9	99.9	97.2	90.2	59.5	0.0	63.1	95.0	96.8	96.7	97.7	97.9	82.7
OF (%)	100.0	100.0	100.0	100.0	72.8	0.0	75.8	100.0	100.0	100.0	100.0	100.0	87.4
EUf (%)	1.2	0.4	2.8	9.8	40.1	100.0	36.0	4.9	3.2	3.3	2.3	2.1	17.2
PUF (%)	0.3	0.0	0.2	0.1	25.8	100.0	10.1	0.1	0.1	0.7	0.1	0.1	11.4
UCLF (%)	0.0	0.0	0.0	0.1	0.0	0.0	23.8	0.0	0.0	0.4	0.0	0.0	2.1
XUF (%)	0.9	0.3	2.6	9.6	14.3	0.0	2.2	4.9	3.2	2.2	2.2	2.1	3.7

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 May 1976  
 Date of First Criticality: 04 Jan 1981  
 Date of Grid Connection: 21 Jan 1981  
 Date of Commercial Operation: 01 Aug 1983

Lifetime Generation: 117043.0 GW(e).h  
 Cumulative Energy Availability Factor: 74.8%  
 Cumulative Load Factor: 70.4%  
 Cumulative Unit Capability Factor: 77.7%  
 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 (%)
1982	638.9	880.0	0.0	0.0	8.4	100.0	8.3	0.0	1299	14.8
1983	3670.0	880.0	0.0	0.0	48.0	100.0	47.6	0.0	4382	50.0
1984	4401.0	880.0	56.0	56.0	56.0	56.0	56.9	56.9	5042	57.4
1985	5630.4	880.0	76.1	66.0	75.0	65.5	73.0	65.0	6827	77.9
1986	5476.4	880.0	79.8	70.6	79.7	70.2	71.0	67.0	7144	81.6
1987	5171.3	880.0	76.8	72.2	76.1	71.7	67.1	67.0	6667	76.1
1988	5721.0	915.0	76.3	73.0	75.9	72.6	71.2	67.9	6464	73.6
1989	6609.8	915.0	85.4	75.1	82.7	74.3	82.5	70.4	7699	87.9
1990	6113.7	915.0	86.3	76.8	84.1	75.7	76.3	71.2	7089	80.9
1991	4005.4	915.0	53.6	73.8	52.3	72.7	50.0	68.5	4736	54.1
1992	5621.1	915.0	75.4	74.0	74.0	72.9	69.9	68.7	6690	76.2
1993	5668.5	915.0	75.3	74.1	72.4	72.8	70.7	68.9	6821	77.9
1994	6095.7	915.0	87.0	75.3	85.1	74.0	76.1	69.6	7252	82.8
1995	4443.0	915.0	64.3	74.4	60.3	72.8	55.4	68.4	5211	59.5
1996	5541.1	915.0	79.1	74.8	78.8	73.3	68.9	68.4	6888	78.4
1997	5132.6	915.0	76.2	74.8	75.4	73.4	64.0	68.1	6404	73.1
1998	6030.7	915.0	84.6	75.5	82.1	74.0	75.2	68.6	7366	84.1
1999	5062.6	915.0	69.7	75.1	67.9	73.6	63.2	68.2	6207	70.9
2000	5086.7	915.0	66.4	74.6	66.0	73.2	63.3	67.9	5957	67.8
2001	6814.8	915.0	86.8	75.3	86.4	73.9	85.0	68.9	7735	88.3
2002	6637.0	890.0	85.2	75.8	82.9	74.4	85.1	69.7	7592	86.7
2003	6630.4	915.0	86.5	76.3	82.8	74.8	82.7	70.4	7658	87.4



# FR-17 ST. LAURENT-B-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	555.0	6.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
05 Jan	11.0	1.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
02 Feb	309.0	2.0	XP	K	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Mar	460.0	5.0	XP	K	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
02 Mar	15.0	1.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
12 Mar	17.0	6.0	XP	S	LOAD LIMITATION OR SHUTDOWN CAUSED BY INDUSTRIAL ACTION
21 Mar	1503.0	167.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
24 May	925.0	847.0	PF	B	REFUELLING WITH NO INSPECTION
01 Jul	56.0	51.0	UF3	R	INDUSTRIAL ACTION DURING PROGRAMMED OUTAGE, EXTENSION
03 Jul	55.0	50.0	UF3	A	MISCELLANEOUS
06 Jul	19.0	17.0	UF3	A12	REACTOR INSTRUMENTATION AND CONTROL
07 Jul	36.0	33.0	UF3	A32	BLOWDOWNS AND MISCELLANEOUS SYSTEM
08 Jul	104.0	46.0	PP	E	START-UP TESTS AFTER REFUELLING
08 Jul	11.0	10.0	PP	E	START-UP TESTS AFTER REFUELLING
13 Jul	426.0	15.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
21 Jul	20.0	10.0	UP3	A33	VARIOUS, PUMPHOUSE-CIRCULATING WATER
01 Aug	2150.0	69.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
05 Oct	11.0	5.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
12 Oct	4.0	2.0	UP3	A31	MAIN CONDENSER
27 Oct	2.0	1.0	UP3	A31	CONTROL AND PROTECTION SYSTEMS
01 Nov	1449.0	29.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1982 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		110			576	
B. Refuelling without a maintenance	925				4	
C. Inspection, maintenance or repair combined with refuelling				1196	25	
E. Testing of plant systems or components	11			11	2	0
H. Nuclear regulatory requirements					1	
J. Grid failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					445	19
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)		56				
Subtotal	936	166	0	1207	1053	19
Total		1102			2279	

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

System	2003 Hours Lost	1982 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		14
12. Reactor I&C Systems	19	46
13. Reactor Auxiliary Systems		15
14. Safety Systems		43
15. Reactor Cooling Systems		12
16. Steam generation systems		98
21. Fuel Handling and Storage Facilities		2
31. Turbine and auxiliaries		57
32. Feedwater and Main Steam System	36	16
33. Circulating Water System		3
41. Main Generator Systems		197
42. Electrical Power Supply Systems		14
XX. Miscellaneous Systems		16
Total	55	533

**FR-23 ST. LAURENT-B-2**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 915.0 MW(e)  
 Design Net Capacity: 880.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 4702.4 GW(e).h  
 Energy Availability Factor: 61.6%  
 Load Factor: 58.7%  
 Operating Factor: 63.7%  
 Energy Unavailability Factor: 38.4%  
 Total Off-line Time: 3180 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	587.3	596.0	642.1	610.4	633.4	563.6	612.1	457.6	0.0	0.0	0.0	0.0	4702.4
EAF (%)	87.5	97.8	98.4	95.9	97.9	93.8	94.8	75.4	0.0	0.0	0.0	0.0	61.6
UCF (%)	87.5	97.8	98.4	95.9	97.9	93.8	94.8	75.4	0.0	0.0	0.0	0.0	61.6
LF (%)	86.3	96.9	94.4	92.7	93.0	85.5	89.9	67.2	0.0	0.0	0.0	0.0	58.7
OF (%)	93.3	100.0	100.0	100.0	100.0	96.1	100.0	76.7	0.0	0.0	0.0	0.0	63.7
EUF (%)	12.5	2.2	1.6	4.1	2.1	6.2	5.2	24.6	100.0	100.0	100.0	100.0	38.4
PUF (%)	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.0	83.3	100.0	100.0	100.0	32.1
UCLF (%)	12.4	2.2	1.5	3.8	2.0	6.1	5.0	24.6	16.7	0.0	0.0	0.0	6.2
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. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Jul 1976      Lifetime Generation: 117713.6 GW(e).h  
 Date of First Criticality: 12 May 1981      Cumulative Energy Availability Factor: 76.6%  
 Date of Grid Connection: 01 Jun 1981      Cumulative Load Factor: 70.5%  
 Date of Commercial Operation: 01 Aug 1983      Cumulative Unit Capability Factor: 77.7%  
    Cumulative Energy Unavailability Factor: 23.4%

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	1356.0	880.0	0.0	0.0	17.5	100.0	17.6	0.0	2493	28.5
1983	4123.0	880.0	0.0	0.0	53.8	100.0	53.5	0.0	4839	55.2
1984	5724.0	880.0	88.9	88.9	88.9	88.9	74.0	74.0	7237	82.4
1985	5295.6	880.0	77.5	83.2	75.7	82.3	68.7	71.4	6806	77.7
1986	5662.8	880.0	81.7	82.7	79.8	81.5	73.5	72.1	7337	83.8
1987	5060.2	880.0	79.9	82.0	79.4	80.9	65.6	70.5	6798	77.6
1988	5108.0	880.0	69.6	79.5	69.6	78.7	66.1	69.6	6262	71.3
1989	5034.0	880.0	81.4	79.8	75.9	78.2	65.3	68.9	6490	74.1
1990	5165.9	915.0	73.8	78.9	71.3	77.2	64.4	68.2	6212	70.9
1991	6043.0	915.0	86.1	79.9	84.2	78.1	75.4	69.1	7374	84.2
1992	5490.1	915.0	80.6	80.0	79.4	78.2	68.3	69.0	6982	79.5
1993	5042.2	915.0	68.7	78.8	64.1	76.8	62.9	68.4	6149	70.2
1994	6322.7	915.0	83.7	79.3	81.2	77.2	78.9	69.4	7406	84.5
1995	5311.3	915.0	72.9	78.7	72.1	76.8	66.3	69.1	6720	76.7
1996	6057.7	915.0	82.2	79.0	80.8	77.1	75.4	69.6	7303	83.1
1997	5960.7	915.0	80.8	79.1	78.1	77.2	74.4	70.0	7147	81.6
1998	6415.3	915.0	85.7	79.6	83.2	77.6	80.0	70.6	7585	86.6
1999	5845.9	915.0	79.0	79.5	77.3	77.6	72.9	70.8	7013	80.1
2000	5134.0	915.0	67.6	78.8	67.0	76.9	63.9	70.4	6069	69.1
2001	6046.7	915.0	81.7	79.0	80.1	77.1	75.4	70.7	7226	82.5
2002	6215.0	890.0	82.2	79.2	82.2	77.4	79.7	71.1	7434	84.9
2003	4702.4	915.0	61.6	78.3	61.6	76.6	58.7	70.5	5580	63.7

## FR-23 ST. LAURENT-B-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	50.0	46.0	UF3	A41	EXCITER AND GENERATOR INSTRUMENTATION AND CONTROL
01 Jan	157.0	32.0	UP3	A41	EXCITER AND GENERATOR INSTRUMENTATION AND CONTROL
08 Jan	1186.0	17.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
03 Feb	4.0	1.0	UP3	A12	INSTRUMENTATION AND CONTROL OF PRIMARY CIRCUIT (INCLUDING SG)
23 Feb	9.0	3.0	UP3	A31	MAIN CONDENSER
01 Mar	4102.0	86.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
06 Apr	33.0	2.0	PP	E	PERIODIC TESTING WITH LOAD REDUCTION OR SHUTDOWN
08 Apr	17.0	8.0	UP3	A31	MAIN CONDENSER
27 Apr	18.0	8.0	UP3	A32	FEEDWATER PUMP (EXCLUDING TURBINE-DRIVEN FEEDWATER PUMP)
28 May	8.0	3.0	UP3	A31	MAIN CONDENSER
29 Jun	28.0	25.0	UF3	A31	CONTROL FLUID SYSTEM
01 Aug	173.0	158.0	UF3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
01 Sep	122.0	112.0	UF3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
06 Sep	2807.0	2569.0	PF	C	REFUELLING AND 10-YEARLY INSPECTION

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		373			668	
B. Refuelling without a maintenance					9	
C. Inspection, maintenance or repair combined with refuelling	2807			986	18	
D. Inspection, maintenance or repair without refuelling				8		
E. Testing of plant systems or components				10	1	
H. Nuclear regulatory requirements					16	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					162	
Subtotal	2807	373	0	1004	874	0
Total		3180			1878	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		16
12. Reactor I&C Systems		17
13. Reactor Auxiliary Systems		13
14. Safety Systems		56
15. Reactor Cooling Systems		59
16. Steam generation systems	295	32
21. Fuel Handling and Storage Facilities		3
31. Turbine and auxiliaries	28	271
32. Feedwater and Main Steam System		15
41. Main Generator Systems	50	73
42. Electrical Power Supply Systems		26
Total	373	581

# FR-18 TRICASTIN-1

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Maximum Net Capacity at the beginning of 2003: 915.0 MW(e)  
 Design Net Capacity: 915.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

## 2. Production Summary 2003

Energy Production: 5670.1 GW(e).h  
 Energy Availability Factor: 73.0%  
 Load Factor: 70.7%  
 Operating Factor: 80.2%  
 Energy Unavailability Factor: 27.0%  
 Total Off-line Time: 1731 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	666.9	586.2	526.7	0.0	252.6	125.8	428.6	559.0	575.7	652.0	639.7	656.8	5670.1
EAF (%)	99.8	95.9	77.7	0.0	38.7	26.7	66.9	85.3	90.6	97.7	98.2	98.5	73.0
UCF (%)	100.0	100.0	90.6	0.0	39.1	100.0	99.8	99.9	95.8	100.0	98.2	98.5	85.2
LF (%)	98.0	95.3	77.5	0.0	37.1	19.1	63.0	82.1	87.4	95.6	97.1	96.5	70.7
OF (%)	100.0	100.0	90.7	0.0	47.0	44.0	84.4	100.0	96.0	100.0	100.0	100.0	80.2
EUf (%)	0.2	4.1	22.3	100.0	61.3	73.3	33.1	14.7	9.4	2.3	1.8	1.5	27.0
PUF (%)	0.0	0.0	9.4	100.0	55.5	0.0	0.2	0.1	0.0	0.0	0.0	0.0	13.8
UCLF (%)	0.1	0.0	0.0	0.0	5.4	0.0	0.0	0.0	4.2	0.0	1.8	1.5	1.1
XUF (%)	0.1	4.1	12.9	0.0	0.4	73.3	32.9	14.6	5.2	2.3	0.0	0.1	12.1

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Nov 1974      Lifetime Generation: 133832.8 GW(e).h  
 Date of First Criticality: 21 Feb 1980      Cumulative Energy Availability Factor: 75.8%  
 Date of Grid Connection: 31 May 1980      Cumulative Load Factor: 71.3%  
 Date of Commercial Operation: 01 Dec 1980      Cumulative Unit Capability Factor: 77.4%  
    Cumulative Energy Unavailability Factor: 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 (%)
1982	5909.8	915.0	90.4	73.3	81.9	69.1	73.7	64.2	8151	93.0
1983	5111.0	915.0	68.8	71.8	67.2	68.5	63.8	64.1	6097	69.6
1984	6468.0	915.0	86.7	75.5	86.7	73.0	80.5	68.2	7662	87.2
1985	6217.9	915.0	86.0	77.6	81.6	74.7	77.6	70.1	7560	86.3
1986	5880.3	915.0	79.4	77.9	77.0	75.1	73.4	70.6	7188	82.1
1987	5978.1	915.0	83.5	78.7	78.2	75.6	74.6	71.2	7360	84.0
1988	5836.0	915.0	79.8	78.8	76.7	75.7	72.6	71.4	7200	82.0
1989	5830.2	915.0	83.3	79.3	83.2	76.5	72.7	71.5	7550	86.2
1990	5099.7	915.0	68.8	78.3	65.1	75.4	63.6	70.7	6377	72.8
1991	5909.1	915.0	83.2	78.7	77.0	75.5	73.7	71.0	7262	82.9
1992	5659.3	915.0	85.3	79.3	83.0	76.2	70.4	70.9	7573	86.2
1993	6134.8	915.0	83.9	79.6	77.7	76.3	76.5	71.4	7393	84.4
1994	5008.4	915.0	75.4	79.3	70.3	75.8	62.5	70.7	6458	73.7
1995	5372.7	915.0	71.3	78.8	70.6	75.5	67.0	70.5	6374	72.8
1996	7302.1	915.0	94.5	79.8	93.8	76.6	90.9	71.8	8448	96.2
1997	5548.3	915.0	73.1	79.4	72.5	76.4	69.2	71.6	6711	76.6
1998	5503.7	915.0	71.0	78.9	71.0	76.1	68.7	71.5	7075	80.8
1999	3426.7	915.0	44.9	77.1	44.5	74.4	42.8	69.9	4016	45.8
2000	6644.9	915.0	87.7	77.7	87.1	75.1	82.7	70.6	7842	89.3
2001	6053.3	915.0	83.2	77.9	82.0	75.4	75.5	70.8	7261	82.9
2002	6384.6	880.0	87.2	78.3	86.1	75.9	82.8	71.3	7778	88.8
2003	5670.1	915.0	85.2	78.6	73.0	75.8	70.7	71.3	7029	80.2

# FR-18 TRICASTIN-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	120.0	11.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Feb	1256.0	112.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
01 Feb	89.0	3.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
29 Mar	1151.0	1053.0	PF	C	REFUELLING AND FULL INSPECTION
16 May	151.0	46.0	PP	E	START-UP TESTS AFTER REFUELLING
16 May	31.0	29.0	UF3	A	CONTROL AND ISOLATING VALVES
22 May	159.0	3.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
31 May	24.0	3.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Jun	940.0	693.0	XP	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
01 Jun	200.0	53.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
01 Jul	235.0	13.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Aug	438.0	111.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Sep	164.0	35.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Sep	455.0	19.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
18 Sep	4.0	4.0	UF3	A12	REACTOR CONTROL
18 Sep	25.0	22.0	UF3	A31	THRUST BEARINGS-SHAFTING, BEARING BUSHES
01 Oct	591.0	16.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Oct	141.0	8.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Nov	603.0	12.0	UP3	K	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
01 Nov	109.0	5.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Dec	588.0	10.0	UP3	K	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
02 Dec	152.0	12.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1980 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		60			379	
B. Refuelling without a maintenance					7	
C. Inspection, maintenance or repair combined with refuelling	1151			1095	12	
D. Inspection, maintenance or repair without refuelling				25	2	
E. Testing of plant systems or components				5	0	
H. Nuclear regulatory requirements						3
J. Grid failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					36	
Subtotal	1151	60	0	1125	436	4
Total		1211			1565	

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

System	2003 Hours Lost	1980 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		108
12. Reactor I&C Systems	4	4
13. Reactor Auxiliary Systems		3
14. Safety Systems		2
15. Reactor Cooling Systems		22
16. Steam generation systems		45
21. Fuel Handling and Storage Facilities		10
31. Turbine and auxiliaries	25	35
32. Feedwater and Main Steam System		7
41. Main Generator Systems		99
42. Electrical Power Supply Systems		17
Total	29	352

# FR-19 TRICASTIN-2

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 915.0 MW(e)  
**Design Net Capacity:** 915.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6196.0 GW(e).h  
**Energy Availability Factor:** 84.4%  
**Load Factor:** 77.3%  
**Operating Factor:** 85.9%  
**Energy Unavailability Factor:** 15.6%  
**Total Off-line Time:** 1239 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	659.6	604.6	633.1	621.9	635.5	604.0	402.2	0.0	328.5	616.5	528.2	561.8	6196.0
<b>EAF (%)</b>	99.9	99.9	100.0	99.7	99.3	98.0	65.9	0.0	59.9	95.9	98.1	97.9	84.4
<b>UCF (%)</b>	99.9	100.0	100.0	100.0	100.0	100.0	80.7	0.0	88.5	97.3	98.2	99.1	88.4
<b>LF (%)</b>	96.9	98.3	93.1	94.4	93.3	91.7	59.1	0.0	49.9	90.4	80.2	82.5	77.3
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	71.0	0.0	75.0	97.6	93.6	95.3	85.9
<b>EUf (%)</b>	0.1	0.1	0.0	0.3	0.7	2.0	34.1	100.0	40.1	4.1	1.9	2.1	15.6
<b>PUF (%)</b>	0.0	0.1	0.0	0.0	0.0	0.0	19.4	100.0	8.7	0.2	0.0	0.0	10.9
<b>UCLF (%)</b>	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	2.5	1.9	0.9	0.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.3	0.7	2.0	14.8	0.0	28.6	1.4	0.1	1.1	4.1

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Dec 1974      **Lifetime Generation:** 133801.9 GW(e).h  
**Date of First Criticality:** 22 Jul 1980      **Cumulative Energy Availability Factor:** 76.1%  
**Date of Grid Connection:** 07 Aug 1980      **Cumulative Load Factor:** 71.8%  
**Date of Commercial Operation:** 01 Dec 1980      **Cumulative Unit Capability Factor:** 77.4%  
**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	4056.2	915.0	63.0	81.6	63.0	72.7	50.6	63.5	5932	67.7
1983	5624.0	915.0	81.9	81.7	81.9	75.8	70.2	65.7	7245	82.7
1984	6603.0	915.0	87.2	83.1	87.2	78.6	82.2	69.8	7684	87.5
1985	6261.7	915.0	86.0	83.7	79.4	78.8	78.1	71.5	7375	84.2
1986	6286.6	915.0	85.8	84.0	82.6	79.4	78.4	72.6	7631	87.1
1987	5302.3	915.0	73.2	82.5	69.6	78.0	66.2	71.7	6500	74.2
1988	4896.0	915.0	76.0	81.7	73.1	77.4	60.9	70.4	6628	75.5
1989	5164.7	915.0	74.3	80.8	71.4	76.7	64.4	69.7	6650	75.9
1990	5614.4	915.0	80.9	80.8	72.5	76.3	70.0	69.7	7177	81.9
1991	4459.1	915.0	60.8	79.0	58.2	74.7	55.6	68.5	5429	62.0
1992	6099.1	915.0	80.0	79.1	78.7	75.0	75.9	69.1	7118	81.0
1993	5777.1	915.0	77.3	79.0	72.9	74.8	72.1	69.3	6876	78.5
1994	6216.7	915.0	81.7	79.2	79.1	75.1	77.6	69.9	7222	82.4
1995	6312.3	915.0	84.6	79.5	81.6	75.6	78.8	70.5	7504	85.7
1996	6391.3	915.0	84.9	79.9	82.1	76.0	79.5	71.1	7615	86.7
1997	5218.8	915.0	68.5	79.2	66.8	75.4	65.1	70.7	6107	69.7
1998	6293.9	915.0	83.0	79.4	81.2	75.8	78.5	71.1	7354	83.9
1999	5661.5	915.0	75.0	79.2	73.0	75.6	70.6	71.1	6674	76.2
2000	4293.8	915.0	56.7	78.0	55.3	74.6	53.4	70.2	5092	58.0
2001	6710.5	915.0	87.2	78.5	87.1	75.2	83.7	70.9	7779	88.8
2002	6593.9	880.0	86.6	78.8	86.3	75.7	85.5	71.5	7714	88.1
2003	6196.0	915.0	88.4	79.3	84.4	76.1	77.3	71.8	7521	85.9

## FR-19 TRICASTIN-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	246.0	15.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
03 Feb	182.0	10.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Mar	404.0	20.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
02 Mar	163.0	23.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
01 Apr	431.0	29.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Apr	158.0	2.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
02 Apr	17.0	6.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
01 May	376.0	40.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
02 May	239.0	5.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Jun	498.0	42.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
02 Jun	450.0	47.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
01 Jul	289.0	42.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
26 Jul	908.0	832.0	PF	C	REFUELLING AND PARTIAL INSPECTION
01 Sep	202.0	185.0	XF	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
01 Sep	88.0	39.0	PP	E	START-UP TESTS AFTER REFUELLING
04 Sep	8.0	8.0	UF3	A12	REACTOR INSTRUMENTATION AND CONTROL
10 Sep	108.0	53.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
13 Sep	34.0	8.0	UP3	A31	INSTRUMENTATION AND CONTROL OF TURBINE AND FEEDWATER PLANT
01 Oct	57.0	37.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX
01 Oct	474.0	8.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
11 Oct	18.0	16.0	UF3	A31	STEAM VALVES
01 Nov	462.0	116.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
17 Nov	12.0	11.0	UF3	L	HUMAN OPERATING ERRORS
01 Dec	351.0	5.0	UP3	Z	VARIOUS, UNIT OPERATIONAL PROBLEMS (SOME NOT EXPLAINED)
01 Dec	225.0	104.0	XP	K	FREQUENCY CONTROL, OPERATION AT BELOW MAXIMUM SET POINT PCMAX

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1980 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		26			343	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	908			1075	43	
D. Inspection, maintenance or repair without refuelling				42		
E. Testing of plant systems or components				5	2	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					41	50
L. Human factor related		12				
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)			202			
Subtotal	908	38	202	1122	433	50
Total		1148			1605	

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

System	2003 Hours Lost	1980 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems	8	45
13. Reactor Auxiliary Systems		6
14. Safety Systems		26
15. Reactor Cooling Systems		51
16. Steam generation systems		11
21. Fuel Handling and Storage Facilities		26
31. Turbine and auxiliaries	18	57
32. Feedwater and Main Steam System		7
41. Main Generator Systems		0
42. Electrical Power Supply Systems		12
Total	26	247

# FR-25 TRICASTIN-3

**Operator:** EDF (ELECTRICITE DE FRANCE)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 915.0 MW(e)  
**Design Net Capacity:** 915.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6144.9 GW(e).h  
**Energy Availability Factor:** 79.7%  
**Load Factor:** 76.7%  
**Operating Factor:** 86.8%  
**Energy Unavailability Factor:** 20.3%  
**Total Off-line Time:** 1153 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	625.3	128.1	113.3	632.4	615.5	533.0	433.2	413.6	639.3	681.9	664.0	665.3	6144.9
<b>EAF (%)</b>	94.8	22.8	17.8	98.4	100.0	85.3	69.6	70.0	97.7	100.0	100.0	96.6	79.7
<b>UCF (%)</b>	100.0	25.5	17.8	98.4	100.0	99.9	99.9	97.5	99.9	100.0	100.0	99.9	86.9
<b>LF (%)</b>	91.9	20.8	16.7	96.0	90.4	80.9	63.6	60.8	97.0	100.0	100.8	97.7	76.7
<b>OF (%)</b>	100.0	25.6	24.5	98.9	96.5	100.0	97.4	97.6	100.0	100.0	100.0	97.2	86.8
<b>EUf (%)</b>	5.2	77.2	82.2	1.6	0.0	14.7	30.4	30.0	2.3	0.0	0.0	3.4	20.3
<b>PUF (%)</b>	0.0	74.5	35.8	0.2	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	8.8
<b>UCLF (%)</b>	0.0	0.0	46.4	1.4	0.0	0.0	0.1	2.6	0.1	0.0	0.0	0.0	4.3
<b>XUF (%)</b>	5.2	2.7	0.0	0.0	0.0	14.6	30.4	27.4	2.2	0.0	0.0	3.3	7.2

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1975  
**Date of First Criticality:** 29 Nov 1980  
**Date of Grid Connection:** 10 Feb 1981  
**Date of Commercial Operation:** 11 May 1981

**Lifetime Generation:** 136560.6 GW(e).h  
**Cumulative Energy Availability Factor:** 78.1%  
**Cumulative Load Factor:** 74.7%  
**Cumulative Unit Capability Factor:** 77.4%  
**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 (%)
1982	5067.3	915.0	65.8	65.8	65.8	65.8	63.2	63.2	5966	68.1
1983	6342.0	915.0	84.7	75.3	84.7	75.3	79.1	71.2	7544	86.1
1984	6682.0	915.0	86.1	78.9	85.1	78.5	83.1	75.2	7668	87.3
1985	7166.0	915.0	97.1	83.4	94.3	82.5	89.4	78.7	8518	97.2
1986	6230.4	915.0	86.8	84.1	83.5	82.7	77.7	78.5	7704	87.9
1987	5654.3	915.0	76.8	82.9	75.4	81.5	70.5	77.2	6810	77.7
1988	5722.0	915.0	80.3	82.5	78.0	81.0	71.2	76.3	7106	80.9
1989	5834.6	915.0	80.9	82.3	75.9	80.3	72.8	75.9	7188	82.1
1990	6457.2	915.0	85.8	82.7	84.6	80.8	80.6	76.4	7671	87.6
1991	4746.8	915.0	66.5	81.1	62.1	78.9	59.2	74.7	5941	67.8
1992	5199.0	915.0	67.5	79.8	66.6	77.8	64.7	73.8	6010	68.4
1993	6423.9	915.0	83.3	80.1	81.4	78.1	80.1	74.3	7373	84.2
1994	6496.5	915.0	86.3	80.6	83.6	78.5	81.1	74.8	7641	87.2
1995	6494.7	915.0	87.0	81.1	85.1	79.0	81.0	75.3	7675	87.6
1996	5806.7	915.0	79.3	81.0	76.2	78.8	72.2	75.1	7172	81.6
1997	6192.8	915.0	82.6	81.0	79.1	78.8	77.3	75.2	7331	83.7
1998	6359.5	915.0	82.3	81.1	80.5	78.9	79.3	75.4	7375	84.2
1999	5731.7	915.0	76.7	80.9	74.0	78.7	71.5	75.2	6828	77.9
2000	5985.2	915.0	82.3	81.0	79.0	78.7	74.5	75.2	7325	83.4
2001	4929.5	915.0	65.8	80.2	65.2	78.0	61.5	74.5	5777	65.9
2002	5976.1	880.0	79.7	80.2	79.4	78.1	77.5	74.6	7140	81.5
2003	6144.9	915.0	86.9	80.5	79.7	78.1	76.7	74.7	7607	86.8



## FR-25 TRICASTIN-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	630.0	53.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
01 Jan	226.0	20.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Feb	60.0	9.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
08 Feb	716.0	656.0	PF	C	REFUELLING AND PARTIAL INSPECTION
10 Mar	216.0	198.0	UF3	R	INDUSTRIAL ACTION DURING PROGRAMMED OUTAGE, EXTENSION
19 Mar	72.0	66.0	UF3	A13	CHEMICAL AND VOLUME CONTROL SYSTEM WITHOUT PUMP
22 Mar	24.0	22.0	UF3	A32	ROTATING BUTTERFLY VALVES
23 Mar	33.0	30.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
24 Mar	112.0	46.0	PP	E	START-UP TESTS AFTER REFUELLING
15 Apr	8.0	7.0	UF3	L	HUMAN ERROR DURING MAINTENANCE
02 May	318.0	40.0	XP	K	REMOTE LOAD DISPATCH CONTROL AT MAXIMUM SET POINT PCOMAX
01 Jun	170.0	31.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Jun	225.0	90.0	XP	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
02 Jun	214.0	3.0	XP	P	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Jul	217.0	39.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
01 Jul	310.0	204.0	XP	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
02 Jul	102.0	2.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Aug	91.0	2.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
03 Aug	460.0	184.0	XP	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
03 Aug	172.0	62.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
27 Aug	18.0	17.0	UF3	A31	CONTROL FLUID SYSTEM
01 Sep	219.0	15.0	XP	K	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
02 Sep	406.0	3.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Oct	175.0	2.0	XP	K	FREQUENCY CONTROL, OPERATION AT MAXIMUM SET POINT PCMAX
02 Dec	47.0	21.0	XP	K	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		114			335	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling	716			1089	11	
D. Inspection, maintenance or repair without refuelling				41		
E. Testing of plant systems or components				7	1	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					30	
L. Human factor related		8				
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant, spare part delivery problems etc.)		216				
Z. Others		33				
Subtotal	716	371	0	1137	391	0
Total		1087			1528	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		16
12. Reactor I&C Systems		47
13. Reactor Auxiliary Systems	72	8
14. Safety Systems		20
15. Reactor Cooling Systems		51
16. Steam generation systems		4
31. Turbine and auxiliaries	18	59
32. Feedwater and Main Steam System	24	6
41. Main Generator Systems		100
42. Electrical Power Supply Systems		3
Total	114	314

**FR-26 TRICASTIN-4**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 915.0 MW(e)  
 Design Net Capacity: 915.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 6387.9 GW(e).h  
 Energy Availability Factor: 79.9%  
 Load Factor: 79.7%  
 Operating Factor: 84.5%  
 Energy Unavailability Factor: 20.1%  
 Total Off-line Time: 1361 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	683.6	614.6	677.0	618.8	425.4	0.0	277.3	646.1	556.8	611.3	647.7	629.3	6387.9
EAF (%)	100.0	99.6	99.5	93.9	62.8	0.0	41.8	94.9	84.9	90.5	98.3	93.0	79.9
UCF (%)	100.0	99.6	99.9	100.0	74.5	0.0	46.8	99.7	91.1	90.5	98.3	94.6	82.9
LF (%)	100.4	100.0	99.6	93.9	62.5	0.0	40.7	94.9	84.5	89.7	98.3	92.4	79.7
OF (%)	100.0	100.0	100.0	100.0	74.6	0.0	55.1	100.0	93.8	93.7	100.0	96.5	84.5
EU (%)	0.0	0.4	0.5	6.1	37.2	100.0	58.2	5.1	15.1	9.5	1.7	7.0	20.1
PU (%)	0.0	0.1	0.0	0.0	25.5	100.0	17.8	0.0	0.1	0.0	0.1	0.0	11.9
UCLF (%)	0.1	0.3	0.1	0.0	0.0	0.0	35.5	0.3	8.8	9.5	1.6	5.4	5.2
XUF (%)	0.0	0.0	0.4	6.1	11.7	0.0	5.0	4.8	6.2	0.0	0.0	1.6	3.0

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 May 1975      Lifetime Generation: 131150.9 GW(e).h  
 Date of First Criticality: 31 May 1981      Cumulative Energy Availability Factor: 79.3%  
 Date of Grid Connection: 12 Jun 1981      Cumulative Load Factor: 73.0%  
 Date of Commercial Operation: 01 Nov 1981      Cumulative Unit Capability Factor: 77.4%  
    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 (%)
1982	5470.5	915.0	69.8	69.8	69.8	69.8	68.2	68.2	6311	72.0
1983	6170.0	915.0	82.6	76.2	82.6	76.2	77.0	72.6	7386	84.3
1984	5446.0	915.0	91.8	81.4	87.1	79.8	67.8	71.0	7587	86.4
1985	6161.7	915.0	91.3	83.9	84.8	81.1	76.9	72.5	7816	89.2
1986	5873.9	915.0	85.7	84.3	81.8	81.2	73.3	72.6	7568	86.4
1987	5725.7	915.0	84.2	84.2	80.1	81.0	71.4	72.4	7257	82.8
1988	3770.0	915.0	67.7	81.9	66.2	78.9	46.9	68.8	4772	54.3
1989	5729.1	915.0	82.9	82.0	79.8	79.0	71.5	69.1	7335	83.7
1990	5201.6	915.0	82.7	82.1	77.4	78.9	64.9	68.6	7329	83.7
1991	5742.8	915.0	77.1	81.6	74.5	78.4	71.6	68.9	6838	78.1
1992	6459.3	915.0	90.2	82.4	86.7	79.2	80.4	70.0	7968	90.7
1993	5302.8	915.0	80.1	82.2	70.9	78.5	66.2	69.7	6842	78.1
1994	5953.0	915.0	80.9	82.1	77.8	78.4	74.3	70.0	7049	80.5
1995	6208.9	915.0	85.7	82.3	82.0	78.7	77.5	70.6	7562	86.3
1996	6700.4	915.0	87.6	82.7	86.5	79.2	83.4	71.4	7774	88.5
1997	6488.8	915.0	86.0	82.9	84.8	79.6	81.0	72.0	7595	86.7
1998	5913.0	915.0	80.5	82.8	76.2	79.4	73.8	72.1	7138	81.5
1999	5887.9	915.0	80.5	82.6	78.0	79.3	73.5	72.2	7158	81.7
2000	5780.3	915.0	77.4	82.3	75.8	79.1	71.9	72.2	6873	78.2
2001	6036.9	915.0	83.0	82.4	81.2	79.2	75.3	72.3	7138	81.5
2002	6260.6	880.0	83.3	82.4	81.2	79.3	81.2	72.7	7168	81.8
2003	6387.9	915.0	82.9	82.4	79.9	79.3	79.7	73.0	7399	84.5

# FR-26 TRICASTIN-4

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
25 Mar	1441.0	123.0	XP	S	LOAD LIMITATION DURING STRETCH-OUT
24 May	981.0	898.0	PF	C	REFUELLING AND FULL INSPECTION
04 Jul	24.0	22.0	UF3	A	CONTROL AND ISOLATING VALVES
05 Jul	86.0	79.0	UF3	Z	PROGRAMMED OUTAGE DURATION EXCEEDED
08 Jul	113.0	103.0	UF3	A42	CIRCUIT BREAKERS
13 Jul	9.0	8.0	UF3	A31	CONTROL FLUID SYSTEM
13 Jul	182.0	55.0	PP	E	START-UP TESTS AFTER REFUELLING
14 Jul	38.0	34.0	XP	N	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
21 Jul	218.0	28.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
01 Aug	722.0	32.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
01 Aug	19.0	2.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
01 Sep	444.0	14.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
06 Sep	41.0	18.0	XP	M	COMPLIANCE WITH REGULATIONS CONCERNING RIVER TEMPERATURES
06 Sep	7.0	1.0	UP3	A12	CONTROL ROD ASSEMBLIES AND DRIVE MECHANISMS
08 Sep	34.0	2.0	UP3	A12	REACTOR CONTROL
08 Sep	56.0	10.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
25 Sep	52.0	3.0	UP3	A31	STEAM VALVES
25 Sep	36.0	33.0	UF3	A31	STEAM VALVES
25 Sep	12.0	9.0	XP	J	GRID FAULT, CORRECT UNIT OPERATION
27 Sep	2.0	2.0	UF3	A	GENERAL CONTROL AND REGULATION CHANNELS
27 Sep	55.0	50.0	UF3	A31	INSTRUMENTATION AND CONTROL OF TURBINE AND FEEDWATER PLANT
01 Oct	10.0	3.0	UP3	A31	STEAM VALVES
03 Oct	122.0	7.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
03 Oct	14.0	8.0	UP3	Z	MALFUNCTION OF REGULATION, CONTROL AND PROTECTION SYSTEM
09 Oct	1245.0	13.0	UP3	A12	REACTOR CONTROL
15 Nov	25.0	3.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS
01 Dec	615.0	7.0	UP3	A12	REACTOR CONTROL
03 Dec	17.0	16.0	UF3	A12	REACTOR INSTRUMENTATION AND CONTROL
03 Dec	19.0	11.0	XP	N	LOAD LIMITATION OR SHUTDOWN FOR ENVIRONMENTAL REASONS
04 Dec	75.0	16.0	UP3	A16	STEAM GENERATOR INCLUDING SG BLOWDOWNS

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		256			248	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	981			956	13	
D. Inspection, maintenance or repair without refuelling				25		
E. Testing of plant systems or components				1		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					95	12
Z. Others		86				
Subtotal	981	342	0	982	357	12
Total		1323			1351	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		28
12. Reactor I&C Systems	17	18
13. Reactor Auxiliary Systems		10
14. Safety Systems		37
15. Reactor Cooling Systems		24
16. Steam generation systems		37
31. Turbine and auxiliaries	100	10
32. Feedwater and Main Steam System		7
41. Main Generator Systems		47
42. Electrical Power Supply Systems	113	5
Total	230	223

# DE-12 BIBLIS-A (KWB A)

**Operator:** RWE (RWE ENERGIE AG)  
**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1167.0 MW(e)  
**Design Net Capacity:** 1146.0 MW(e)  
**Design Discharge Burnup:** 36000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 2695.8 GW(e).h  
**Energy Availability Factor:** 26.6%  
**Load Factor:** 26.4%  
**Operating Factor:** 27.5%  
**Energy Unavailability Factor:** 73.4%  
**Total Off-line Time:** 6354 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	762.3	769.5	846.9	299.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.5	2695.8
<b>EAF (%)</b>	88.6	98.8	98.4	35.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	26.6
<b>UCF (%)</b>	88.6	98.8	98.4	35.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	26.6
<b>LF (%)</b>	87.8	98.1	97.5	35.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	26.4
<b>OF (%)</b>	93.7	100.0	99.9	36.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	27.5
<b>EUF (%)</b>	11.4	1.2	1.6	64.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.0	73.4
<b>PUF (%)</b>	0.0	0.7	0.7	18.9	0.0	35.8	0.0	0.0	53.3	100.0	100.0	97.9	34.0
<b>UCLF (%)</b>	11.4	0.5	0.9	45.3	100.0	64.2	100.0	100.0	46.7	0.0	0.0	0.1	39.4
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1970      **Lifetime Generation:** 193095.4 GW(e).h  
**Date of First Criticality:** 16 Jul 1974      **Cumulative Energy Availability Factor:** 70.2%  
**Date of Grid Connection:** 25 Aug 1974      **Cumulative Load Factor:** 65.5%  
**Date of Commercial Operation:** 26 Feb 1975      **Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 29.8%

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	8994.3	1146.0	87.6	85.6	87.6	68.6	89.6	64.8	7723	88.2
1983	7766.0	1146.0	76.7	84.5	76.7	69.6	77.4	66.4	6783	77.4
1984	6901.0	1146.0	67.9	82.6	67.9	69.4	68.6	66.6	6175	70.3
1985	7564.9	1146.0	79.2	82.2	75.1	70.0	75.4	67.5	6797	77.6
1986	6968.1	1146.0	76.9	81.7	76.9	70.6	69.4	67.7	7227	82.5
1987	7467.8	1146.0	80.9	81.7	80.9	71.5	74.4	68.3	7154	81.7
1988	5985.4	1146.0	72.5	81.0	72.5	71.6	59.5	67.6	6594	75.1
1989	6431.0	1146.0	66.9	79.9	66.9	71.2	64.1	67.3	5904	67.4
1990	5052.7	1146.0	53.1	78.1	53.1	70.0	50.3	66.2	4676	53.4
1991	6931.0	1146.0	76.3	78.0	76.3	70.4	69.0	66.4	6778	77.4
1992	6884.8	1146.0	79.6	78.1	79.6	71.0	68.4	66.5	7024	80.0
1993	8240.7	1146.0	97.5	79.2	97.5	72.4	82.1	67.4	8558	97.7
1994	7483.6	1146.0	76.8	79.1	76.8	72.7	74.5	67.7	6697	76.4
1995	2509.4	1156.0	30.0	76.6	30.0	70.5	24.8	65.6	2655	30.3
1996	4012.5	1167.0	39.7	74.8	39.7	69.0	39.1	64.3	3503	39.9
1997	8002.3	1167.0	87.0	75.3	87.0	69.8	78.3	64.9	7648	87.3
1998	10042.3	1167.0	99.7	76.4	99.7	71.2	98.2	66.4	8752	99.9
1999	7251.1	1167.0	78.0	76.5	78.0	71.5	70.9	66.6	6865	78.4
2000	5910.1	1167.0	62.5	75.9	62.5	71.1	57.7	66.2	5497	62.6
2001	9532.0	1167.0	94.9	76.7	94.9	72.0	93.2	67.3	8334	95.1
2002	6167.7	1167.0	68.0	76.3	68.1	71.9	60.3	67.0	5988	68.4
2003	2695.8	1167.0	26.6	74.5	26.6	70.2	26.4	65.5	2406	27.5

## DE-12 BIBLIS-A (KWB A)

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
11 Apr	136.0	158.8	PF	D32	HIGH PRESSURE HEATERS LEAKAGE REPAIR
17 Apr	1527.0	1781.7	UF2	A14	PROOF OF THE CONDITION OF THE SUMP PUMPS IN CASE OF LOCA
10 Jun	258.0	301.1	PF	B	REFUELLING WITHOUT MAINTENANCE
01 Jul	1824.0	2128.6	UF2	A14	UPGRADE OF FILTERS OF THE EMERGENCY COOLING PUMPS IN THE SUMP OF REACTOR CONTAINEMENT
15 Sep	2561.0	2989.2	PF	C	REFUELLING AND MAINTENANCE
30 Dec	26.0	15.6	PP	E	TEST

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1975 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		3351			768	
B. Refuelling without a maintenance	258				3	
C. Inspection, maintenance or repair combined with refuelling	2561			1356		
D. Inspection, maintenance or repair without refuelling	136			36		
E. Testing of plant systems or components				30	7	
H. Nuclear regulatory requirements					14	22
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				3	4	0
Subtotal	2955	3351	0	1425	796	22
Total		6306			2243	

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

System	2003 Hours Lost	1975 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		13
12. Reactor I&C Systems		23
13. Reactor Auxiliary Systems		4
14. Safety Systems	3351	325
15. Reactor Cooling Systems		215
16. Steam generation systems		77
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		8
31. Turbine and auxiliaries		34
32. Feedwater and Main Steam System		24
33. Circulating Water System		3
41. Main Generator Systems		33
42. Electrical Power Supply Systems		1
Total	3351	761

## DE-18 BIBLIS-B (KWB B)

**Operator:** RWE (RWE ENERGIE AG)  
**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1240.0 MW(e)  
**Design Net Capacity:** 1178.0 MW(e)  
**Design Discharge Burnup:** 36000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 7792.0 GW(e).h  
**Energy Availability Factor:** 75.3%  
**Load Factor:** 71.7%  
**Operating Factor:** 75.7%  
**Energy Unavailability Factor:** 24.7%  
**Total Off-line Time:** 2130 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	906.1	328.6	0.0	0.0	481.2	839.5	860.8	823.9	854.1	908.2	876.3	913.3	7792.0
<b>EAF (%)</b>	100.0	48.9	0.0	0.0	53.4	100.0	100.0	100.0	99.6	100.0	99.3	99.8	75.3
<b>UCF (%)</b>	100.0	48.9	0.0	0.0	53.4	100.0	100.0	100.0	99.6	100.0	99.3	99.8	75.3
<b>LF (%)</b>	98.2	39.4	0.0	0.0	52.2	94.0	93.3	89.3	95.7	98.3	98.2	99.0	71.7
<b>OF (%)</b>	100.0	49.9	0.0	0.0	55.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	75.7
<b>EUf (%)</b>	0.0	51.1	100.0	100.0	46.6	0.0	0.0	0.0	0.4	0.0	0.7	0.2	24.7
<b>PUF (%)</b>	0.0	50.3	100.0	100.0	46.6	0.0	0.0	0.0	0.4	0.0	0.4	0.2	24.6
<b>UCLF (%)</b>	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	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. 2003 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Feb 1972      **Lifetime Generation:** 199727.8 GW(e).h  
**Date of First Criticality:** 25 Mar 1976      **Cumulative Energy Availability Factor:** 75.7%  
**Date of Grid Connection:** 06 Apr 1976      **Cumulative Load Factor:** 68.2%  
**Date of Commercial Operation:** 31 Jan 1977      **Cumulative Unit Capability Factor:** 77.2%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	9196.0	1240.0	85.5	97.5	85.5	72.0	84.7	67.0	7681	87.7
1983	6490.0	1240.0	60.6	92.1	60.6	70.4	59.7	65.9	5360	61.2
1984	8216.0	1240.0	77.6	90.3	77.6	71.3	75.4	67.2	7338	83.5
1985	7780.2	1240.0	75.3	88.6	75.3	71.7	71.6	67.7	6918	79.0
1986	6722.6	1240.0	68.2	86.5	68.2	71.4	61.9	67.1	6370	72.7
1987	5623.0	1240.0	76.2	85.6	76.2	71.8	51.8	65.7	7273	83.0
1988	5591.8	1240.0	74.8	84.7	74.8	72.1	51.3	64.5	6593	75.1
1989	5165.8	1240.0	53.6	82.2	53.6	70.6	47.6	63.1	4807	54.9
1990	9100.1	1240.0	90.0	82.8	90.1	72.0	83.8	64.6	8631	98.5
1991	3917.8	1240.0	41.1	80.0	39.3	69.8	36.1	62.7	3626	41.4
1992	7630.5	1240.0	81.5	80.1	81.5	70.6	70.1	63.2	7184	81.8
1993	7441.8	1240.0	83.8	80.3	83.8	71.3	68.5	63.5	7368	84.1
1994	7973.8	1240.0	84.9	80.6	84.9	72.1	73.4	64.0	7468	85.3
1995	7854.2	1240.0	75.4	80.3	75.4	72.3	72.3	64.5	6603	75.4
1996	7857.4	1240.0	80.1	80.3	80.1	72.7	72.1	64.9	6762	77.0
1997	8469.4	1240.0	85.9	80.5	85.9	73.3	78.0	65.5	7560	86.3
1998	8182.1	1240.0	84.4	80.7	84.4	73.8	75.3	65.9	7409	84.6
1999	8707.4	1240.0	85.0	80.9	85.0	74.3	80.2	66.6	7474	85.3
2000	8295.7	1240.0	89.2	81.3	89.2	74.9	76.2	67.0	7950	90.5
2001	7442.2	1240.0	73.8	81.0	73.8	74.9	68.5	67.0	6470	73.9
2002	10173.6	1240.0	95.2	81.5	95.2	75.7	93.7	68.1	8371	95.6
2003	7792.0	1240.0	75.3	81.3	75.3	75.7	71.7	68.2	6630	75.7

## DE-18 BIBLIS-B (KWB B)

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
15 Feb	2127.0	2638.2	PF	C	REFUELLING AND MAINTENANCE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1976 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					510	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	2127			1247		
D. Inspection, maintenance or repair without refuelling				4		
E. Testing of plant systems or components				3	0	
H. Nuclear regulatory requirements				18	42	
Subtotal	2127	0	0	1272	552	0
Total		2127			1824	

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

System	2003 Hours Lost	1976 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		33
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		78
15. Reactor Cooling Systems		190
16. Steam generation systems		139
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System		19
33. Circulating Water System		1
41. Main Generator Systems		30
Total	0	506

# DE-32 BROKDORF (KBR)

**Operator:** EON (EON Kernkraft Ges.m.b.H)  
**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1370.0 MW(e)  
**Design Net Capacity:** 1307.0 MW(e)  
**Design Discharge Burnup:** 29000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 10564.6 GW(e).h  
**Energy Availability Factor:** 90.1%  
**Load Factor:** 88.0%  
**Operating Factor:** 90.2%  
**Energy Unavailability Factor:** 9.9%  
**Total Off-line Time:** 857 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	1020.0	922.3	1013.6	983.0	971.5	426.3	322.2	979.7	962.1	1005.4	973.7	984.9	10564.6
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	49.7	32.4	100.0	99.9	100.0	100.0	100.0	90.1
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	49.7	32.4	100.0	99.9	100.0	100.0	100.0	90.1
<b>LF (%)</b>	100.1	100.2	99.4	99.8	95.3	43.2	31.6	96.1	97.5	98.5	98.7	96.6	88.0
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	50.0	33.2	100.0	100.0	100.0	100.0	100.0	90.2
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	50.3	67.6	0.0	0.1	0.0	0.0	0.0	9.9
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	50.3	29.7	0.0	0.0	0.0	0.0	0.0	6.7
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	37.9	0.0	0.1	0.0	0.0	0.0	3.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1976      **Lifetime Generation:** 173659.6 GW(e).h  
**Date of First Criticality:** 08 Oct 1986      **Cumulative Energy Availability Factor:** 89.1%  
**Date of Grid Connection:** 14 Oct 1986      **Cumulative Load Factor:** 87.0%  
**Date of Commercial Operation:** 22 Dec 1986      **Cumulative Unit Capability Factor:** 78.1%  
**Cumulative Energy Unavailability Factor:** 10.9%

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	296.8	1307.0	0.0	0.0	100.0	100.0	2.6	0.0	228	2.6
1987	9481.3	1307.0	85.2	85.2	85.2	85.2	82.8	82.8	7477	85.4
1988	8581.8	1326.0	85.2	85.2	85.2	85.2	73.7	78.2	7014	79.8
1989	8991.3	1326.0	80.0	83.5	80.0	83.5	77.4	77.9	7134	81.4
1990	8337.2	1326.0	72.5	80.7	72.5	80.7	71.8	76.4	6447	73.6
1991	9492.7	1326.0	85.7	81.7	85.7	81.7	81.7	77.5	7542	86.1
1992	10788.0	1326.0	96.0	84.1	96.0	84.1	92.6	80.0	8461	96.3
1993	9447.1	1326.0	85.6	84.3	84.8	84.2	81.3	80.2	7441	84.9
1994	10228.6	1326.0	88.7	84.9	88.7	84.8	88.1	81.2	7793	89.0
1995	9912.4	1326.0	86.6	85.1	86.6	85.0	85.3	81.6	7833	89.4
1996	10555.4	1326.0	93.2	85.9	93.2	85.8	90.6	82.5	8212	93.5
1997	11249.3	1326.0	95.1	86.7	95.1	86.6	96.8	83.8	8328	95.1
1998	10752.3	1326.0	92.6	87.2	90.4	87.0	92.6	84.6	7966	90.9
1999	11093.3	1370.0	93.3	87.7	93.3	87.5	92.4	85.2	8177	93.3
2000	11335.1	1370.0	95.5	88.3	95.6	88.1	94.2	85.9	8397	95.6
2001	11215.4	1370.0	95.0	88.7	95.0	88.5	93.5	86.4	8331	95.1
2002	11336.9	1370.0	95.8	89.2	95.8	89.0	94.5	86.9	8405	95.9
2003	10564.6	1370.0	90.1	89.2	90.1	89.1	88.0	87.0	7903	90.2



## DE-32 BROKDORF (KBR)

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
15 Jun	594.0	798.5	PF	C	ANNUAL MAINTENANCE AND REFUELLING
09 Jul	263.0	386.4	UF3	Z	OUTAGE EXTENSION

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					105	
B. Refuelling without a maintenance					19	
C. Inspection, maintenance or repair combined with refuelling	594			645		
D. Inspection, maintenance or repair without refuelling				10		
H. Nuclear regulatory requirements					60	10
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					12	4
Z. Others		263				
Subtotal	594	263	0	655	196	14
Total		857			865	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
13. Reactor Auxiliary Systems		9
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		1
41. Main Generator Systems		93
Total	0	104

# DE-13 BRUNSBUETTEL (KKB)

**Operator:** HEW (Hamburgische Elektrizitaetswerke)  
**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 771.0 MW(e)  
**Design Net Capacity:** 770.0 MW(e)  
**Design Discharge Burnup:** 32000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4905.8 GW(e).h  
**Energy Availability Factor:** 76.3%  
**Load Factor:** 72.6%  
**Operating Factor:** 76.3%  
**Energy Unavailability Factor:** 23.7%  
**Total Off-line Time:** 2072 hours

## 3. 2003 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	46.0	502.7	562.4	538.6	540.9	507.9	540.0	562.8	546.3	558.3	4905.8
<b>EAF (%)</b>	0.0	0.0	33.2	90.6	98.6	99.3	97.5	99.4	98.9	98.3	98.1	96.9	76.3
<b>UCF (%)</b>	0.0	0.0	33.2	90.6	98.6	99.3	97.5	99.4	98.9	98.4	98.2	96.9	76.3
<b>LF (%)</b>	0.0	0.0	8.0	90.7	98.0	97.0	94.3	88.5	97.3	98.0	98.4	97.3	72.6
<b>OF (%)</b>	0.0	0.0	13.6	100.1	100.0	100.0	100.0	100.0	100.0	100.0	98.8	99.3	76.3
<b>EUf (%)</b>	100.0	100.0	66.8	9.4	1.4	0.7	2.5	0.6	1.1	1.7	1.9	3.1	23.7
<b>PUF (%)</b>	0.0	0.0	12.1	0.0	1.2	0.7	0.0	0.5	0.5	0.0	0.0	0.0	1.3
<b>UCLF (%)</b>	100.0	100.0	54.7	9.4	0.1	0.0	2.5	0.2	0.6	1.7	1.9	3.1	22.4
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 15 Apr 1970      **Lifetime Generation:** 101134.4 GW(e).h  
**Date of First Criticality:** 23 Jun 1976      **Cumulative Energy Availability Factor:** 59.7%  
**Date of Grid Connection:** 13 Jul 1976      **Cumulative Load Factor:** 55.1%  
**Date of Commercial Operation:** 09 Feb 1977      **Cumulative Unit Capability Factor:** 77.2%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	3439.2	770.0	51.1	65.7	51.1	32.6	51.0	32.4	5007	57.2
1983	2416.0	770.0	34.2	60.5	34.2	32.9	35.8	33.0	3241	37.0
1984	5334.0	770.0	78.9	63.1	78.9	39.5	78.9	39.6	7549	85.9
1985	5625.3	770.0	83.1	65.6	83.1	44.9	83.4	45.0	7661	87.5
1986	5630.9	771.0	86.1	67.9	86.1	49.5	83.4	49.3	7802	89.1
1987	5233.8	771.0	85.9	69.7	85.9	53.2	77.5	52.1	7837	89.5
1988	5085.3	771.0	85.4	71.1	85.4	56.1	75.1	54.2	7800	88.8
1989	4097.2	771.0	71.6	71.2	71.6	57.4	60.7	54.8	6730	76.8
1990	4780.3	771.0	93.8	72.9	93.8	60.2	70.8	56.0	8527	97.3
1991	3819.3	771.0	80.8	73.5	61.2	60.3	56.5	56.0	6317	72.1
1992	3487.4	771.0	57.4	72.4	57.4	60.1	51.5	55.7	5425	61.8
1993	0.0	771.0	0.0	67.9	0.0	56.3	0.0	52.2	0	0.0
1994	0.0	771.0	0.0	63.9	0.0	53.0	0.0	49.2	0	0.0
1995	3001.0	771.0	51.4	63.2	51.4	52.9	44.4	48.9	4750	54.2
1996	4696.4	771.0	77.9	64.0	74.7	54.1	69.3	50.0	7255	82.6
1997	5102.9	771.0	97.4	65.6	97.4	56.2	75.6	51.3	8760	100.0
1998	3993.9	771.0	64.7	65.6	64.7	56.6	59.1	51.6	5712	65.2
1999	6219.8	771.0	93.6	66.9	93.6	58.3	92.1	53.5	8290	94.6
2000	5784.8	771.0	93.8	68.0	93.8	59.9	85.4	54.9	8295	94.4
2001	5764.3	771.0	93.1	69.1	86.8	61.0	85.3	56.1	8202	93.6
2002	860.0	771.0	13.1	66.8	13.1	59.1	12.7	54.4	1167	13.3
2003	4905.8	771.0	76.3	67.2	76.3	59.7	72.6	55.1	6688	76.3

**DE-13 BRUNSBUETTEL (KKB)****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	1820.0	1403.2	UF3	Z	EXTENSION OF MAINTENANCE STARTED IN 2002
17 Mar	189.0	143.9	XF	M	OPERATION PERMISSION
25 Mar	150.0	69.2	PP	E	START-UP ACTIVITIES
15 Jul	43.0	14.2	UP1	A34	LOAD REDUCTION DUE TO VALVE PROBLEM
21 Dec	27.0	9.1	UF2	A17	AIR TUBE FAILURE

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

Outage Cause	2003 Hours Lost			1976 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		27			1470	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling				654		
D. Inspection, maintenance or repair without refuelling				492		
E. Testing of plant systems or components				0	2	
H. Nuclear regulatory requirements				0	26	30
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					3	
M. Governmental requirements or court decisions			189			
Z. Others		1820				
Subtotal	0	1847	189	1146	1501	30
Total		2036			2677	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1976 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		808
15. Reactor Cooling Systems		117
17. Safety I&C Systems (excluding reactor I&C)	27	
31. Turbine and auxiliaries		522
32. Feedwater and Main Steam System		0
35. All other I&C Systems		0
41. Main Generator Systems		6
Total	27	1457

# DE-33 EMSLAND (KKE)

Operator: RWE (RWE ENERGIE AG)

Contractor: SIEM, KWU (SIEMENS AG, KRAFTWERK UNION AG)

## 1. Station Details

Type: PWR  
 Maximum Net Capacity at the beginning of 2003: 1329.0 MW(e)  
 Design Net Capacity: 1242.0 MW(e)  
 Design Discharge Burnup: 36000 MW.d/t

## 2. Production Summary 2003

Energy Production: 11097.0 GW(e).h  
 Energy Availability Factor: 95.8%  
 Load Factor: 95.3%  
 Operating Factor: 95.9%  
 Energy Unavailability Factor: 4.2%  
 Total Off-line Time: 359 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	1000.3	904.5	995.4	944.5	487.8	912.9	976.6	974.6	952.1	998.0	960.0	990.4	11097.0
EAF (%)	100.0	99.9	100.0	100.0	54.7	96.4	100.0	100.0	100.0	100.0	100.0	100.0	95.8
UCF (%)	100.0	99.9	100.0	100.0	54.7	96.4	100.0	100.0	100.0	100.0	100.0	100.0	95.8
LF (%)	101.2	101.3	100.7	98.8	49.3	95.4	98.8	98.6	99.5	100.8	100.3	100.2	95.3
OF (%)	100.0	100.0	99.9	100.1	54.8	96.8	100.0	100.0	100.0	100.0	100.0	100.0	95.9
EUf (%)	0.0	0.1	0.0	0.0	45.3	3.6	0.0	0.0	0.0	0.0	0.0	0.0	4.2
PUf (%)	0.0	0.0	0.0	0.0	45.3	3.6	0.0	0.0	0.0	0.0	0.0	0.0	4.2
UCLF (%)	0.0	0.1	0.0	0.0	0.1	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. 2003 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: 163342.0 GW(e).h  
 Cumulative Energy Availability Factor: 92.8%  
 Cumulative Load Factor: 93.0%  
 Cumulative Unit Capability Factor: 78.4%  
 Cumulative Energy Unavailability Factor: 7.2%

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	5694.9	1262.0	0.0	0.0	98.2	100.0	51.4	0.0	4516	51.4
1989	9857.2	1242.0	88.7	88.7	88.7	88.7	90.6	90.6	7794	89.0
1990	10039.2	1242.0	90.4	89.5	90.4	89.5	91.2	91.4	7956	90.8
1991	9287.3	1242.0	82.0	87.0	82.0	87.0	85.4	89.4	7304	83.4
1992	10158.0	1290.0	90.2	87.8	90.2	87.8	89.6	89.5	7933	90.3
1993	10477.1	1290.0	92.9	88.9	92.9	88.8	92.7	90.1	8147	93.0
1994	10526.7	1290.0	93.4	89.6	93.4	89.6	93.2	90.6	8193	93.5
1995	10495.7	1290.0	93.1	90.1	93.1	90.1	92.9	91.0	8168	93.2
1996	10557.3	1290.0	93.2	90.5	93.2	90.5	93.2	91.3	8195	93.3
1997	10650.2	1290.0	94.6	91.0	94.6	91.0	94.2	91.6	8298	94.7
1998	10794.7	1290.0	95.7	91.5	95.7	91.4	95.5	92.0	8388	95.8
1999	10729.2	1290.0	96.0	91.9	96.0	91.9	94.9	92.3	8413	96.0
2000	10802.0	1306.0	94.9	92.1	94.9	92.1	94.2	92.4	8339	94.9
2001	10933.2	1329.0	94.2	92.3	93.8	92.3	93.9	92.5	8257	94.3
2002	11242.3	1329.0	96.9	92.6	96.9	92.6	96.6	92.8	8497	97.0
2003	11097.0	1329.0	95.8	92.8	95.8	92.8	95.3	93.0	8401	95.9

## DE-33 EMSLAND (KKE)

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
18 May	359.0	482.5	PF	C	MAINTENANCE AND REFUELLING

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					35	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	359			477		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					0	
Subtotal	359	0	0	477	35	0
Total	359			512		

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
15. Reactor Cooling Systems		21
31. Turbine and auxiliaries		4
41. Main Generator Systems		9
42. Electrical Power Supply Systems		1
Total	0	35

# DE-23 GRAFENRHEINFELD (KKG)

**Operator:** EON (EON Kernkraft Ges.m.b.H)  
**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1275.0 MW(e)  
**Design Net Capacity:** 1225.0 MW(e)  
**Design Discharge Burnup:** 34100 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 10270.2 GW(e).h  
**Energy Availability Factor:** 93.4%  
**Load Factor:** 92.0%  
**Operating Factor:** 93.6%  
**Energy Unavailability Factor:** 6.6%  
**Total Off-line Time:** 564 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	946.9	862.1	946.1	901.3	242.4	826.5	924.9	914.5	904.0	946.9	911.3	943.3	10270.2
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	28.6	93.5	100.0	100.0	100.0	100.0	99.9	100.0	93.4
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	28.7	93.5	100.0	100.0	100.0	100.0	100.0	100.0	93.4
<b>LF (%)</b>	99.8	100.6	99.7	98.3	25.6	90.0	97.5	96.4	98.5	99.7	99.3	99.4	92.0
<b>OF (%)</b>	100.0	100.0	99.9	100.1	29.8	94.2	100.0	100.0	100.0	100.0	100.0	100.0	93.6
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	71.4	6.5	0.0	0.0	0.0	0.0	0.1	0.0	6.6
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	71.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	6.5	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1975      **Lifetime Generation:** 205428.7 GW(e).h  
**Date of First Criticality:** 09 Dec 1981      **Cumulative Energy Availability Factor:** 87.4%  
**Date of Grid Connection:** 21 Dec 1981      **Cumulative Load Factor:** 85.5%  
**Date of Commercial Operation:** 17 Jun 1982      **Cumulative Unit Capability Factor:** 77.6%  
**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 (%)
1982	8139.1	1229.0	0.0	0.0	75.9	100.0	75.6	0.0	7350	83.9
1983	9412.0	1229.0	87.5	87.5	87.5	87.5	87.4	87.4	7898	90.2
1984	9590.0	1229.0	88.7	88.1	88.7	88.1	88.8	88.1	7890	89.8
1985	9741.6	1235.0	90.6	88.9	90.6	88.9	90.0	88.8	8155	93.1
1986	8718.2	1235.0	80.9	86.9	80.9	86.9	80.6	86.7	7179	82.0
1987	8360.6	1235.0	77.8	85.1	77.8	85.1	77.3	84.8	7509	85.7
1988	8799.9	1235.0	84.3	85.0	84.3	85.0	81.1	84.2	7604	86.6
1989	9401.7	1235.0	88.0	85.4	88.0	85.4	86.9	84.6	7840	89.5
1990	7910.3	1235.0	73.5	83.9	73.5	83.9	73.1	83.2	6743	77.0
1991	9753.5	1235.0	92.5	84.9	92.5	84.9	90.2	83.9	8114	92.6
1992	9657.2	1235.0	91.8	85.6	91.8	85.6	89.0	84.4	8074	91.9
1993	8845.9	1235.0	84.5	85.5	84.5	85.5	81.8	84.2	7524	85.9
1994	9674.5	1275.0	88.8	85.8	88.8	85.8	86.6	84.4	8116	92.6
1995	9946.0	1275.0	93.5	86.4	93.5	86.4	89.1	84.8	8193	93.5
1996	9528.6	1275.0	89.1	86.6	89.1	86.6	85.1	84.8	7886	89.8
1997	10131.0	1275.0	93.5	87.0	93.5	87.0	90.7	85.2	8202	93.6
1998	9147.0	1275.0	84.6	86.9	84.6	86.9	81.9	85.0	7429	84.8
1999	8336.7	1275.0	76.1	86.2	76.1	86.2	74.6	84.4	6737	76.9
2000	9600.9	1275.0	89.1	86.4	89.1	86.4	85.7	84.4	7829	89.1
2001	10573.9	1275.0	95.7	86.9	95.7	86.9	94.7	85.0	8392	95.8
2002	9889.9	1275.0	91.0	87.1	91.0	87.1	88.5	85.2	7977	91.1
2003	10270.2	1275.0	93.4	87.4	93.4	87.4	92.0	85.5	8196	93.6

## DE-23 GRAFENRHEINFELD (KKG)

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
03 May	522.0	666.0	PF	C	MAINTENANCE AND REFUELLING
27 Jun	42.0	59.8	UF1	A16	SG TUBE LEAKAGE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		42			162	
C. Inspection, maintenance or repair combined with refuelling	522			790		
Subtotal	522	42	0	790	162	0
Total		564			952	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
14. Safety Systems		0
15. Reactor Cooling Systems		44
16. Steam generation systems	42	26
31. Turbine and auxiliaries		34
32. Feedwater and Main Steam System		12
41. Main Generator Systems		43
Total	42	159

## DE-27 GROHNDE (KWG)

**Operator:** EON (EON Kernkraft Ges.m.b.H)  
**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1360.0 MW(e)  
**Design Net Capacity:** 1289.0 MW(e)  
**Design Discharge Burnup:** 34000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 10933.0 GW(e).h  
**Energy Availability Factor:** 95.0%  
**Load Factor:** 91.8%  
**Operating Factor:** 95.2%  
**Energy Unavailability Factor:** 5.0%  
**Total Off-line Time:** 417 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	1007.9	925.2	999.8	958.3	753.5	496.7	961.6	957.0	936.3	998.2	960.1	978.5	10933.0
<b>EAF (%)</b>	100.0	100.0	99.9	100.0	87.1	53.0	100.0	99.9	100.0	99.9	100.0	99.9	95.0
<b>UCF (%)</b>	100.0	100.0	99.9	100.0	87.1	53.0	100.0	99.9	100.0	100.0	100.0	99.9	95.0
<b>LF (%)</b>	99.6	101.2	98.8	98.0	74.5	50.7	95.0	94.6	95.6	98.5	98.0	96.7	91.8
<b>OF (%)</b>	100.0	100.0	99.9	100.1	87.6	54.9	100.0	100.0	100.0	100.0	100.0	100.0	95.2
<b>EUf (%)</b>	0.0	0.0	0.1	0.0	12.9	47.0	0.0	0.1	0.0	0.1	0.0	0.1	5.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	12.9	27.4	0.0	0.1	0.0	0.0	0.0	0.0	3.4
<b>UCLF (%)</b>	0.0	0.0	0.2	0.0	0.0	19.7	0.0	0.0	0.0	0.1	0.0	0.1	1.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Jun 1976      **Lifetime Generation:** 203170.4 GW(e).h  
**Date of First Criticality:** 01 Sep 1984      **Cumulative Energy Availability Factor:** 91.9%  
**Date of Grid Connection:** 04 Sep 1984      **Cumulative Load Factor:** 90.7%  
**Date of Commercial Operation:** 01 Feb 1985      **Cumulative Unit Capability Factor:** 77.8%  
**Cumulative Energy Unavailability Factor:** 8.1%

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	1214.0	1336.0	0.0	0.0	76.4	100.0	10.5	0.0	1424	16.4
1985	10871.1	1300.0	0.0	0.0	95.6	100.0	95.5	0.0	8406	96.0
1986	10205.4	1300.0	89.7	89.7	89.7	89.7	89.6	89.6	8120	92.7
1987	9648.5	1300.0	86.4	88.1	86.4	88.1	84.7	87.2	7979	91.1
1988	10208.3	1300.0	90.8	89.0	90.8	89.0	89.4	87.9	8104	92.3
1989	10279.4	1300.0	90.3	89.3	90.3	89.3	90.3	88.5	8058	92.0
1990	10123.6	1300.0	88.1	89.1	88.1	89.1	87.9	88.6	7872	89.9
1991	9957.8	1325.0	86.4	88.6	86.4	88.6	85.8	88.1	7603	86.8
1992	10424.3	1325.0	90.0	88.8	90.0	88.8	89.6	88.3	7981	90.9
1993	10680.1	1325.0	92.8	89.3	92.8	89.3	92.0	88.8	8147	93.0
1994	10266.5	1325.0	91.9	89.6	91.9	89.6	88.5	88.7	8063	92.0
1995	10771.2	1349.0	91.1	89.8	91.1	89.8	91.1	89.0	7986	91.2
1996	10589.8	1360.0	88.9	89.7	88.9	89.7	88.6	89.0	7861	89.5
1997	11864.7	1360.0	100.0	90.6	100.0	90.6	99.6	89.9	8760	100.0
1998	11146.3	1360.0	94.5	90.9	94.5	90.9	93.6	90.2	8301	94.8
1999	11212.1	1360.0	95.3	91.2	95.3	91.2	94.1	90.5	8351	95.3
2000	11055.9	1360.0	93.7	91.4	93.7	91.4	92.5	90.6	8250	93.9
2001	10926.6	1360.0	94.7	91.6	94.2	91.5	91.7	90.7	8310	94.9
2002	10791.9	1360.0	93.8	91.7	93.8	91.7	90.6	90.7	8233	94.0
2003	10933.0	1360.0	95.0	91.9	95.0	91.9	91.8	90.7	8343	95.2



## DE-27 GROHNDE (KWG)

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
27 May	288.0	396.3	PF	C	MAINTENANCE AND REFUELLING
09 Jun	129.0	186.1	UF3	Z	OUTAGE EXTENSION

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					53	
C. Inspection, maintenance or repair combined with refuelling	288			497		
D. Inspection, maintenance or repair without refuelling				2		
Z. Others		129			5	
Subtotal	288	129	0	499	58	0
Total		417			557	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		5
15. Reactor Cooling Systems		4
32. Feedwater and Main Steam System		0
41. Main Generator Systems		37
42. Electrical Power Supply Systems		5
Total	0	51

## DE-26 GUNDREMMINGEN-B (GUN-B)

**Operator:** RWE (RWE ENERGIE AG)  
**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1284.0 MW(e)  
**Design Net Capacity:** 1244.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 10480.4 GW(e).h  
**Energy Availability Factor:** 94.4%  
**Load Factor:** 93.2%  
**Operating Factor:** 95.0%  
**Energy Unavailability Factor:** 5.6%  
**Total Off-line Time:** 435 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	957.1	865.7	936.2	743.7	561.6	903.5	940.2	936.7	913.6	953.4	807.7	961.0	10480.4
<b>EAF (%)</b>	100.0	100.0	99.0	88.3	59.1	100.0	100.0	100.0	99.3	99.8	87.5	100.0	94.4
<b>UCF (%)</b>	100.0	100.0	99.0	88.3	59.1	100.0	100.0	100.0	99.3	99.8	87.5	100.0	94.4
<b>LF (%)</b>	100.2	100.3	98.0	80.6	58.8	97.7	98.4	98.1	98.8	99.7	87.4	100.6	93.2
<b>OF (%)</b>	100.0	100.0	99.9	89.0	61.4	100.0	100.0	100.0	100.0	100.0	90.6	100.0	95.0
<b>EUf (%)</b>	0.0	0.0	1.0	11.7	40.9	0.0	0.0	0.0	0.7	0.2	12.5	0.0	5.6
<b>PUF (%)</b>	0.0	0.0	0.6	11.4	40.9	0.0	0.0	0.0	0.0	0.0	12.1	0.0	5.5
<b>UCLF (%)</b>	0.0	0.0	0.4	0.3	0.0	0.0	0.0	0.0	0.7	0.2	0.5	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. 2003 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 20 Jul 1976  
**Date of First Criticality:** 09 Mar 1984  
**Date of Grid Connection:** 16 Mar 1984  
**Date of Commercial Operation:** 19 Jul 1984

**Lifetime Generation:** 175313.9 GW(e).h  
**Cumulative Energy Availability Factor:** 87.8%  
**Cumulative Load Factor:** 80.5%  
**Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1984	6132.0	1250.0	0.0	0.0	76.7	100.0	58.4	0.0	5744	68.4
1985	9147.5	1244.0	85.5	85.5	85.5	85.5	83.9	83.9	7852	89.6
1986	8298.3	1244.0	83.1	84.3	83.1	84.3	76.1	80.0	7434	84.9
1987	8413.2	1240.0	84.4	84.3	84.4	84.3	77.5	79.2	7876	89.9
1988	7079.3	1240.0	83.7	84.2	83.6	84.2	65.0	75.6	7706	87.7
1989	9653.7	1240.0	97.8	86.9	97.9	86.9	88.9	78.3	8743	99.8
1990	8442.3	1240.0	83.6	86.3	83.6	86.4	77.7	78.2	7717	88.1
1991	8002.7	1240.0	77.8	85.1	74.8	84.7	73.7	77.5	7520	85.8
1992	7366.8	1240.0	78.4	84.3	78.4	83.9	67.6	76.3	7073	80.5
1993	8015.8	1240.0	84.9	84.3	84.9	84.0	73.8	76.0	7632	87.1
1994	8825.6	1240.0	92.1	85.1	91.7	84.8	81.2	76.5	8213	93.8
1995	8681.7	1284.0	84.8	85.1	84.7	84.8	77.2	76.6	7535	86.0
1996	9370.9	1284.0	88.6	85.4	88.6	85.1	83.1	77.2	7903	90.0
1997	9206.1	1284.0	92.8	86.0	92.8	85.7	81.8	77.5	8264	94.3
1998	9072.1	1284.0	89.2	86.2	89.2	86.0	80.7	77.8	7996	91.3
1999	9595.4	1284.0	93.3	86.7	93.3	86.5	85.3	78.3	8257	94.3
2000	9336.4	1284.0	88.8	86.8	88.8	86.6	82.8	78.6	7887	89.8
2001	10216.7	1284.0	94.8	87.3	94.8	87.1	90.8	79.3	8405	95.9
2002	9976.9	1284.0	92.1	87.6	92.1	87.4	88.7	79.8	8139	92.9
2003	10480.4	1284.0	94.4	87.9	94.4	87.8	93.2	80.5	8325	95.0

## DE-26 GUNDREMMINGEN-B (GUN-B)

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
27 Apr	366.0	495.9	PF	C	REFUELLING
13 Nov	68.0	111.5	PF	D15	PRIMARY PUMP MAINTENANCE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					16	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	366			741		
D. Inspection, maintenance or repair without refuelling	68			12		
E. Testing of plant systems or components				0		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					6	
Subtotal	434	0	0	753	22	0
Total		434			775	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
14. Safety Systems		0
15. Reactor Cooling Systems		0
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		11
Total	0	15

## DE-28 GUNDREMMINGEN-C (GUN-C)

**Operator:** EON (EON Kernkraft Ges.m.b.H)  
**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1288.0 MW(e)  
**Design Net Capacity:** 1249.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 9965.6 GW(e).h  
**Energy Availability Factor:** 89.2%  
**Load Factor:** 88.3%  
**Operating Factor:** 90.5%  
**Energy Unavailability Factor:** 10.8%  
**Total Off-line Time:** 829 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	963.7	839.4	943.9	921.6	908.0	576.5	153.8	918.3	925.5	964.1	933.2	917.8	9965.6
<b>EAF (%)</b>	100.0	96.6	98.6	99.8	97.5	70.1	16.2	97.2	99.9	99.9	100.0	95.4	89.2
<b>UCF (%)</b>	100.0	96.6	98.6	99.8	97.5	70.1	16.2	97.2	99.9	99.9	100.0	95.4	89.2
<b>LF (%)</b>	100.6	97.0	98.5	99.5	94.8	62.2	16.1	95.8	99.8	100.5	100.6	95.8	88.3
<b>OF (%)</b>	100.0	98.7	99.9	100.1	100.0	72.4	19.0	100.0	100.0	100.0	100.0	97.6	90.5
<b>EUf (%)</b>	0.0	3.4	1.4	0.2	2.5	29.9	83.8	2.8	0.1	0.1	0.0	4.6	10.8
<b>PUF (%)</b>	0.0	0.1	0.0	0.0	1.0	28.1	83.8	0.0	0.0	0.0	0.0	1.8	9.7
<b>UCLF (%)</b>	0.0	3.4	1.4	0.2	1.6	1.7	0.0	2.8	0.1	0.1	0.0	2.8	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. 2003 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 20 Jul 1976  
**Date of First Criticality:** 26 Oct 1984  
**Date of Grid Connection:** 02 Nov 1984  
**Date of Commercial Operation:** 18 Jan 1985

**Lifetime Generation:** 167363.2 GW(e).h  
**Cumulative Energy Availability Factor:** 86.6%  
**Cumulative Load Factor:** 78.7%  
**Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1984	1310.0	1280.0	0.0	0.0	90.9	100.0	11.7	0.0	1258	14.4
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

**DE-28 GUNDREMMINGEN-C (GUN-C)****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
02 Feb	9.0	19.9	UF2	A15	PRIMARY COOLANT SYSTEM PROBLEM
23 Mar	50.0	13.6	UP1	A31	CONDENSER TUBE LEAKAGE
01 May	49.0	14.9	UP1	A31	CONDENSER TUBE LEAKAGE
22 Jun	802.0	1064.3	PF	C	REFUELLING
05 Dec	18.0	24.8	UF1	A14	AUXILIARY FEEDWATER SYSTEM FAILURE
06 Dec	55.0	15.1	PP	E	TEST

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

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		27			127	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	802			746		
D. Inspection, maintenance or repair without refuelling				22		
E. Testing of plant systems or components					2	
Subtotal	802	27	0	768	129	0
Total		829			897	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
14. Safety Systems	18	17
15. Reactor Cooling Systems	9	6
31. Turbine and auxiliaries		42
32. Feedwater and Main Steam System		0
41. Main Generator Systems		60
Total	27	125

# DE-16 ISAR-1 (KKI 1)

**Operator:** EON (EON Kernkraft Ges.m.b.H)  
**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 878.0 MW(e)  
**Design Net Capacity:** 870.0 MW(e)  
**Design Discharge Burnup:** 27600 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6301.4 GW(e).h  
**Energy Availability Factor:** 87.4%  
**Load Factor:** 81.9%  
**Operating Factor:** 88.7%  
**Energy Unavailability Factor:** 12.6%  
**Total Off-line Time:** 987 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	644.1	573.7	376.3	0.0	599.6	589.7	544.3	419.8	618.6	656.1	637.5	641.6	6301.4
<b>EAF (%)</b>	97.6	98.0	59.8	0.0	96.4	100.0	100.0	99.1	100.0	99.6	99.9	97.4	87.4
<b>UCF (%)</b>	97.6	98.0	59.8	0.0	96.4	100.0	100.0	99.1	100.0	99.6	100.0	97.4	87.4
<b>LF (%)</b>	98.6	97.2	57.6	0.0	91.8	93.3	83.3	64.3	97.9	100.3	100.8	98.2	81.9
<b>OF (%)</b>	100.0	100.0	67.3	0.0	97.4	100.0	100.0	99.2	100.0	100.0	100.0	100.0	88.7
<b>EUF (%)</b>	2.4	2.0	40.2	100.0	3.6	0.0	0.0	0.9	0.0	0.4	0.1	2.6	12.6
<b>PUF (%)</b>	0.9	0.0	35.6	80.0	0.4	0.0	0.0	0.1	0.0	0.4	0.1	2.6	10.0
<b>UCLF (%)</b>	1.5	2.1	4.6	20.0	3.2	0.0	0.0	0.9	0.0	0.0	0.0	0.0	2.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1972      **Lifetime Generation:** 148165.0 GW(e).h  
**Date of First Criticality:** 20 Nov 1977      **Cumulative Energy Availability Factor:** 81.1%  
**Date of Grid Connection:** 03 Dec 1977      **Cumulative Load Factor:** 76.7%  
**Date of Commercial Operation:** 21 Mar 1979      **Cumulative Unit Capability Factor:** 77.3%  
**Cumulative Energy Unavailability Factor:** 18.9%

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	1603.3	870.0	21.1	58.8	21.1	43.3	21.0	43.5	2232	25.5
1983	7143.0	870.0	93.9	67.5	93.9	56.0	93.7	56.1	8627	98.5
1984	5587.0	870.0	73.2	68.7	73.2	59.4	73.1	59.5	7262	82.7
1985	6515.6	870.0	86.0	71.5	86.0	63.8	85.5	63.8	8006	91.4
1986	6370.4	870.0	83.4	73.2	83.4	66.6	83.6	66.6	7871	89.9
1987	7164.7	870.0	93.6	75.8	93.6	70.0	94.0	70.1	8335	95.1
1988	5639.1	870.0	82.3	76.5	82.3	71.4	73.8	70.5	7674	87.4
1989	5205.3	870.0	74.4	76.3	74.4	71.7	68.3	70.3	7233	82.6
1990	5054.8	870.0	74.2	76.1	74.2	71.9	66.3	69.9	7577	86.5
1991	6760.6	870.0	94.9	77.7	94.9	73.8	88.7	71.5	8381	95.7
1992	5872.0	870.0	89.3	78.6	89.4	75.0	76.8	71.9	7903	90.0
1993	5575.2	870.0	85.5	79.1	85.5	75.8	73.2	72.0	7553	86.2
1994	5150.3	870.0	73.5	78.7	73.5	75.6	67.6	71.7	6462	73.8
1995	6446.0	870.0	94.7	79.7	94.7	76.8	84.6	72.5	8306	94.8
1996	5816.3	870.0	86.2	80.1	86.2	77.4	76.1	72.7	7674	87.4
1997	5998.4	870.0	91.5	80.7	91.5	78.1	78.7	73.0	8059	92.0
1998	6335.8	870.0	89.3	81.2	89.2	78.7	83.1	73.6	7857	89.7
1999	7532.1	870.0	98.7	82.0	98.7	79.7	98.8	74.8	8736	99.7
2000	6646.0	874.0	90.8	82.5	90.8	80.2	86.6	75.4	8231	93.7
2001	5889.0	878.0	82.4	82.5	76.2	80.1	76.6	75.4	7353	83.9
2002	7566.2	878.0	98.6	83.2	98.6	80.9	98.4	76.4	8731	99.7
2003	6301.4	878.0	87.4	83.3	87.4	81.1	81.9	76.7	7773	88.7

## DE-16 ISAR-1 (KKI 1)

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
21 Mar	818.0	718.2	PF	C	REFUELLING
25 Apr	163.0	143.3	UF	Z	OUTAGE EXTENSION
13 Dec	140.0	16.1	PP	D31	CONDENSER TUBE LEAKAGE REPAIR

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1977 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					162	
C. Inspection, maintenance or repair combined with refuelling	818			903		
D. Inspection, maintenance or repair without refuelling				100		
E. Testing of plant systems or components				111		
H. Nuclear regulatory requirements					27	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				10	0	0
Z. Others		163				
Subtotal	818	163	0	1124	189	0
Total		981			1313	

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

System	2003 Hours Lost	1977 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		14
15. Reactor Cooling Systems		31
21. Fuel Handling and Storage Facilities		7
31. Turbine and auxiliaries		28
32. Feedwater and Main Steam System		4
41. Main Generator Systems		21
42. Electrical Power Supply Systems		33
Total	0	138

## DE-31 ISAR-2 (KKI 2)

**Operator:** EON (EON Kernkraft Ges.m.b.H)  
**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1400.0 MW(e)  
**Design Net Capacity:** 1285.0 MW(e)  
**Design Discharge Burnup:** >35000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 11671.6 GW(e).h  
**Energy Availability Factor:** 95.9%  
**Load Factor:** 95.2%  
**Operating Factor:** 96.9%  
**Energy Unavailability Factor:** 4.1%  
**Total Off-line Time:** 269 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	1052.9	962.1	1035.9	982.4	1013.5	953.5	631.3	928.5	998.5	1050.4	1019.0	1043.5	11671.6
<b>EAF (%)</b>	100.0	100.0	99.9	97.9	100.0	100.0	62.3	91.9	100.0	100.0	100.0	100.0	95.9
<b>UCF (%)</b>	100.0	100.0	99.9	97.9	100.0	100.0	71.2	91.9	100.0	100.0	100.0	100.0	96.7
<b>LF (%)</b>	101.1	102.3	99.4	97.6	97.3	94.6	60.6	89.1	99.1	100.7	101.1	100.2	95.2
<b>OF (%)</b>	100.0	100.0	99.9	99.7	100.0	100.0	70.0	94.2	100.0	100.0	100.0	100.0	96.9
<b>EUf (%)</b>	0.0	0.0	0.1	2.1	0.0	0.0	37.7	8.1	0.0	0.0	0.0	0.0	4.1
<b>PUF (%)</b>	0.0	0.0	0.1	0.0	0.0	0.0	28.8	6.9	0.0	0.0	0.0	0.0	3.0
<b>UCLF (%)</b>	0.0	0.0	0.0	2.1	0.0	0.0	0.0	1.2	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	8.8	0.0	0.0	0.0	0.0	0.0	0.7

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 15 Sep 1982      **Lifetime Generation:** 163045.9 GW(e).h  
**Date of First Criticality:** 15 Jan 1988      **Cumulative Energy Availability Factor:** 91.0%  
**Date of Grid Connection:** 22 Jan 1988      **Cumulative Load Factor:** 88.3%  
**Date of Commercial Operation:** 09 Apr 1988      **Cumulative Unit Capability Factor:** 78.4%  
**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 (%)
1988	6023.0	1323.0	0.0	0.0	96.3	100.0	51.8	0.0	6177	70.3
1989	7728.9	1310.0	73.4	73.4	73.4	73.4	67.4	67.4	6876	78.5
1990	9271.4	1310.0	84.9	79.2	84.9	79.2	80.8	74.1	7915	90.4
1991	9699.2	1320.0	87.8	82.1	87.8	82.1	84.0	77.4	7732	88.3
1992	9843.5	1320.0	89.9	84.0	89.9	84.0	84.9	79.3	7917	90.1
1993	10193.0	1330.0	91.3	85.5	88.1	84.9	87.5	80.9	8052	91.9
1994	10499.9	1330.0	93.1	86.8	93.1	86.2	90.1	82.5	8209	93.7
1995	10040.3	1332.0	89.8	87.2	89.8	86.8	86.0	83.0	7891	90.1
1996	10265.1	1338.0	90.7	87.7	88.5	87.0	87.3	83.5	7989	90.9
1997	10906.4	1365.0	94.1	88.4	94.1	87.8	91.2	84.4	8258	94.3
1998	10758.1	1365.0	93.6	88.9	93.6	88.4	90.0	85.0	8356	95.4
1999	11610.9	1380.0	96.5	89.6	96.5	89.2	96.0	86.0	8465	96.6
2000	11291.1	1400.0	94.5	90.1	94.5	89.6	91.8	86.5	8311	94.6
2001	11731.3	1400.0	97.1	90.6	97.1	90.2	95.7	87.2	8506	97.1
2002	11512.2	1400.0	95.1	91.0	95.1	90.6	93.9	87.7	8350	95.3
2003	11671.6	1400.0	96.7	91.3	95.9	91.0	95.2	88.3	8491	96.9



**DE-31 ISAR-2 (KKI 2)****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
01 Jul	516.0	91.8	XP	S	COAST DOWN OPERATION
22 Jul	266.0	389.8	PF	C	REFUELLING

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

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					83	
C. Inspection, maintenance or repair combined with refuelling	266			544		
E. Testing of plant systems or components				0	2	
Subtotal	266	0	0	544	85	0
Total		266			629	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
15. Reactor Cooling Systems		19
31. Turbine and auxiliaries		6
32. Feedwater and Main Steam System		0
41. Main Generator Systems		57
Total	0	82

# DE-20 KRUEMMEL (KKK)

**Operator:** HEW (Hamburgische Elektrizitaetswerke)  
**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1260.0 MW(e)  
**Design Net Capacity:** 1260.0 MW(e)  
**Design Discharge Burnup:** 18000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9488.5 GW(e).h  
**Energy Availability Factor:** 88.2%  
**Load Factor:** 86.0%  
**Operating Factor:** 89.1%  
**Energy Unavailability Factor:** 11.8%  
**Total Off-line Time:** 951 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	952.3	856.1	950.6	900.1	928.5	873.3	854.0	739.1	122.6	465.9	899.1	946.9	9488.5
<b>EAF (%)</b>	99.9	99.4	99.9	98.6	99.9	99.2	97.9	99.6	16.7	49.3	97.8	99.5	88.2
<b>UCF (%)</b>	99.9	99.4	99.9	98.6	99.9	99.2	97.9	99.6	16.7	49.3	97.8	99.6	88.2
<b>LF (%)</b>	101.6	101.1	101.4	99.4	99.0	96.3	91.1	78.8	13.5	49.6	99.1	101.0	86.0
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	100.0	98.8	99.7	16.9	55.2	98.9	100.0	89.1
<b>EUf (%)</b>	0.1	0.6	0.1	1.4	0.1	0.8	2.1	0.4	83.3	50.7	2.2	0.5	11.8
<b>PUF (%)</b>	0.1	0.6	0.1	1.4	0.1	0.8	0.0	0.0	83.3	11.8	2.2	0.5	8.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.4	0.0	38.9	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 05 Apr 1974      **Lifetime Generation:** 166954.5 GW(e).h  
**Date of First Criticality:** 14 Sep 1983      **Cumulative Energy Availability Factor:** 78.7%  
**Date of Grid Connection:** 28 Sep 1983      **Cumulative Load Factor:** 74.5%  
**Date of Commercial Operation:** 28 Mar 1984      **Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1983	944.0	1260.0	0.0	0.0	81.5	100.0	9.3	0.0	1652	20.4
1984	9672.0	1260.0	0.0	0.0	86.9	100.0	87.4	0.0	8112	92.3
1985	9301.9	1260.0	86.2	86.2	84.5	84.5	84.3	84.3	7551	86.2
1986	9488.3	1260.0	87.0	86.6	87.0	85.7	86.0	85.1	7780	88.8
1987	9180.2	1260.0	87.9	87.0	87.9	86.5	83.2	84.5	7822	89.3
1988	9219.2	1260.0	90.0	87.8	90.1	87.4	83.3	84.2	8018	91.3
1989	8241.6	1260.0	78.5	85.9	78.5	85.6	74.7	82.3	7247	82.7
1990	8830.2	1260.0	84.5	85.7	84.5	85.4	80.0	81.9	7507	85.7
1991	7737.6	1260.0	80.0	84.9	80.0	84.6	70.1	80.2	6946	79.3
1992	8325.0	1260.0	83.2	84.7	83.2	84.5	75.2	79.6	7188	81.8
1993	6558.5	1260.0	61.3	82.1	61.3	81.9	59.4	77.3	5399	61.6
1994	2479.8	1260.0	25.1	76.4	25.1	76.2	22.5	71.9	2091	23.9
1995	9217.9	1260.0	88.2	77.5	88.2	77.3	83.5	72.9	7824	89.3
1996	8242.3	1260.0	83.9	78.0	83.9	77.9	74.5	73.1	6868	78.2
1997	9250.6	1260.0	87.3	78.7	85.1	78.4	83.8	73.9	7492	85.5
1998	4611.1	1260.0	46.1	76.4	44.0	76.0	41.8	71.6	3878	44.3
1999	10517.1	1260.0	99.4	77.9	99.4	77.5	95.3	73.2	8760	100.0
2000	9022.9	1260.0	90.2	78.7	90.2	78.3	81.5	73.7	7975	90.8
2001	8141.9	1260.0	76.7	78.6	76.2	78.2	73.8	73.7	6591	75.2
2002	8483.9	1260.0	78.0	78.5	78.0	78.2	76.9	73.9	7069	80.7
2003	9488.5	1260.0	88.2	79.0	88.2	78.7	86.0	74.5	7809	89.1

## DE-20 KRUEMMEL (KKK)

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
03 Sep	685.0	866.8	PF	C	REFUELLING AND MAINTENANCE
05 Oct	247.0	364.8	UF2	A32	FEEDWATER TANK LEAK

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		247			549	
C. Inspection, maintenance or repair combined with refuelling	685			1029		
D. Inspection, maintenance or repair without refuelling				26		
E. Testing of plant systems or components				10	1	
H. Nuclear regulatory requirements					8	18
J. Grid failure or grid unavailability						8
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					0	
Subtotal	685	247	0	1065	558	26
Total		932			1649	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		0
14. Safety Systems		1
15. Reactor Cooling Systems		2
21. Fuel Handling and Storage Facilities		26
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System	247	490
41. Main Generator Systems		21
XX. Miscellaneous Systems		5
Total	247	545

# DE-15 NECKARWESTHEIM-1 (GKN 1)

**Operator:** EnBW (EnBW Kraftwerk AG)  
**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 785.0 MW(e)  
**Design Net Capacity:** 805.0 MW(e)  
**Design Discharge Burnup:** 37000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6024.0 GW(e).h  
**Energy Availability Factor:** 90.5%  
**Load Factor:** 87.6%  
**Operating Factor:** 94.8%  
**Energy Unavailability Factor:** 9.5%  
**Total Off-line Time:** 456 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	584.5	523.9	580.6	529.7	429.9	185.1	493.5	515.4	514.6	563.4	539.4	564.2	6024.0
<b>EAF (%)</b>	100.0	98.9	100.0	100.0	84.1	31.3	80.6	92.6	100.0	100.0	99.7	99.2	90.5
<b>UCF (%)</b>	100.0	98.9	100.0	100.0	84.1	31.3	80.6	92.6	100.0	100.0	99.7	99.2	90.5
<b>LF (%)</b>	100.1	99.3	99.4	93.8	73.6	32.7	84.5	88.2	91.0	96.3	95.4	96.6	87.6
<b>OF (%)</b>	100.0	99.3	99.9	100.1	98.1	39.3	100.0	100.0	100.0	100.0	100.0	100.0	94.8
<b>EUf (%)</b>	0.0	1.1	0.0	0.0	15.9	68.7	19.4	7.4	0.0	0.0	0.3	0.8	9.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	15.9	68.7	19.4	7.4	0.0	0.0	0.0	0.0	9.3
<b>UCLF (%)</b>	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.8	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1972      **Lifetime Generation:** 152176.5 GW(e).h  
**Date of First Criticality:** 26 May 1976      **Cumulative Energy Availability Factor:** 82.0%  
**Date of Grid Connection:** 03 Jun 1976      **Cumulative Load Factor:** 80.0%  
**Date of Commercial Operation:** 01 Dec 1976      **Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1982	5781.1	810.0	82.4	97.1	82.4	73.3	81.5	72.0	7517	85.8
1983	6047.0	810.0	85.3	95.4	85.3	75.0	85.2	73.9	7910	90.3
1984	5842.0	795.0	83.1	93.9	83.1	76.0	83.7	75.1	7618	86.7
1985	6161.4	795.0	88.8	93.3	88.8	77.4	88.5	76.5	8050	91.9
1986	4153.1	795.0	59.6	90.0	59.6	75.6	59.6	74.9	5368	61.3
1987	5395.1	795.0	76.8	88.8	76.8	75.7	77.5	75.1	6828	77.9
1988	5269.4	795.0	75.5	87.7	75.5	75.7	75.5	75.1	6772	77.1
1989	4019.5	795.0	64.2	85.9	64.2	74.8	57.7	73.8	6395	73.0
1990	5754.1	785.0	82.8	85.7	82.8	75.4	83.7	74.5	7524	85.9
1991	5404.5	785.0	85.0	85.7	85.0	76.0	78.6	74.8	7614	86.9
1992	5270.1	785.0	83.6	85.5	83.6	76.5	76.4	74.9	7470	85.0
1993	5559.5	785.0	81.6	85.3	81.6	76.8	80.8	75.2	7371	84.1
1994	6307.8	785.0	92.0	85.7	92.0	77.6	91.7	76.1	8184	93.4
1995	5966.0	785.0	87.5	85.8	87.4	78.1	86.8	76.7	8020	91.6
1996	6054.5	785.0	92.0	86.1	92.0	78.8	87.8	77.2	8301	94.5
1997	6230.2	785.0	92.6	86.4	92.6	79.5	90.6	77.8	8305	94.8
1998	5907.8	785.0	91.3	86.6	91.1	80.0	85.9	78.2	8185	93.4
1999	5849.1	785.0	90.0	86.7	90.0	80.4	85.1	78.5	8022	91.6
2000	6141.4	785.0	94.2	87.0	94.2	81.0	89.1	78.9	8284	94.3
2001	5991.5	785.0	90.0	87.2	88.1	81.3	87.1	79.3	8038	91.8
2002	6238.3	785.0	92.7	87.4	92.7	81.7	90.7	79.7	8239	94.1
2003	6024.0	785.0	90.5	87.5	90.5	82.0	87.6	80.0	8304	94.8

## DE-15 NECKARWESTHEIM-1 (GKN 1)

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
10 May	517.0	79.7	PP	D41	SHUTDOWN ACTIVITIES
31 May	451.0	292.2	PF	C	MAINTENANCE WITH REFUELLING
01 Jun	1741.0	265.9	PP	D41	MAIN GENERATOR REPAIR

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1976 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					36	
C. Inspection, maintenance or repair combined with refuelling	451			1167		
D. Inspection, maintenance or repair without refuelling				20		
E. Testing of plant systems or components					55	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						1
Subtotal	451	0	0	1187	91	1
Total	451			1279		

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

System	2003 Hours Lost	1976 to 2003 Average Hours Lost Per Year
15. Reactor Cooling Systems		20
31. Turbine and auxiliaries		3
32. Feedwater and Main Steam System		8
41. Main Generator Systems		4
42. Electrical Power Supply Systems		0
Total	0	35

## DE-44 NECKARWESTHEIM-2 (GKN 2)

Operator: EnBW (EnBW Kraftwerk AG)

Contractor: SIEM,KWU (SIEMENS AG, KRAFTWERK UNION AG)

### 1. Station Details

Type: PWR  
 Maximum Net Capacity at the beginning of 2003: 1269.0 MW(e)  
 Design Net Capacity: 1225.0 MW(e)  
 Design Discharge Burnup: 35000 MW.d/t

### 2. Production Summary 2003

Energy Production: 10545.0 GW(e).h  
 Energy Availability Factor: 95.8%  
 Load Factor: 94.9%  
 Operating Factor: 96.0%  
 Energy Unavailability Factor: 4.2%  
 Total Off-line Time: 352 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	960.4	868.0	953.5	924.0	939.7	904.9	878.5	540.1	884.6	951.9	920.1	819.3	10545.0
EAF (%)	100.0	100.0	100.0	100.0	99.9	100.0	100.0	65.3	100.0	100.0	100.0	85.4	95.8
UCF (%)	100.0	100.0	100.0	100.0	99.9	100.0	100.0	65.3	100.0	100.0	100.0	85.4	95.8
LF (%)	101.7	101.8	101.0	101.3	99.5	99.0	93.0	57.2	96.8	100.7	100.7	86.8	94.9
OF (%)	100.0	100.0	99.9	100.1	100.0	100.0	100.0	66.7	100.0	100.0	100.0	86.0	96.0
EUf (%)	0.0	0.0	0.0	0.0	0.1	0.0	0.0	34.7	0.0	0.0	0.0	14.6	4.2
PUF (%)	0.0	0.0	0.0	0.0	0.1	0.0	0.0	34.7	0.0	0.0	0.0	0.0	3.0
UCLF (%)	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
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. 2003 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 09 Nov 1982      Lifetime Generation: 151799.5 GW(e).h  
 Date of First Criticality: 29 Dec 1988      Cumulative Energy Availability Factor: 93.1%  
 Date of Grid Connection: 03 Jan 1989      Cumulative Load Factor: 92.4%  
 Date of Commercial Operation: 15 Apr 1989      Cumulative Unit Capability Factor: 78.8%  
    Cumulative Energy Unavailability Factor: 6.9%

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 (%)
1989	8673.2	1225.0	0.0	0.0	99.8	100.0	80.8	0.0	8205	93.7
1990	9693.9	1225.0	90.2	90.2	90.2	90.2	90.3	90.3	7958	90.8
1991	9434.9	1225.0	90.5	90.4	90.5	90.4	87.9	89.1	7932	90.5
1992	10204.6	1269.0	91.6	90.8	91.6	90.8	91.5	90.0	8094	92.1
1993	9912.2	1269.0	89.0	90.3	89.0	90.3	89.2	89.8	8163	93.2
1994	10320.7	1269.0	93.6	91.0	93.6	91.0	92.8	90.4	8215	93.8
1995	10532.0	1269.0	94.7	91.6	94.7	91.6	94.7	91.1	8351	95.3
1996	10614.3	1269.0	95.1	92.1	95.1	92.1	95.2	91.7	8419	95.8
1997	10111.6	1269.0	91.5	92.0	91.5	92.0	91.0	91.6	8028	91.6
1998	10610.8	1269.0	96.0	92.5	96.0	92.5	95.5	92.0	8411	96.0
1999	10460.9	1269.0	96.1	92.8	96.1	92.9	94.1	92.3	8435	96.3
2000	10473.9	1269.0	96.2	93.2	96.2	93.2	94.0	92.4	8450	96.2
2001	10423.9	1269.0	95.4	93.3	94.2	93.2	93.8	92.5	8363	95.5
2002	9787.5	1269.0	88.7	93.0	88.7	92.9	88.0	92.2	7777	88.8
2003	10545.0	1269.0	95.8	93.2	95.8	93.1	94.9	92.4	8408	96.0

## DE-44 NECKARWESTHEIM-2 (GKN 2)

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
17 Aug	248.0	327.7	PF	C	MAINTENANCE AND REFUELLING
18 Dec	104.0	137.7	UF2	A11	RDB LEAKAGE REPAIR

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1989 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		104			1	
C. Inspection, maintenance or repair combined with refuelling	248			488		
Subtotal	248	104	0	488	1	0
Total		352			489	

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

System	2003 Hours Lost	1989 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	104	
32. Feedwater and Main Steam System		0
41. Main Generator Systems		0
Total	104	0

# DE-5 OBRIGHEIM (KWO)

Operator: EnBW (EnBW Kraftwerk AG)

Contractor: SIEM,KWU (SIEMENS AG, KRAFTWERK UNION AG)

## 1. Station Details

Type: PWR  
 Maximum Net Capacity at the beginning of 2003: 340.0 MW(e)  
 Design Net Capacity: 283.0 MW(e)  
 Design Discharge Burnup: 30000 MW.d/t

## 2. Production Summary 2003

Energy Production: 2450.2 GW(e).h  
 Energy Availability Factor: 88.3%  
 Load Factor: 82.3%  
 Operating Factor: 88.4%  
 Energy Unavailability Factor: 11.7%  
 Total Off-line Time: 1013 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	252.1	228.3	252.2	244.5	246.9	226.4	171.3	18.5	95.5	250.8	242.0	221.4	2450.2
EAF (%)	99.9	100.0	99.8	100.0	98.0	100.0	100.0	15.7	47.3	100.0	99.9	100.0	88.3
UCF (%)	99.9	100.0	99.8	100.0	98.0	100.0	100.0	15.7	47.3	100.0	99.9	100.0	88.3
LF (%)	99.7	99.9	99.7	100.0	97.6	92.5	67.7	7.3	39.0	99.0	98.9	87.5	82.3
OF (%)	100.0	100.0	99.9	100.1	98.3	100.0	100.0	16.0	47.9	100.0	100.0	100.0	88.4
EUf (%)	0.1	0.0	0.2	0.0	2.0	0.0	0.0	84.3	52.8	0.0	0.1	0.0	11.7
PUf (%)	0.1	0.0	0.2	0.0	0.0	0.0	0.0	84.3	52.8	0.0	0.1	0.0	11.5
UCLF (%)	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 15 Mar 1965      Lifetime Generation: 83370.4 GW(e).h  
 Date of First Criticality: 22 Sep 1968      Cumulative Energy Availability Factor: 81.8%  
 Date of Grid Connection: 29 Oct 1968      Cumulative Load Factor: 81.1%  
 Date of Commercial Operation: 31 Mar 1969      Cumulative Unit Capability Factor: 77.3%  
    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 (%)
1982	2407.4	328.0	83.8	95.0	83.8	81.3	83.8	80.9	7534	86.0
1983	1951.0	328.0	67.6	93.1	67.4	80.4	67.9	80.0	6051	69.1
1984	2483.0	340.0	83.1	92.4	83.1	80.5	83.1	80.2	7798	88.8
1985	2592.9	340.0	86.7	92.0	86.7	80.9	87.1	80.6	7783	88.8
1986	2663.3	340.0	88.7	91.8	88.7	81.4	89.4	81.2	7869	89.8
1987	2483.0	340.0	83.0	91.3	83.0	81.5	83.4	81.3	7351	83.9
1988	2621.6	340.0	88.0	91.1	88.0	81.8	87.8	81.6	7800	88.8
1989	2558.0	340.0	86.1	90.9	86.1	82.1	85.9	81.9	7756	88.5
1990	1178.2	340.0	39.4	88.4	39.4	80.0	39.6	79.8	3475	39.7
1991	1051.7	340.0	79.5	88.0	35.3	77.9	35.3	77.8	3186	36.4
1992	1882.0	340.0	67.6	87.1	67.6	77.5	63.0	77.1	6015	68.5
1993	2616.8	340.0	88.3	87.1	88.3	77.9	87.9	77.6	7773	88.7
1994	2623.8	340.0	89.4	87.2	89.4	78.4	88.1	78.0	7858	89.7
1995	2165.4	340.0	76.4	86.8	76.4	78.3	72.7	77.8	6717	76.7
1996	2775.0	340.0	93.1	87.0	93.1	78.9	92.9	78.3	8189	93.2
1997	2769.4	340.0	93.8	87.3	93.8	79.4	93.0	78.9	8242	94.1
1998	2758.8	340.0	94.7	87.5	94.7	79.9	92.6	79.4	8317	94.9
1999	2802.8	340.0	94.8	87.8	94.8	80.4	94.1	79.9	8319	95.0
2000	2660.3	340.0	89.7	87.8	89.7	80.7	89.1	80.2	7888	89.8
2001	2797.1	340.0	96.0	88.1	94.4	81.2	93.9	80.6	8424	96.2
2002	2841.1	340.0	95.9	88.3	95.9	81.6	95.4	81.0	8410	96.0
2003	2450.2	340.0	88.3	88.3	88.3	81.8	82.3	81.1	7747	88.4



## DE-5 OBRIGHEIM (KWO)

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
14 May	13.0	5.1	UF1	A41	GENERATOR COOLING SYSTEM LEAKAGE
05 Aug	1000.0	342.5	PF	C	MAINTENANCE AND REFUELLING

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		13			164	
B. Refuelling without a maintenance					27	
C. Inspection, maintenance or repair combined with refuelling	1000			976		
D. Inspection, maintenance or repair without refuelling				13		
E. Testing of plant systems or components				0	0	
H. Nuclear regulatory requirements					135	114
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						5
Subtotal	1000	13	0	989	326	119
Total		1013			1434	

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		16
12. Reactor I&C Systems		38
13. Reactor Auxiliary Systems		2
15. Reactor Cooling Systems		27
16. Steam generation systems		42
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		0
33. Circulating Water System		3
41. Main Generator Systems	13	27
42. Electrical Power Supply Systems		0
Total	13	159

# DE-14 PHILIPPSBURG-1 (KKP 1)

**Operator:** EnBW (EnBW Kraftwerk AG)  
**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 890.0 MW(e)  
**Design Net Capacity:** 864.0 MW(e)  
**Design Discharge Burnup:** 27000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6395.2 GW(e).h  
**Energy Availability Factor:** 86.0%  
**Load Factor:** 82.0%  
**Operating Factor:** 87.1%  
**Energy Unavailability Factor:** 14.0%  
**Total Off-line Time:** 1131 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	658.5	490.6	631.5	487.7	0.0	471.2	632.9	564.6	574.4	593.8	633.0	657.0	6395.2
<b>EAF (%)</b>	100.0	83.2	100.0	83.3	0.0	79.3	100.0	100.0	94.9	91.4	100.0	100.0	86.0
<b>UCF (%)</b>	100.0	83.2	100.0	83.3	0.0	79.3	100.0	100.0	94.9	91.4	100.0	100.0	86.0
<b>LF (%)</b>	99.5	82.0	95.4	76.2	0.0	73.5	95.6	85.3	89.6	89.5	98.8	99.2	82.0
<b>OF (%)</b>	100.0	84.7	99.9	90.8	0.0	80.7	100.0	100.0	96.4	93.0	100.0	100.0	87.1
<b>EUf (%)</b>	0.0	16.8	0.0	16.7	100.0	20.7	0.0	0.0	5.1	8.6	0.0	0.0	14.0
<b>PUF (%)</b>	0.0	0.2	0.0	9.9	71.5	0.0	0.0	0.0	5.1	0.0	0.0	0.0	7.3
<b>UCLF (%)</b>	0.0	16.7	0.0	6.8	28.5	20.7	0.0	0.0	0.0	8.6	0.0	0.0	6.7
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1970      **Lifetime Generation:** 140935.4 GW(e).h  
**Date of First Criticality:** 09 Mar 1979      **Cumulative Energy Availability Factor:** 80.6%  
**Date of Grid Connection:** 07 May 1979      **Cumulative Load Factor:** 78.3%  
**Date of Commercial Operation:** 26 Mar 1980      **Cumulative Unit Capability Factor:** 77.4%  
**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 (%)
1982	5034.4	840.0	66.5	83.5	66.5	41.2	68.4	41.0	6237	71.2
1983	5503.0	864.0	72.7	79.8	72.7	51.8	72.7	51.7	6567	75.0
1984	6325.0	864.0	83.2	80.7	83.2	59.7	83.3	59.7	7482	85.2
1985	6120.2	864.0	81.2	80.8	81.1	64.0	80.9	63.9	7561	86.3
1986	5222.0	864.0	69.1	78.8	69.1	64.9	69.0	64.8	6148	70.2
1987	6488.4	864.0	84.9	79.7	84.9	67.7	85.7	67.8	7582	86.6
1988	6199.6	864.0	83.7	80.2	83.7	69.7	81.7	69.5	7302	83.1
1989	6158.9	864.0	81.3	80.3	81.4	71.0	81.4	70.9	7432	84.8
1990	5203.1	864.0	68.3	79.1	68.3	70.8	68.7	70.6	6138	70.1
1991	6171.9	864.0	82.9	79.5	82.9	71.9	81.5	71.6	7304	83.4
1992	6513.0	864.0	86.6	80.1	86.6	73.1	85.8	72.8	7647	87.1
1993	4614.5	864.0	74.7	79.7	74.7	73.2	61.0	71.9	6599	75.3
1994	6565.9	864.0	86.5	80.1	86.5	74.2	86.8	73.0	7645	87.3
1995	6317.1	876.0	86.9	80.6	86.9	75.0	82.3	73.6	7671	87.6
1996	6929.8	864.0	91.1	81.3	91.1	76.0	91.3	74.7	8087	92.1
1997	6409.5	876.0	85.3	81.5	85.3	76.6	83.5	75.2	7510	85.7
1998	6905.9	890.0	93.9	82.2	93.9	77.6	88.6	76.0	8253	94.2
1999	6892.9	890.0	94.3	82.9	94.3	78.5	88.4	76.7	8292	94.7
2000	6904.9	890.0	92.9	83.4	92.9	79.2	88.3	77.3	8187	93.2
2001	6956.9	890.0	92.7	83.8	92.7	79.9	89.2	77.9	8206	93.7
2002	6559.4	890.0	89.4	84.1	89.4	80.3	84.1	78.1	7885	90.0
2003	6395.2	890.0	86.0	84.2	86.0	80.6	82.0	78.3	7629	87.1

## DE-14 PHILIPPSBURG-1 (KKP 1)

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
21 Feb	104.0	99.7	UF1	A14	CHECK OF THE WELD OF INTERMEDIATE COOLANT SYSTEM
20 Apr	85.0	14.6	UP2	A15	SHUT OF OF RCP BECAUSE OF HIGH VIBRATION
23 Apr	102.0	28.8	UP2	A15	POWER REDUCTION IN CONJUNCTION WITH CHECK OF SUPPORT IN THE AREA OF BYPASS STATION
28 Apr	603.0	536.8	PF	C	REFUELLING
23 May	212.0	188.7	UF2	A15	PROLONGATION OF REVISION BECAUSE OF INDICATIONS IN RCP AND AT FAST SHUTDOWN SYSTEM
20 Sep	26.0	31.0	PF	D32	VALVE LEAKAGE REPAIR
25 Oct	51.0	54.7	UF1	A31	MAIN CONDENSER FAILURE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		367			117	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	603			988		
D. Inspection, maintenance or repair without refuelling	26			10		
E. Testing of plant systems or components					7	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					6	
Subtotal	629	367	0	998	130	0
Total		996			1128	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		5
13. Reactor Auxiliary Systems		2
14. Safety Systems	104	7
15. Reactor Cooling Systems	212	16
31. Turbine and auxiliaries	51	23
32. Feedwater and Main Steam System		25
33. Circulating Water System		1
41. Main Generator Systems		7
42. Electrical Power Supply Systems		0
XX. Miscellaneous Systems		17
Total	367	106

## DE-24 PHILIPPSBURG-2 (KKP 2)

**Operator:** EnBW (EnBW Kraftwerk AG)  
**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1392.0 MW(e)  
**Design Net Capacity:** 1268.0 MW(e)  
**Design Discharge Burnup:** 34000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 11010.2 GW(e).h  
**Energy Availability Factor:** 93.5%  
**Load Factor:** 90.3%  
**Operating Factor:** 94.0%  
**Energy Unavailability Factor:** 6.5%  
**Total Off-line Time:** 526 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	1033.4	933.3	1028.6	988.2	1003.4	934.4	518.1	710.2	929.2	911.2	989.3	1030.9	11010.2
<b>EAF (%)</b>	99.9	99.9	100.0	100.0	100.0	99.9	58.1	78.3	97.8	89.2	99.9	100.0	93.5
<b>UCF (%)</b>	99.9	99.9	100.0	100.0	100.0	99.9	58.1	78.3	97.8	89.2	99.9	100.0	93.5
<b>LF (%)</b>	99.8	99.8	99.3	98.7	96.9	93.2	50.0	68.6	92.7	87.9	98.7	99.5	90.3
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	100.0	58.6	78.8	100.0	91.9	100.0	100.0	94.0
<b>EUf (%)</b>	0.1	0.1	0.0	0.0	0.0	0.1	41.9	21.7	2.2	10.8	0.1	0.0	6.5
<b>PUf (%)</b>	0.0	0.1	0.0	0.0	0.0	0.0	41.9	21.7	2.2	10.8	0.1	0.0	6.5
<b>UCLF (%)</b>	0.1	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>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. 2003 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 07 Jul 1977  
**Date of First Criticality:** 13 Dec 1984  
**Date of Grid Connection:** 17 Dec 1984  
**Date of Commercial Operation:** 17 Apr 1985

**Lifetime Generation:** 193695.4 GW(e).h  
**Cumulative Energy Availability Factor:** 88.9%  
**Cumulative Load Factor:** 88.0%  
**Cumulative Unit Capability Factor:** 77.8%  
**Cumulative Energy Unavailability Factor:** 11.1%

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	26.0	1350.0	0.0	0.0	96.5	100.0	0.2	0.0	110	1.3
1985	9359.8	1268.0	0.0	0.0	88.4	100.0	84.3	0.0	7896	90.1
1986	10235.3	1268.0	90.6	90.6	90.6	90.6	92.1	92.1	7958	90.8
1987	9616.2	1268.0	85.0	87.8	85.0	87.8	86.6	89.4	7446	85.0
1988	9710.8	1268.0	86.5	87.4	86.5	87.4	87.2	88.6	7656	87.2
1989	9677.3	1268.0	86.2	87.1	86.2	87.1	87.1	88.3	7575	86.5
1990	8516.3	1268.0	75.5	84.8	75.5	84.8	76.7	85.9	6628	75.7
1991	9903.3	1276.0	88.4	85.4	88.0	85.3	89.1	86.4	7757	88.6
1992	9400.0	1324.0	82.2	84.9	82.2	84.9	83.3	85.6	7273	82.8
1993	10481.3	1324.0	90.5	85.6	90.5	85.6	90.4	86.2	7946	90.7
1994	10284.8	1336.0	88.7	86.0	88.7	86.0	87.9	86.4	7778	88.8
1995	10550.5	1336.0	91.0	86.5	91.0	86.5	90.1	86.8	7990	91.2
1996	11217.6	1358.0	94.7	87.3	94.7	87.3	94.0	87.5	8323	94.8
1997	11113.5	1358.0	95.3	88.0	95.3	88.0	93.4	88.0	8358	95.4
1998	10731.5	1358.0	93.0	88.4	93.0	88.4	90.2	88.2	8304	94.8
1999	11122.9	1358.0	96.1	89.0	96.1	89.0	93.5	88.5	8431	96.2
2000	10689.1	1363.0	92.2	89.2	92.2	89.2	89.3	88.6	8115	92.4
2001	8995.8	1392.0	96.0	89.6	76.6	88.3	73.8	87.6	6749	77.0
2002	11053.2	1392.0	92.4	89.8	92.4	88.6	90.6	87.8	8138	92.9
2003	11010.2	1392.0	93.5	90.0	93.5	88.9	90.3	88.0	8234	94.0

## DE-24 PHILIPPSBURG-2 (KKP 2)

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
19 Jul	466.0	658.0	PF	C	MAINTENANCE AND REFUELLING
29 Sep	32.0	21.7	PP	E	START-UP ACTIVITIES
01 Oct	44.0	25.5	PP	D15	3-LOOP-OPERATION
02 Oct	60.0	86.1	PF	D12	REPAIR OF THE FULL POWER REGULATOR

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					99	
C. Inspection, maintenance or repair combined with refuelling	466			660		
D. Inspection, maintenance or repair without refuelling	60			56		
E. Testing of plant systems or components				0		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						88
Subtotal	526	0	0	716	99	88
Total		526			903	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		6
15. Reactor Cooling Systems		66
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		0
41. Main Generator Systems		16
42. Electrical Power Supply Systems		8
Total	0	97

# DE-17 UNTERWESER (KKU)

**Operator:** EON (EON Kernkraft Ges.m.b.H)  
**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1345.0 MW(e)  
**Design Net Capacity:** 1230.0 MW(e)  
**Design Discharge Burnup:** 31500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9254.9 GW(e).h  
**Energy Availability Factor:** 88.3%  
**Load Factor:** 78.5%  
**Operating Factor:** 90.0%  
**Energy Unavailability Factor:** 11.7%  
**Total Off-line Time:** 878 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	0.0	578.3	1002.6	956.2	974.0	722.1	660.0	551.5	918.4	968.2	959.0	964.6	9254.9
<b>EAF (%)</b>	0.0	64.0	99.4	99.2	99.8	99.8	99.3	100.0	100.0	97.9	99.9	100.0	88.3
<b>UCF (%)</b>	0.0	64.0	99.4	99.2	99.8	99.8	99.3	100.0	100.0	97.9	99.9	100.0	88.3
<b>LF (%)</b>	0.0	64.0	100.2	98.9	97.3	74.6	66.0	55.1	94.8	96.6	99.0	96.4	78.5
<b>OF (%)</b>	0.0	81.8	99.9	100.1	100.0	100.0	100.0	100.0	100.0	98.4	100.0	100.0	90.0
<b>EUf (%)</b>	100.0	36.0	0.6	0.8	0.2	0.2	0.7	0.0	0.0	2.1	0.1	0.0	11.7
<b>PUF (%)</b>	0.0	0.0	0.2	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
<b>UCLF (%)</b>	100.0	36.0	0.4	0.2	0.0	0.2	0.7	0.0	0.0	2.1	0.0	0.0	11.6
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jul 1972      **Lifetime Generation:** 219268.0 GW(e).h  
**Date of First Criticality:** 16 Sep 1978      **Cumulative Energy Availability Factor:** 81.9%  
**Date of Grid Connection:** 29 Sep 1978      **Cumulative Load Factor:** 79.4%  
**Date of Commercial Operation:** 06 Sep 1979      **Cumulative Unit Capability Factor:** 77.3%  
**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 (%)
1982	9114.2	1230.0	84.9	95.0	84.9	84.9	84.6	84.7	8022	91.6
1983	8215.0	1230.0	100.0	96.2	76.4	82.8	76.2	82.6	7191	82.1
1984	9483.0	1230.0	87.2	94.4	87.2	83.7	87.8	83.6	7908	90.0
1985	9931.8	1230.0	93.5	94.3	93.4	85.3	92.2	85.1	8279	94.5
1986	7280.8	1230.0	67.4	90.4	67.4	82.7	67.6	82.6	6254	71.4
1987	8673.9	1230.0	80.7	89.2	80.7	82.5	80.5	82.3	7277	83.1
1988	9108.4	1230.0	85.0	88.7	84.9	82.8	84.3	82.5	7627	86.8
1989	9245.6	1230.0	89.3	88.8	89.3	83.4	85.8	82.9	7873	89.9
1990	8485.0	1230.0	78.9	87.9	78.9	83.0	78.7	82.5	6921	79.0
1991	6485.9	1243.0	61.1	85.7	61.1	81.2	60.1	80.6	5369	61.3
1992	8731.5	1230.0	86.5	85.7	86.5	81.6	80.8	80.6	7646	87.0
1993	10824.8	1255.0	99.9	86.8	99.9	82.9	98.5	81.9	8760	100.0
1994	7685.9	1255.0	80.1	86.3	80.1	82.7	69.9	81.1	7039	80.4
1995	7980.6	1255.0	77.5	85.7	77.5	82.4	72.6	80.5	6832	78.0
1996	9907.7	1285.0	91.3	86.1	91.3	83.0	87.8	81.0	8055	91.7
1997	9932.4	1285.0	94.4	86.6	94.4	83.6	88.2	81.4	8291	94.6
1998	6618.0	1285.0	58.7	85.0	58.7	82.3	58.8	80.2	5217	59.6
1999	8096.6	1285.0	78.3	84.7	78.3	82.0	71.9	79.7	6899	78.8
2000	9615.8	1295.0	86.2	84.8	86.2	82.3	84.5	80.0	7604	86.6
2001	10656.7	1345.0	95.3	85.3	90.8	82.7	90.4	80.5	8378	95.6
2002	6774.8	1345.0	60.5	84.1	60.5	81.6	57.5	79.4	5313	60.7
2003	9254.9	1345.0	88.3	84.3	88.3	81.9	78.5	79.4	7882	90.0

## DE-17 UNTERWESER (KKU)

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	866.0	1164.6	UF3	A41	GENERATOR FAILURE
21 Oct	12.0	21.4	UF2	A32	RESA/TUSA START VIA THE STEAM GENERATOR LEVEL < 8M CAUSED BY CLOSURE OF THE FULL POWER VALVE OF THE FEEDWATER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1978 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		878			262	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling				888	44	
D. Inspection, maintenance or repair without refuelling				30		
E. Testing of plant systems or components				33		
H. Nuclear regulatory requirements				0	30	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					20	
Subtotal	0	878	0	951	370	0
Total		878			1321	

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

System	2003 Hours Lost	1978 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		38
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		25
15. Reactor Cooling Systems		10
31. Turbine and auxiliaries		62
32. Feedwater and Main Steam System	12	2
33. Circulating Water System		0
41. Main Generator Systems	866	114
42. Electrical Power Supply Systems		1
XX. Miscellaneous Systems		0
Total	878	258

# HU-1 PAKS-1

**Operator:** PAKS RT. (PAKS NUCLEAR POWER PLANT LTD)  
**Contractor:** AEE (ATOMENERGOEXPORT)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 437.0 MW(e)  
**Design Net Capacity:** 408.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3097.8 GW(e).h  
**Energy Availability Factor:** 81.0%  
**Load Factor:** 80.9%  
**Operating Factor:** 81.3%  
**Energy Unavailability Factor:** 19.0%  
**Total Off-line Time:** 1636 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	323.6	293.6	314.2	313.9	324.7	314.6	46.3	0.0	213.4	325.5	304.2	323.7	3097.8
<b>EAF (%)</b>	99.9	100.0	96.8	99.7	99.9	100.0	14.2	0.0	67.8	100.0	96.7	99.6	81.0
<b>UCF (%)</b>	99.9	100.0	96.8	99.8	99.9	100.0	14.3	0.0	67.8	100.0	96.7	99.6	81.0
<b>LF (%)</b>	99.5	100.0	96.6	99.9	99.9	100.0	14.2	0.0	67.8	100.0	96.7	99.6	80.9
<b>OF (%)</b>	100.0	100.0	99.1	100.1	100.0	100.0	12.8	0.0	67.9	100.0	99.2	100.0	81.3
<b>EU (%)</b>	0.1	0.0	3.2	0.3	0.1	0.0	85.8	100.0	32.2	0.0	3.3	0.4	19.0
<b>PU (%)</b>	0.1	0.0	2.4	0.0	0.0	0.0	85.8	100.0	0.0	0.0	0.2	0.1	16.0
<b>UCLF (%)</b>	0.1	0.0	0.9	0.3	0.1	0.0	0.0	0.0	32.2	0.0	3.1	0.4	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1974  
**Date of First Criticality:** 14 Dec 1982  
**Date of Grid Connection:** 28 Dec 1982  
**Date of Commercial Operation:** 10 Aug 1983

**Lifetime Generation:** 66304.8 GW(e).h  
**Cumulative Energy Availability Factor:** 85.0%  
**Cumulative Load Factor:** 86.1%  
**Cumulative Unit Capability Factor:** 77.7%  
**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 (%)
1982	3.9	82.0	0.0	0.0	99.4	100.0	0.6	0.0	96	1.2
1983	2299.7	410.0	0.0	0.0	65.7	100.0	64.0	0.0	7106	81.1
1984	2595.3	410.0	75.7	75.7	75.6	76.0	73.3	72.1	6901	78.6
1985	2997.3	410.0	84.2	80.0	84.2	80.1	83.5	77.8	7491	85.5
1986	3114.6	410.0	87.1	82.4	87.1	82.4	86.7	80.7	7718	88.1
1987	2883.1	415.0	79.2	81.6	79.2	81.6	79.3	80.4	7107	81.1
1988	3076.9	415.0	85.8	82.4	85.8	82.5	84.4	81.2	7737	88.1
1989	3182.2	415.0	87.7	83.3	87.7	83.3	87.5	82.3	7929	90.5
1990	3216.8	415.0	87.2	83.9	87.2	83.9	88.5	83.1	7837	89.5
1991	2883.9	410.0	75.1	82.8	75.1	82.8	80.3	82.8	6823	77.9
1992	3498.9	430.0	84.9	83.0	84.9	83.0	92.6	83.9	7629	86.9
1993	3512.4	430.0	85.8	83.3	85.8	83.3	93.2	84.9	7637	87.2
1994	3441.5	430.0	89.9	83.9	89.8	83.9	91.4	85.5	8031	91.7
1995	3056.3	430.0	79.6	83.6	79.5	83.6	81.1	85.1	7088	80.9
1996	3472.7	430.0	90.7	84.1	90.6	84.1	91.9	85.7	8033	91.5
1997	3328.5	430.0	87.0	84.3	86.9	84.3	88.4	85.9	7646	87.3
1998	3487.7	430.0	92.4	84.9	92.4	84.9	92.6	86.3	8095	92.4
1999	3117.5	430.0	81.6	84.7	81.2	84.6	82.8	86.1	7240	82.6
2000	3192.1	430.0	82.5	84.5	82.3	84.5	84.5	86.0	7268	82.7
2001	3514.9	437.0	91.8	85.0	91.6	84.9	91.8	86.3	8069	92.1
2002	3330.7	437.0	90.2	85.3	90.1	85.2	87.0	86.4	7909	90.3
2003	3097.8	437.0	81.0	85.0	81.0	85.0	80.9	86.1	7124	81.3



# HU-1 PAKS-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	26.7	1.3	XP	K	LOAD FOLLOWING
12 Jan	2.1	0.1	PP	E	TESTING.
02 Feb	3.3	0.1	XP	K	LOAD FOLLOWING
01 Mar	47.9	2.6	XP	K	LOAD FOLLOWING
11 Mar	1.5	0.1	UP	A12	CONTROL ROD SUPPLY REPAIR.
16 Mar	17.0	7.7	PF	D	SHORT MAINTENANCE.
06 Apr	17.4	0.5	XP	K	LOAD FOLLOWING
11 Apr	3.5	0.3	UP	A12	CONTROL ROD DROP.
01 May	11.2	0.4	XP	K	LOAD FOLLOWING
04 Jul	1370.0	599.0	PF	C	ANNUAL MAINTENANCE AND REFUELLING.
01 Sep	230.0	100.8	UF	A32	DRAIN TANK LEAKAGE.
29 Sep	2.3	0.3	UP	A12	CONTROL ROD DROP.
01 Nov	29.6	1.1	XP	K	LOAD FOLLOWING
12 Nov	19.0	8.5	UF	A15	PRESSURIZER SAFETY VALVE REPAIR.
15 Nov	21.0	0.7	PP	E31	TURBINE EFFICIENCY MEASUREMENT AFTER RETROFIT.
25 Nov	1.3	0.1	UP	A12	CONTROL ROD DROP.
02 Dec	37.1	1.2	XP	K	LOAD FOLLOWING

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		249			70	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1370			949	32	
D. Inspection, maintenance or repair without refuelling	17			17		
E. Testing of plant systems or components					0	
J. Grid failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					8	
Subtotal	1387	249	0	966	111	0
Total		1636			1077	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		20
14. Safety Systems		5
15. Reactor Cooling Systems	19	1
16. Steam generation systems		16
31. Turbine and auxiliaries		3
32. Feedwater and Main Steam System	230	3
33. Circulating Water System		1
35. All other I&C Systems		0
41. Main Generator Systems		0
42. Electrical Power Supply Systems		0
Total	249	49

# HU-2 PAKS-2

**Operator:** PAKS RT. (PAKS NUCLEAR POWER PLANT LTD)  
**Contractor:** AEE (ATOMENERGOEXPORT)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 441.0 MW(e)  
**Design Net Capacity:** 410.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 918.8 GW(e).h  
**Energy Availability Factor:** 23.8%  
**Load Factor:** 23.8%  
**Operating Factor:** 23.8%  
**Energy Unavailability Factor:** 76.2%  
**Total Off-line Time:** 6671 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	326.8	296.0	296.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	918.8
<b>EAF (%)</b>	99.6	99.9	90.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.8
<b>UCF (%)</b>	99.6	99.9	90.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.8
<b>LF (%)</b>	99.6	99.9	90.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.8
<b>OF (%)</b>	100.0	100.0	90.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.8
<b>EUf (%)</b>	0.4	0.1	9.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	76.2
<b>PUF (%)</b>	0.0	0.0	9.5	100.0	22.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.9
<b>UCLF (%)</b>	0.4	0.1	0.1	0.0	77.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	65.3
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1974  
**Date of First Criticality:** 26 Aug 1984  
**Date of Grid Connection:** 06 Sep 1984  
**Date of Commercial Operation:** 14 Nov 1984

**Lifetime Generation:** 60289.5 GW(e).h  
**Cumulative Energy Availability Factor:** 82.1%  
**Cumulative Load Factor:** 83.3%  
**Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1984	921.8	425.0	0.0	0.0	98.7	100.0	25.0	0.0	2659	30.7
1985	3101.6	415.0	85.1	85.1	85.1	85.1	85.3	85.3	7695	87.8
1986	3148.3	415.0	86.0	85.6	86.0	85.6	86.6	86.0	7643	87.2
1987	3193.9	415.0	85.3	85.5	85.3	85.5	87.9	86.6	7770	88.7
1988	3046.3	415.0	81.9	84.6	81.9	84.6	83.6	85.8	7352	83.7
1989	3300.7	415.0	88.6	85.4	88.6	85.4	90.8	86.8	7962	90.9
1990	3338.2	425.0	88.0	85.8	88.0	85.8	89.7	87.3	7845	89.6
1991	3421.6	415.0	88.6	86.2	88.6	86.2	94.1	88.3	7912	90.3
1992	3174.9	433.0	76.0	84.9	76.0	84.9	83.5	87.7	6829	77.7
1993	3569.0	433.0	87.0	85.2	87.0	85.2	94.1	88.4	7731	88.3
1994	3440.4	433.0	89.5	85.6	89.4	85.6	90.7	88.6	8000	91.3
1995	3309.1	433.0	86.6	85.7	86.4	85.7	87.2	88.5	7657	87.4
1996	3019.9	433.0	79.5	85.2	79.4	85.1	79.4	87.7	7011	79.8
1997	3267.6	433.0	88.3	85.4	88.2	85.4	86.1	87.6	7807	89.1
1998	3206.7	433.0	88.3	85.6	88.2	85.6	84.5	87.4	7717	88.1
1999	3246.6	433.0	90.2	85.9	89.2	85.8	85.6	87.3	7780	88.8
2000	3059.3	433.0	80.1	85.5	80.0	85.5	80.4	86.8	7073	80.5
2001	3266.9	441.0	84.9	85.5	84.8	85.4	84.6	86.7	7484	85.4
2002	3338.5	441.0	86.7	85.6	86.5	85.5	86.4	86.7	7644	87.3
2003	918.8	441.0	23.8	82.2	23.8	82.1	23.8	83.3	2089	23.8

## HU-2 PAKS-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	28.4	1.3	XP	K	LOAD FOLLOWING
02 Feb	8.9	0.3	XP	K	LOAD FOLLOWING
06 Mar	8.5	0.3	XP	K	LOAD FOLLOWING
29 Mar	959.0	422.9	PF	C	ANNUAL MAINTENANCE AND REFUELLING.
07 May	5711.0	2519.4	UF3	A11	SERIOUS TROUBLE IN THE FIRST PIT.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		5711			78	
B. Refuelling without a maintenance					19	
C. Inspection, maintenance or repair combined with refuelling	959			873	22	
D. Inspection, maintenance or repair without refuelling				16		
E. Testing of plant systems or components				1	0	
J. Grid failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					25	
Z. Others					7	
Subtotal	959	5711	0	890	151	0
Total		6670			1041	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	5711	
12. Reactor I&C Systems		25
15. Reactor Cooling Systems		5
16. Steam generation systems		12
17. Safety I&C Systems (excluding reactor I&C)		25
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		0
41. Main Generator Systems		0
42. Electrical Power Supply Systems		2
Total	5711	70

# HU-3 PAKS-3

**Operator:** PAKS RT. (PAKS NUCLEAR POWER PLANT LTD)  
**Contractor:** AEE (ATOMENERGOEXPORT)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 433.0 MW(e)  
**Design Net Capacity:** 410.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3008.3 GW(e).h  
**Energy Availability Factor:** 80.5%  
**Load Factor:** 79.3%  
**Operating Factor:** 88.4%  
**Energy Unavailability Factor:** 19.5%  
**Total Off-line Time:** 1014 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	321.6	100.8	268.4	273.6	280.8	274.2	283.4	274.8	192.5	107.9	310.6	319.6	3008.3
<b>EAF (%)</b>	99.8	34.6	83.5	87.8	87.2	88.0	88.0	85.3	75.9	33.3	99.7	99.2	80.5
<b>UCF (%)</b>	99.8	37.4	98.3	99.7	99.1	99.9	99.9	97.3	86.7	33.3	99.7	99.2	87.9
<b>LF (%)</b>	99.8	34.6	83.3	87.8	87.2	88.0	88.0	85.3	61.8	33.5	99.6	99.2	79.3
<b>OF (%)</b>	100.0	34.7	99.2	100.0	100.0	100.0	100.0	100.0	90.0	33.2	100.0	100.0	88.4
<b>EUF (%)</b>	0.2	65.4	16.5	12.2	12.8	12.0	12.0	14.7	24.1	66.7	0.3	0.8	19.5
<b>PUF (%)</b>	0.0	61.2	0.3	0.1	0.0	0.0	0.0	2.7	13.3	61.4	0.0	0.0	11.3
<b>UCLF (%)</b>	0.2	1.4	1.4	0.2	0.9	0.1	0.1	0.0	0.0	5.3	0.3	0.8	0.9
<b>XUF (%)</b>	0.0	2.8	14.9	12.0	12.0	12.0	12.0	12.0	10.8	0.0	0.0	0.0	7.4

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

OPERATION AT FULL POWER IN BASE LOAD MODE.

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1979  
**Date of First Criticality:** 15 Sep 1986  
**Date of Grid Connection:** 28 Sep 1986  
**Date of Commercial Operation:** 01 Dec 1986

**Lifetime Generation:** 56491.0 GW(e).h  
**Cumulative Energy Availability Factor:** 86.2%  
**Cumulative Load Factor:** 87.3%  
**Cumulative Unit Capability Factor:** 78.1%  
**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 (%)
1986	718.5	427.0	0.0	0.0	100.0	100.0	20.7	0.0	2109	26.0
1987	3209.6	415.0	87.0	87.0	87.0	87.0	88.3	88.3	7648	87.3
1988	3300.9	415.0	88.1	87.5	88.1	87.5	90.6	89.4	7874	89.6
1989	3140.5	415.0	82.4	85.8	82.4	85.8	86.4	88.4	7343	83.8
1990	3273.4	435.0	85.6	85.8	85.6	85.8	85.9	87.8	7755	88.5
1991	3256.0	410.0	84.2	85.5	84.2	85.5	90.7	88.3	7580	86.5
1992	3587.3	433.0	87.7	85.8	87.5	85.8	94.3	89.4	7852	89.4
1993	3177.9	433.0	77.6	84.6	77.4	84.6	83.8	88.5	6950	79.3
1994	3376.0	433.0	88.6	85.2	88.5	85.1	89.0	88.6	7884	90.0
1995	3392.8	433.0	89.2	85.6	89.0	85.5	89.4	88.7	7911	90.3
1996	3429.4	433.0	90.9	86.2	90.8	86.1	90.2	88.8	8136	92.6
1997	3066.1	433.0	81.1	85.7	80.9	85.6	80.8	88.1	7136	81.5
1998	3294.1	433.0	88.0	85.9	88.0	85.8	86.8	88.0	7566	86.4
1999	3445.7	433.0	92.3	86.4	92.2	86.3	90.8	88.2	8058	92.0
2000	3517.3	433.0	93.0	86.9	92.8	86.8	92.5	88.5	8163	92.9
2001	3040.4	433.0	80.7	86.5	80.3	86.3	80.2	88.0	7159	81.7
2002	3256.8	433.0	90.5	86.7	90.4	86.6	85.9	87.8	7900	90.2
2003	3008.3	433.0	87.8	86.8	80.5	86.2	79.3	87.3	7746	88.4

## HU-3 PAKS-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	15.0	0.6	XP	K	LOAD FOLLOWING
01 Feb	410.0	177.9	PF	C	ANNUAL MAINTENANCE AND REFUELLING.
23 Feb	29.0	4.1	UP3	Z	PLANNED MAINTENANCE EXTENTION
23 Feb	0.4	0.1	PP	E	TESTING.
24 Feb	5179.1	279.7	XP	K	CAPACITY DECREASING OF THE REACTOR PHYSICS ANOMALY.
02 Mar	8.9	0.8	PP	E	CORE CHECKING MEASUREMENT.
03 Mar	35.1	1.5	XP	K	LOAD FOLLOWING
22 Mar	10.9	3.1	UF	A42	HOUSE TRANSFORMER DISCONNECTION.
06 Apr	3.5	0.3	PP	E	TESTING.
13 Apr	22.5	0.6	XP	K	LOAD FOLLOWING
01 May	14.9	0.5	XP	K	LOAD FOLLOWING
25 May	11.8	1.7	UP	A31	TURBINE TRIP.
26 May	5.6	0.6	UP	A14	SIMULTANEOUS TWO SAFETY SYSTEM UNAVAILABILITY.
16 Jun	6.6	0.3	XP	K	LOAD FOLLOWING
03 Jul	3.8	0.1	XP	K	LOAD FOLLOWING
23 Jul	1.0	0.1	UP	A12	CONTROL ROD DROP.
19 Aug	958.0	66.6	XP	S	COAST DOWN.
27 Sep	521.0	225.8	PF	C	ANNUAL MAINTENANCE AND REFUELLING.
22 Oct	36.4	8.6	UF	A12	REACTOR SCRAM
30 Oct	28.4	8.5	UF	A42	HOUSE TRANSFORMER GROUND FAULT.
02 Nov	23.6	0.8	XP	K	LOAD FOLLOWINGS IN NOVEMBER.
02 Dec	8.7	1.9	UP	A31	TURBINE TRIP.
21 Dec	26.0	0.7	XP	K	LOAD FOLLOWINGS IN DECEMBER.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		75			123	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	931			842	157	
D. Inspection, maintenance or repair without refuelling				28		
E. Testing of plant systems or components				2	7	
Subtotal	931	75	0	872	287	0
Total		1006			1159	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	36	39
14. Safety Systems		0
15. Reactor Cooling Systems		0
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		27
42. Electrical Power Supply Systems	39	41
Total	75	107

# HU-4 PAKS-4

**Operator:** PAKS RT. (PAKS NUCLEAR POWER PLANT LTD)  
**Contractor:** AEE (ATOMENERGOEXPORT)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 444.0 MW(e)  
**Design Net Capacity:** 410.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3607.6 GW(e).h  
**Energy Availability Factor:** 92.8%  
**Load Factor:** 92.8%  
**Operating Factor:** 92.7%  
**Energy Unavailability Factor:** 7.2%  
**Total Off-line Time:** 641 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	328.5	298.1	326.9	319.3	174.9	203.4	330.1	330.3	318.9	330.6	318.0	328.5	3607.6
<b>EAF (%)</b>	99.4	99.9	99.1	99.9	53.0	63.6	99.9	100.0	99.8	100.0	99.5	99.4	92.8
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	53.0	63.7	100.0	100.0	99.8	100.0	100.0	100.0	93.0
<b>LF (%)</b>	99.4	99.9	99.0	99.9	53.0	63.6	99.9	100.0	99.8	100.1	99.5	99.4	92.8
<b>OF (%)</b>	100.0	100.0	99.9	100.0	50.0	62.6	100.0	100.0	100.0	100.1	100.0	100.0	92.7
<b>EUf (%)</b>	0.6	0.1	0.9	0.1	47.0	36.4	0.1	0.0	0.2	0.0	0.5	0.6	7.2
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	47.0	29.2	0.0	0.0	0.0	0.0	0.0	0.0	6.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	7.2	0.0	0.0	0.2	0.0	0.0	0.0	0.6
<b>XUF (%)</b>	0.5	0.1	0.9	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.2

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

OPERATION AT FULL POWER IN BASE LOAD MODE.

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1979      **Lifetime Generation:** 55143.1 GW(e).h  
**Date of First Criticality:** 09 Aug 1987      **Cumulative Energy Availability Factor:** 87.4%  
**Date of Grid Connection:** 16 Aug 1987      **Cumulative Load Factor:** 89.4%  
**Date of Commercial Operation:** 01 Nov 1987      **Cumulative Unit Capability Factor:** 78.2%  
**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 (%)
1987	1039.1	425.0	0.0	0.0	29.1	100.0	29.1	0.0	2936	35.0
1988	3200.9	415.0	85.7	85.7	85.6	85.6	87.8	87.8	7564	86.1
1989	3425.3	415.0	89.7	87.7	89.7	87.7	94.2	91.0	7974	91.0
1990	3064.5	435.0	76.7	83.9	76.7	83.9	80.4	87.4	7253	82.8
1991	3343.0	410.0	86.5	84.5	86.5	84.5	93.1	88.8	7787	88.9
1992	3702.8	433.0	90.9	85.8	90.7	85.8	97.4	90.5	8082	92.0
1993	3537.2	430.0	87.5	86.1	87.0	86.0	93.9	91.1	7767	88.7
1994	2971.2	433.0	78.1	85.0	78.1	84.9	78.3	89.2	7019	80.1
1995	3443.8	433.0	90.8	85.7	90.4	85.6	90.8	89.4	8049	91.9
1996	3487.5	433.0	91.3	86.3	90.7	86.1	91.7	89.7	8087	92.1
1997	3487.1	433.0	92.0	86.9	91.6	86.7	91.9	89.9	8098	92.4
1998	3136.1	433.0	84.3	86.7	83.7	86.4	82.7	89.3	7389	84.3
1999	3464.0	433.0	89.3	86.9	89.3	86.7	91.3	89.4	8046	91.8
2000	3578.4	433.0	92.3	87.3	92.2	87.1	94.1	89.8	8116	92.4
2001	3471.7	444.0	90.1	87.5	90.0	87.3	89.3	89.8	7916	90.4
2002	3182.9	444.0	83.3	87.2	83.1	87.0	81.8	89.2	7287	83.2
2003	3607.6	444.0	93.0	87.6	92.8	87.4	92.8	89.4	8119	92.7

## HU-4 PAKS-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	29.8	1.7	XP	K	LOAD FOLLOWING
24 Jan	1.3	0.1	PP	E	TESTING.
02 Feb	7.8	0.2	XP	K	LOAD FOLLOWING
01 Mar	61.3	2.9	XP	K	LOAD FOLLOWING
11 Mar	1.3	0.1	UP	A12	CONTROL ROD DROP.
06 Apr	13.2	0.4	XP	K	LOAD FOLLOWING
16 May	560.0	248.7	PF	C	ANNUAL MAINTENANCE AND REFUELLING.
10 Jun	81.4	22.9	UF3	Z	ANNUAL MAINTENANCE EXTENTION
19 Jun	5.3	0.1	XP	K	LOAD FOLLOWING
03 Jul	3.7	0.1	XP	K	LOAD FOLLOWING
09 Jul	1.3	0.1	UP	A12	CONTROL ROD DROP.
10 Aug	1.0	0.0	XP	K	LOAD FOLLOWING
02 Sep	6.8	0.7	UP	A32	FEEDWATER SYSTEM LEAKAGE.
15 Sep	2.3	0.1	XP	K	LOAD FOLLOWING
05 Oct	2.1	0.1	XP	K	LOAD FOLLOWING
07 Oct	1.6	0.0	UP	A14	SIMULTANEOUS TWO SAFETY SYSTEMS UNAVAILABILITY.
01 Nov	35.7	1.6	XP	K	LOAD FOLLOWING
02 Dec	41.1	1.7	XP	K	LOAD FOLLOWING
06 Dec	1.2	0.1	UP	A12	CONTROL ROD DROP.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					65	
C. Inspection, maintenance or repair combined with refuelling	560			837	34	
D. Inspection, maintenance or repair without refuelling				6		
E. Testing of plant systems or components				0		
H. Nuclear regulatory requirements				1		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				4		
Z. Others		81				
Subtotal	560	81	0	848	99	0
Total		641			947	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		11
15. Reactor Cooling Systems		20
16. Steam generation systems		7
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System		6
42. Electrical Power Supply Systems		2
Total	0	54

# 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  
**Maximum Net Capacity at the beginning of 2003:** 202.0 MW(e)  
**Design Net Capacity:** 220.0 MW(e)  
**Design Discharge Burnup:** 6700 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 1336.0 GW(e).h  
**Energy Availability Factor:** 83.4%  
**Load Factor:** 75.5%  
**Operating Factor:** 82.8%  
**Energy Unavailability Factor:** 16.6%  
**Total Off-line Time:** 1505 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	63.1	60.9	123.2	148.7	142.9	138.0	112.1	82.4	112.6	112.4	116.9	123.0	1336.0
<b>EAF (%)</b>	49.8	49.0	84.5	100.0	93.6	93.3	81.1	83.9	90.3	90.0	91.0	92.8	83.4
<b>UCF (%)</b>	56.9	49.0	99.9	100.0	100.0	93.3	81.1	83.9	100.0	100.0	91.0	92.8	87.5
<b>LF (%)</b>	42.0	44.9	82.0	102.2	95.1	94.9	74.6	54.9	77.4	74.8	80.4	81.8	75.5
<b>OF (%)</b>	46.4	47.2	84.0	100.0	93.5	93.2	80.6	83.3	90.1	89.9	90.8	92.6	82.8
<b>EUf (%)</b>	50.2	51.0	15.5	0.0	6.4	6.7	18.9	16.1	9.7	10.0	9.0	7.2	16.6
<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>	43.1	51.0	0.1	0.0	0.0	6.7	18.9	16.1	0.0	0.0	9.0	7.2	12.5
<b>XUF (%)</b>	7.1	0.0	15.4	0.0	6.4	0.0	0.0	0.0	9.7	10.0	0.0	0.0	4.1

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

UNIT OPERATED AT REDUCED POWER LEVEL BETWEEN 70% TO 90% FP DUE TO LOWER DEMAND FROM GRID.

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1989      **Lifetime Generation:** 4462.4 GW(e).h  
**Date of First Criticality:** 26 Sep 2000      **Cumulative Energy Availability Factor:** 82.1%  
**Date of Grid Connection:** 12 Oct 2000      **Cumulative Load Factor:** 80.7%  
**Date of Commercial Operation:** 16 Nov 2000      **Cumulative Unit Capability Factor:** 83.5%  
**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 (%)
2000	192.3	200.0	0.0	0.0	84.4	100.0	50.1	0.0	1173	61.1
2001	1241.1	200.0	75.8	75.8	70.4	70.4	70.8	70.8	6316	72.1
2002	1692.9	202.0	95.6	85.8	92.4	81.4	95.7	83.3	8082	92.3
2003	1336.0	202.0	87.5	86.3	83.4	82.1	75.5	80.7	7255	82.8



# IN-13 KAIGA-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
14 Jan	198.9	37.6	UF5	A31	UNIT WAS TRIPPED MANUALLY FOR INSPECTION AND RECTIFICATION OF TG AS ITS EXCENTRICITY HAD GONE UP.
14 Jan	56.4	10.6	XF4	J31	UNIT TRIPPED DUE TO GRID DISTURBANCE.
26 Jan	499.2	96.4	UF5	A21	UNIT WAS TRIPPED MANUALLY FOR THE INSPECTION OF ONE REACTOR COOLANT CHANNEL.
12 Mar	118.9	23.2	XF4	J31	UNIT TRIPPED DUE TO GRID DISTURBANCE.
17 May	47.8	9.6	XF4	J31	TG TRIPPED DURING GRID DISTURBANCES AND REACTOR TRIP
07 Jun	46.4	9.3	UF5	A31	UNIT TRIPPED MANUALLY TO ATTEND CONDENSER STEAM DUMP HEADER LEVEL SWITCH STAND PIPE STEAM LEAK.
17 Jul	62.6	12.3	UF4	Z31	TG CLASS-A TRIP FOLLOWED BY MANUAL TRIP OF REACTOR.
22 Jul	81.4	16.0	UF4	A32	REACTOR SET BACK ON ASDV NOT FULLY CLOSED FOLLOWED Y TRIPPING OF TURBINE AND REACTOR POISONED OUT.
01 Aug	69.7	13.3	UF4	Z31	TG TRIP ON CLASS-A PROTECTION AND SUBSEQUENT MANUAL TRIPPING OF REACTOR
26 Aug	54.4	11.0	UF4	A11	REACTOR TRIP ON PHT PRESSURE HIGH DUE TO PCP-4 TRIPPING SPURIOUSLY.
12 Sep	68.3	13.5	XF4	J31	TURBINE TRIPPED ON CLASS-B TRIP DUE TO REHEATER PRESSURE VERY HIGH.
30 Sep	77.0	15.6	XF4	J31	UNIT TRIPPED DUE TO PHT HIGH PRESSURE DUE TO GRID DISTURBANCE.
06 Nov	66.5	13.1	UF4	A12	REACTOR TRIP DUE TO RRS SYSTEM A&B FAILURE.
14 Dec	54.0	10.7	UF4	A13	UNIT OUTAGE DUE TO SPURIOUS TRIPPING OF PCP-3.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			2000 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		1000			660	
B. Refuelling without a maintenance					45	
E. Testing of plant systems or components				29		
J. Grid failure or grid unavailability			368			210
Z. Others		132				
Subtotal	0	1132	368	29	705	210
Total		1500			944	

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

System	2003 Hours Lost	2000 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	54	12
12. Reactor I&C Systems	66	24
13. Reactor Auxiliary Systems	54	
15. Reactor Cooling Systems		38
17. Safety I&C Systems (excluding reactor I&C)		53
21. Fuel Handling and Storage Facilities	499	
31. Turbine and auxiliaries	245	55
32. Feedwater and Main Steam System	81	44
35. All other I&C Systems		0
41. Main Generator Systems		396
42. Electrical Power Supply Systems		10
XX. Miscellaneous Systems		24
Total	999	656

# 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  
**Maximum Net Capacity at the beginning of 2003:** 202.0 MW(e)  
**Design Net Capacity:** 220.0 MW(e)  
**Design Discharge Burnup:** 6700 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 1413.0 GW(e).h  
**Energy Availability Factor:** 86.9%  
**Load Factor:** 79.9%  
**Operating Factor:** 86.0%  
**Energy Unavailability Factor:** 13.1%  
**Total Off-line Time:** 1225 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	24.6	137.1	133.1	149.4	154.1	149.8	108.9	88.0	106.0	119.5	119.6	122.8	1413.0
<b>EAF (%)</b>	24.7	100.0	89.4	100.0	100.0	100.0	77.8	86.5	88.4	93.9	91.9	92.7	86.9
<b>UCF (%)</b>	24.7	100.0	99.8	100.0	100.0	100.0	77.8	86.5	100.0	93.9	91.9	92.7	88.8
<b>LF (%)</b>	16.4	101.0	88.6	102.7	102.5	103.0	72.4	58.5	72.9	79.5	82.2	81.7	79.9
<b>OF (%)</b>	19.8	100.0	89.4	100.0	100.0	100.0	77.4	85.9	83.3	94.4	91.8	92.6	86.0
<b>EUf (%)</b>	75.3	0.0	10.6	0.0	0.0	0.0	22.2	13.5	11.6	6.1	8.1	7.3	13.1
<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>	75.3	0.0	0.2	0.0	0.0	0.0	22.2	13.5	0.0	6.1	8.1	7.3	11.3
<b>XUF (%)</b>	0.0	0.0	10.4	0.0	0.0	0.0	0.0	0.0	11.6	0.0	0.0	0.0	1.8

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

UNIT OPERATED AT REDUCED POWER LEVEL BETWEEN 70% TO 90% FP DUE TO LOWER DEMAND FROM GRID.

## 5. Historical Summary

**Date of Construction Start:** 01 Dec 1989      **Lifetime Generation:** 5367.3 GW(e).h  
**Date of First Criticality:** 24 Sep 1999      **Cumulative Energy Availability Factor:** 82.3%  
**Date of Grid Connection:** 02 Dec 1999      **Cumulative Load Factor:** 80.9%  
**Date of Commercial Operation:** 16 Mar 2000      **Cumulative Unit Capability Factor:** 83.5%  
**Cumulative Energy Unavailability Factor:** 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 (%)
2000	1086.5	200.0	0.0	0.0	72.2	100.0	61.8	0.0	5975	68.0
2001	1308.6	200.0	82.1	82.1	74.2	74.2	74.7	74.7	6670	76.1
2002	1559.2	202.0	87.5	84.8	85.8	80.0	88.1	81.4	7455	85.1
2003	1413.0	202.0	88.8	86.1	86.9	82.3	79.9	80.9	7535	86.0

## IN-14 KAIGA-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	542.3	102.8	UF5	A31	UNIT TRIPPED MANUALLY FOR INSPECTION AND RECTIFICATION OF TG AS ITS EXCENTRICITY AND VIBRATION HAD GONE UP.
25 Jan	55.0	10.4	UF5	A31	UNIT TRIPPED FOR TG BALANCING.
12 Mar	78.1	15.7	XF4	J31	UNIT TRIPPED DUE TO GRID DISTURBANCES.
04 Jul	167.6	33.4	UF5	A15	UNIT OUTAGE DUE TO MODERATOR PUMP-1 SEAL LEAKAGE.
25 Aug	59.9	11.6	UF4	A12	REACTOR TRIP ON SSS ACTUATION SPURIOUSLY ON HIGH LINEAR N.
29 Aug	45.1	0.2	UF5	A13	REACTOR MANUAL TRIP TO INVESTIGATE GRADUAL DROP IN PHT STORAGE TANK LEVEL.
09 Sep	56.7	11.2	UF4	A13	REACTOR TRIP ON PHT PRESSURE < 79.6 KG/CM2 WITH 15 SEC. TIME DELAY. SUBSEQUENTLY TURBINE TRIPPED ON CLASS-B PROTECTION.
12 Sep	59.7	4.8	XF4	J31	HIGH FREQUENCY HOUSE LOAD OPERATION DUE TO GRID DISTURBANCES FOLLOWED BY REACTOR TRIP ON SG LOW LEVEL.
30 Sep	47.0	9.6	XF4	J12	UNIT TRIPPED DUE TO PHT HIGH PRESSURE DUE TO GRID DISTURBANCES.
19 Nov	59.1	11.8	UF4	A42	UNIT TRIP ON PHT HIGH PRESSURE DUE TO TRIPPING OF STATION UNIT TRANSFORMER ON DIFFERENTIAL PROTECTION.
07 Dec	55.3	11.0	UF4	Z13	TG TRIP ON REVERSE POWER DURING TRANSFER OF BREAKER OF GT BREAKER FROM CB-10 TO CB-G DUE TO MALFUNCTION OF REALY.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			2000 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		985			955	
D. Inspection, maintenance or repair without refuelling				254		
J. Grid failure or grid unavailability			184			293
Z. Others		55				
Subtotal	0	1040	184	254	955	293
Total		1224			1502	

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

System	2003 Hours Lost	2000 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		25
12. Reactor I&C Systems	59	187
13. Reactor Auxiliary Systems	101	
15. Reactor Cooling Systems	167	59
17. Safety I&C Systems (excluding reactor I&C)		91
31. Turbine and auxiliaries	597	399
32. Feedwater and Main Steam System		91
41. Main Generator Systems		18
42. Electrical Power Supply Systems	59	81
Total	983	951

# 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  
**Maximum Net Capacity at the beginning of 2003:** 202.0 MW(e)  
**Design Net Capacity:** 220.0 MW(e)  
**Design Discharge Burnup:** 6700 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 1419.4 GW(e).h  
**Energy Availability Factor:** 81.9%  
**Load Factor:** 80.2%  
**Operating Factor:** 87.0%  
**Energy Unavailability Factor:** 18.1%  
**Total Off-line Time:** 1138 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	127.3	135.4	152.4	142.4	143.3	140.2	146.2	102.4	0.8	100.5	126.9	101.6	1419.4
<b>EAF (%)</b>	84.1	98.5	100.0	100.0	98.8	99.9	100.0	71.6	4.0	69.7	90.7	66.4	81.9
<b>UCF (%)</b>	84.1	98.5	100.0	100.0	100.0	99.9	100.0	100.0	4.9	80.6	100.0	81.3	87.5
<b>LF (%)</b>	84.7	99.8	101.4	97.9	95.4	96.4	97.3	68.2	0.6	66.9	87.3	67.6	80.2
<b>OF (%)</b>	83.5	98.4	100.0	100.0	100.0	100.0	100.0	100.0	3.1	78.4	100.0	80.5	87.0
<b>EUf (%)</b>	15.9	1.5	0.0	0.0	1.2	0.1	0.0	28.4	96.0	30.3	9.3	33.6	18.1
<b>PUF (%)</b>	15.9	1.5	0.0	0.0	0.0	0.0	0.0	0.0	95.1	19.4	0.0	0.0	10.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	18.7	1.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	1.2	0.0	0.0	28.4	0.9	10.9	9.3	14.9	5.5

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

UNIT OPERATED AT REDUCED POWER LEVEL BETWEEN 70% TO 90% FP DUE TO LOWER DEMAND FROM GRID.

## 5. Historical Summary

**Date of Construction Start:** 01 Dec 1984      **Lifetime Generation:** 12199.7 GW(e).h  
**Date of First Criticality:** 03 Sep 1992      **Cumulative Energy Availability Factor:** 71.6%  
**Date of Grid Connection:** 24 Nov 1992      **Cumulative Load Factor:** 70.9%  
**Date of Commercial Operation:** 06 May 1993      **Cumulative Unit Capability Factor:** 80.8%  
**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 (%)
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	42.0	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

## IN-9 KAKRAPAR-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
26 Jan	133.4	26.0	PF	D16	UNIT WAS MANUALLY SHUTDOWN TO IDENTIFY AND RECTIFY THE LEAKY TUBE OF ONE OF THE STEAM GENERATOR.
01 Aug	765.9	43.9	XP	R42	UNIT POWER WAS REDUCED TO 70% FP AS A STEP FOR RATIONALIZATION OF GENERATION WITH RESPECT TO GRID DEMAND.
01 Sep	858.7	167.4	PF	D	ANNUAL SHUTDOWN
07 Oct	1902.9	57.0	XP	R42	AFTER ASD, POWER WAS LIMITED TO 90% DUE TO LOWER DEMAND FROM GRID.
04 Dec	54.3	10.6	UF5	A31	TG TRIPPED ON LOW CONDENSER VACUUM SUBSEQUENT TO FAILURE OF CONDENSER DOG BONE JOINT.
07 Dec	89.9	17.5	UF5	A31	TG TRIPPED ON LOW CONDENSER VACUUM DUE TO FAILURE OF CONDENSER DOG BONE JOINT.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1994 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		144			674	
D. Inspection, maintenance or repair without refuelling	992			1167		
E. Testing of plant systems or component				0	32	
G. Major back-fitting, refurbishment or upgrading activities without refuelling						33
H. Nuclear regulatory requirement					6	
J. Grid failure or grid unavailability						90
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					18	14
Subtotal	992	144	0	1167	730	137
Total		1136			2034	

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

System	2003 Hours Lost	1994 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		70
12. Reactor I&C Systems		65
13. Reactor Auxiliary System		24
15. Reactor Cooling System		146
16. Steam generation system		19
17. Safety I&C Systems (excluding reactor I&C)		23
31. Turbine and auxiliaries	144	154
32. Feedwater and Main Steam System		23
35. All other I&C Systems		23
41. Main Generator System		20
42. Electrical Power Supply System		67
Total	144	634

# 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  
**Maximum Net Capacity at the beginning of 2003:** 202.0 MW(e)  
**Design Net Capacity:** 220.0 MW(e)  
**Design Discharge Burnup:** 6700 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 1613.2 GW(e).h  
**Energy Availability Factor:** 92.3%  
**Load Factor:** 91.2%  
**Operating Factor:** 97.2%  
**Energy Unavailability Factor:** 7.7%  
**Total Off-line Time:** 245 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	143.2	113.5	153.8	145.7	148.9	147.3	149.1	103.5	128.5	117.8	128.8	133.2	1613.2
<b>EAF (%)</b>	93.8	83.1	100.0	100.0	100.0	100.0	100.0	72.3	91.8	81.8	92.0	92.1	92.3
<b>UCF (%)</b>	93.8	83.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.8	100.0	100.0	97.3
<b>LF (%)</b>	95.3	83.6	102.3	100.2	99.1	101.3	99.2	68.9	88.4	78.4	88.6	88.6	91.2
<b>OF (%)</b>	93.5	82.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.5	100.0	99.9	97.2
<b>EUf (%)</b>	6.2	16.9	0.0	0.0	0.0	0.0	0.0	27.7	8.2	18.2	8.0	7.9	7.7
<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>	6.2	16.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.2	0.0	0.0	2.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.7	8.2	8.0	8.0	7.9	5.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1985      **Lifetime Generation:** 12435.3 GW(e).h  
**Date of First Criticality:** 08 Jan 1995      **Cumulative Energy Availability Factor:** 84.0%  
**Date of Grid Connection:** 04 Mar 1995      **Cumulative Load Factor:** 84.1%  
**Date of Commercial Operation:** 01 Sep 1995      **Cumulative Unit Capability Factor:** 81.6%  
**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 (%)
1995	825.5	196.0	0.0	0.0	83.2	100.0	48.7	0.0	5401	62.4
1996	1326.8	195.0	86.3	86.3	77.5	77.5	77.5	77.5	7663	87.2
1997	1093.4	195.0	66.7	76.5	63.8	70.6	64.0	70.7	6139	70.1
1998	1291.6	195.0	78.7	77.2	76.6	72.6	75.6	72.4	6932	79.1
1999	1512.3	195.0	92.4	81.0	91.1	77.3	88.5	76.4	7955	90.8
2000	1489.9	195.0	85.8	82.0	85.6	78.9	87.0	78.5	7697	87.6
2001	1685.4	195.0	96.0	84.3	95.3	81.6	98.7	81.9	8500	97.0
2002	1597.1	202.0	89.5	85.1	89.2	82.8	90.3	83.1	7940	90.6
2003	1613.2	202.0	97.3	86.6	92.3	84.0	91.2	84.1	8515	97.2

## IN-10 KAKRAPAR-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
02 Jan	47.5	9.3	UF1	A16	TURBINE TRIPPED ON STEAM GENERATOR LEVEL VERY HIGH. REACTOR TRIPPED ON HIGH SG DELTA T.
20 Feb	117.5	22.9	UF1	A16	UNIT WAS SHUTDOWN TO ATTEND SG-1 TUBE LEAK.
01 Aug	744.0	41.6	XP	R42	POWER WAS REDUCED TO 70% FP DUE TO LOWER DEMAND FROM GRID.
01 Sep	2848.0	47.4	XP	R42	POWER LEVEL WAS REDUCED TO 90% FP DUE TO LOWER DEMAND FROM GRID.
13 Oct	78.4	15.3	UF1	A15	UNIT WAS SHUTDOWN TO PERFORM SURVEILLANCE TEST AND TO IDENTIFY AND RECTIFY THE HEAVY WATER LEAK IN PUMP ROOM.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1995 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		243			551	
B. Refuelling without a maintenance					15	
D. Inspection, maintenance or repair without refuelling				434		
E. Testing of plant systems or components				1	38	
G. Major back-fitting, refurbishment or upgrading activities without refuelling						7
H. Nuclear regulatory requirements					24	
J. Grid failure or grid unavailability						50
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					6	
Subtotal	0	243	0	435	634	57
Total		243			1126	

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

System	2003 Hours Lost	1995 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		46
14. Safety Systems		18
15. Reactor Cooling Systems	78	30
16. Steam generation systems	165	
17. Safety I&C Systems (excluding reactor I&C)		60
31. Turbine and auxiliaries		144
32. Feedwater and Main Steam System		31
35. All other I&C Systems		6
41. Main Generator Systems		102
42. Electrical Power Supply Systems		93
Total	243	530

# IN-5 KALPAKKAM-1

**Operator:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

**Contractor:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

## 1. Station Details

**Type:** PHWR  
**Maximum Net Capacity at the beginning of 2003:** 155.0 MW(e)  
**Design Net Capacity:** 220.0 MW(e)  
**Design Discharge Burnup:** 6700 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 810.6 GW(e).h  
**Energy Availability Factor:** 65.3%  
**Load Factor:** 59.7%  
**Operating Factor:** 61.9%  
**Energy Unavailability Factor:** 34.7%  
**Total Off-line Time:** 3339 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	115.8	104.5	99.9	109.6	104.5	108.2	111.0	57.1	0.0	0.0	0.0	0.0	810.6
<b>EAF (%)</b>	100.0	100.0	90.4	100.0	94.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0	65.3
<b>UCF (%)</b>	100.0	100.0	90.4	100.0	94.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0	65.3
<b>LF (%)</b>	100.4	100.3	86.6	98.2	90.7	97.0	96.2	49.5	0.0	0.0	0.0	0.0	59.7
<b>OF (%)</b>	100.0	100.0	90.1	100.0	93.8	100.0	100.0	60.9	0.0	0.0	0.0	0.0	61.9
<b>EUF (%)</b>	0.0	0.0	9.6	0.0	6.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0	34.7
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0	33.4
<b>UCLF (%)</b>	0.0	0.0	9.6	0.0	6.0	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. 2003 Summary of Operation

UNIT WAS SHUTDOWN ON 20TH AUGUST FOR COMPLETE REACTOR RETUBING AND SAFETY SYSTEM UPGRADING

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1971      **Lifetime Generation:** 17458.7 GW(e).h  
**Date of First Criticality:** 02 Jul 1983      **Cumulative Energy Availability Factor:** 58.8%  
**Date of Grid Connection:** 23 Jul 1983      **Cumulative Load Factor:** 52.8%  
**Date of Commercial Operation:** 27 Jan 1984      **Cumulative Unit Capability Factor:** 77.7%  
**Cumulative Energy Unavailability Factor:** 41.2%

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 (%)
1983	0.0	155.0	0.0	0.0	0.0	100.0	0.0	0.0	0	0.0
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	53.1	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	49.9	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	44.9	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	43.6	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



## IN-5 KALPAKKAM-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
09 Mar	73.6	11.0	UF4	A11	UNIT WAS MANUALLY TRIPPED TO ATTEND MODERATOR PUMP DISCHARGE VALVE LANGE LEAK.
23 May	46.3	6.9	UF4	A32	6.6. KV BUS SUPPLY WAS LOST AND EXTERNAL POWER SUPPLY (CLASS-IV) POWER FAILURE OCCURRED. REACTOR TRIPPED ON LESS THAN 2 PHT PUMPS RUNNING
20 Aug	3168.0	491.0	PF	H	COMPLETE REACTOR RETUBING AND SAFETY UPGRADING WORK

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		119			1089	9
B. Refuelling without a maintenance					9	
D. Inspection, maintenance or repair without refuelling				734		
E. Testing of plant systems or components				14	28	
H. Nuclear regulatory requirements	3168			635		
J. Grid failure or grid unavailability					9	131
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					25	
Subtotal	3168	119	0	1383	1160	140
Total		3287			2683	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	73	177
12. Reactor I&C Systems		94
13. Reactor Auxiliary Systems		27
15. Reactor Cooling Systems		84
16. Steam generation systems		35
31. Turbine and auxiliaries		119
32. Feedwater and Main Steam System	46	36
35. All other I&C Systems		2
41. Main Generator Systems		35
42. Electrical Power Supply Systems		431
XX. Miscellaneous Systems		7
Total	119	1047

**IN-6 KALPAKKAM-2**

Operator: NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

Contractor: NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

**1. Station Details**

Type: PHWR  
 Maximum Net Capacity  
 at the beginning of 2003: 155.0 MW(e)  
 Design Net Capacity: 220.0 MW(e)  
 Design Discharge Burnup: 8400 MW.d/t

**2. Production Summary 2003**

Energy Production: 589.1 GW(e).h  
 Energy Availability Factor: 40.0%  
 Load Factor: 43.4%  
 Operating Factor: 35.8%  
 Energy Unavailability Factor: 60.0%  
 Total Off-line Time: 5625 hours

**3. 2003 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	24.2	97.0	78.4	123.4	145.6	120.6	589.1
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	93.8	65.6	48.1	86.5	100.0	81.6	40.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	93.8	65.6	48.1	86.5	100.0	81.6	40.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	20.9	84.1	70.3	107.0	130.4	104.6	43.4
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	23.4	72.7	55.6	89.2	100.0	85.5	35.8
EUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	6.2	34.4	51.9	13.5	0.0	18.4	60.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	49.6
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	6.2	34.4	51.9	13.5	0.0	18.4	10.4
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. 2003 Summary of Operation**

UNIT WAS SYNCHRONIZED TO THE GRID ON JULY 23, 2003 AFTER COMPLETE REACTOR RETUBING AND SAFETY SYSTEM UPGRADING WORK

**5. Historical Summary**

Date of Construction Start: 01 Oct 1972      Lifetime Generation: 15026.2 GW(e).h  
 Date of First Criticality: 12 Aug 1985      Cumulative Energy Availability Factor: 58.8%  
 Date of Grid Connection: 20 Sep 1985      Cumulative Load Factor: 52.4%  
 Date of Commercial Operation: 21 Mar 1986      Cumulative Unit Capability Factor: 78.1%  
    Cumulative Energy Unavailability Factor: 41.2%

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	783.7	220.0	0.0	0.0	40.7	100.0	40.7	0.0	5303	60.5
1987	1066.0	220.0	62.5	62.5	55.5	55.5	55.3	55.3	6382	72.9
1988	642.0	220.0	33.2	47.8	33.2	44.3	33.2	44.3	3535	40.2
1989	438.2	220.0	22.8	39.5	22.7	37.1	22.7	37.1	4350	49.7
1990	1082.4	215.0	61.6	44.9	57.2	42.1	57.5	42.1	7726	88.2
1991	1083.0	215.0	87.2	53.2	86.6	50.8	57.5	45.1	7642	87.2
1992	665.2	194.0	55.2	53.5	54.2	51.4	39.0	44.2	4751	54.1
1993	950.3	205.0	80.2	57.2	77.1	54.9	52.9	45.4	6625	75.6
1994	1032.1	194.0	85.5	60.5	80.9	57.9	60.7	47.2	7071	80.7
1995	274.7	194.0	22.7	56.6	21.4	54.1	16.2	44.0	1871	21.4
1996	1061.9	161.0	84.7	58.8	82.2	56.3	75.1	46.4	7256	82.6
1997	958.2	150.0	75.6	59.9	72.4	57.4	72.9	48.2	6464	73.8
1998	1104.2	150.0	87.0	61.7	85.4	59.2	84.0	50.5	7478	85.4
1999	879.9	150.0	68.0	62.1	65.7	59.6	67.0	51.5	5755	65.7
2000	1273.4	150.0	95.7	64.0	94.6	61.6	96.6	54.1	8304	94.5
2001	1119.1	150.0	88.5	65.3	87.6	63.0	85.2	55.8	7671	87.6
2002	22.7	155.0	1.7	61.9	1.7	59.8	1.7	52.9	183	2.1
2003	589.1	155.0	40.0	60.9	40.0	58.8	43.4	52.4	3135	35.8

## IN-6 KALPAKKAM-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	4896.0	758.9	PF	G	COOLANT CHANNEL REPLACEMENT AND SYSTEM UPGRADING WORK
27 Jul	45.0	7.1	UF4	A12	UNIT TRIPPED ON CHANNEL-D AND CHANNEL-F HIGH DELTA-T CAUSING CHANNEL-E ALSO TO TRIP. TG TRIPPED ON REACTOR TRIP.
02 Aug	47.6	9.4	UF4	A41	TURBINE TRIPPED DUE TO FAULT IN EXCITATION SYSTEM OF GENERATOR FOLLOWED BY REACTOR TRIP ON PHT PRESSURE HIGH.
11 Aug	154.8	30.3	UF4	A41	UNIT OUTAGE OCCURRED DUE TO GENERATOR BREAKER TRIPPING. REACTOR ALSO TRIPPED
15 Sep	295.3	57.9	UF4	A12	REACTOR TRIPPED ON PROTECTION DURING PLANNED LOAD THROW OFF TEST.
17 Oct	79.7	15.6	UF4	A13	REACTOR TRIPPED ON LOW PHT PRESSURE DUE TO 3311-P-10 TRIP ON HIGH CURRENT.
09 Dec	58.4	11.5	UF5	A13	UNIT WAS SHUTDOWN TO ATTEND 3311-P-9 PRIMARY SEAL AND OTHER MAINTENANCE ACTIVITIES.
24 Dec	50.1	9.8	UF4	A42	GENERATOR-2 OUTPUT R-PHASE CONDUCTOR AT INTERMEDIATE TOWER GOT OUT. THIS LED TO GENERATOR TRIP O MAIN AND BACKUP PROTECTION FOLLOWED BY REACTOR TRIP ON HIGH PHT PRESSURE.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		730			927	7
B. Refuelling without a maintenance					9	
D. Inspection, maintenance or repair without refuelling				740		
E. Testing of plant systems or components				32	11	
G. Major back-fitting, refurbishment or upgrading activities without refuelling	4896			451		
H. Nuclear regulatory requirements				178	6	
J. Grid failure or grid unavailability					4	118
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					9	20
Subtotal	4896	730	0	1401	966	145
Total		5626			2512	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		292
12. Reactor I&C Systems	340	50
13. Reactor Auxiliary Systems	138	5
14. Safety Systems		3
15. Reactor Cooling Systems		166
16. Steam generation systems		44
21. Fuel Handling and Storage Facilities		9
31. Turbine and auxiliaries		82
32. Feedwater and Main Steam System		31
35. All other I&C Systems		4
41. Main Generator Systems	202	49
42. Electrical Power Supply Systems	50	62
XX. Miscellaneous Systems		16
Total	730	813

# 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  
**Maximum Net Capacity at the beginning of 2003:** 202.0 MW(e)  
**Design Net Capacity:** 220.0 MW(e)  
**Design Discharge Burnup:** 6700 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 1528.2 GW(e).h  
**Energy Availability Factor:** 86.0%  
**Load Factor:** 86.4%  
**Operating Factor:** 94.2%  
**Energy Unavailability Factor:** 14.0%  
**Total Off-line Time:** 506 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	120.5	129.4	152.8	119.2	137.4	108.8	133.4	110.7	130.1	122.3	129.6	134.1	1528.2
<b>EAF (%)</b>	72.5	95.7	97.4	83.1	93.3	75.4	87.4	74.9	90.8	82.1	90.0	90.1	86.0
<b>UCF (%)</b>	76.1	100.0	100.0	99.1	100.0	86.7	88.6	100.0	100.0	91.6	100.0	100.0	95.1
<b>LF (%)</b>	80.2	95.3	101.6	82.1	91.5	74.8	88.8	73.7	89.4	81.3	89.1	89.2	86.4
<b>OF (%)</b>	78.5	92.9	100.0	90.7	100.0	87.8	89.5	100.0	100.0	91.3	100.0	100.0	94.2
<b>EUf (%)</b>	27.5	4.3	2.6	16.9	6.7	24.6	12.6	25.1	9.2	17.9	10.0	9.9	14.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	13.3	11.4	0.0	0.0	0.0	0.0	0.0	2.1
<b>UCLF (%)</b>	23.9	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	8.4	0.0	0.0	2.8
<b>XUF (%)</b>	3.6	4.3	2.6	16.1	6.7	11.3	1.2	25.1	9.2	9.4	10.0	9.9	9.1

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

UNIT OPERATED AT A REDUCED POWER BETWEEN 70% TO 90% FP DUE TO LOWER DEMAND FROM GRID.

## 5. Historical Summary

**Date of Construction Start:** 01 Dec 1976  
**Date of First Criticality:** 12 Mar 1989  
**Date of Grid Connection:** 29 Jul 1989  
**Date of Commercial Operation:** 01 Jan 1991

**Lifetime Generation:** 13889.6 GW(e).h  
**Cumulative Energy Availability Factor:** 64.0%  
**Cumulative Load Factor:** 60.6%  
**Cumulative Unit Capability Factor:** 79.3%  
**Cumulative Energy Unavailability Factor:** 36.0%

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 (%)
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	26.4	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

# IN-7 NARORA-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
17 Jan	157.0	34.6	UF2	A32	UNIT WAS SHUTDOWN TO ATTEND THE STEAM LEAK FROM STEAM GENERATOR-2 FLOW TRANSMITTER ROOT VALVE AND TUBING.
19 Feb	48.0	10.5	XF4	J42	REACTOR TRIPPED ON NO PRIMARY CIRCULATING PUMP RUNNING DUE TO CLASS-IV POWER SUPPLY FAILURE CAUSED BY GRID DISTURBANCE.
27 Apr	68.0	15.1	XF4	Z42	DUE TO SEVER STORM AND HEAVY RAINS, 220 KV DISTURBANCE RESULTED IN EXTERNAL POWER SUPPLY (CLASS-IV) FAILURE AND REACTOR TRIPPED ON NO PRIMARY CIRCULATING PUMP RUNNING.
27 Jun	166.0	36.5	PF	D34	UNIT WAS PLANNED SHUTDOWN TO CARRY OUT CHEMICAL AND MECHANICAL CLEANING OF CONDENSER TUBES.
22 Oct	64.0	12.7	UF4	A12	REACTOR TRIPPED ON PHT PRESSURE LOW CAUSED BY OPENING INSTRUMENTED RELIEF VALVE DUE TO INTERRUPTION IN INSTRUMENT AIR SUPPLY TO OPENING INSTRUMENTED RELIEF VALVE.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1991 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		221			1303	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling				151		
D. Inspection, maintenance or repair without refuelling	166			980		
E. Testing of plant systems or components				36	28	
G. Major back-fitting, refurbishment or upgrading activities without refuelling					26	
H. Nuclear regulatory requirements					16	
J. Grid failure or grid unavailability			48			83
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						18
Z. Others			68			
Subtotal	166	221	116	1167	1375	101
Total		503			2643	

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

System	2003 Hours Lost	1991 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		38
12. Reactor I&C Systems	64	85
13. Reactor Auxiliary Systems		35
15. Reactor Cooling Systems		151
16. Steam generation systems		14
17. Safety I&C Systems (excluding reactor I&C)		45
21. Fuel Handling and Storage Facilities		3
31. Turbine and auxiliaries		661
32. Feedwater and Main Steam System	157	18
33. Circulating Water System		3
41. Main Generator Systems		113
42. Electrical Power Supply Systems		82
XX. Miscellaneous Systems		3
Total	221	1251

# 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  
**Maximum Net Capacity at the beginning of 2003:** 202.0 MW(e)  
**Design Net Capacity:** 220.0 MW(e)  
**Design Discharge Burnup:** 6700 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 1287.1 GW(e).h  
**Energy Availability Factor:** 70.7%  
**Load Factor:** 72.7%  
**Operating Factor:** 85.1%  
**Energy Unavailability Factor:** 29.3%  
**Total Off-line Time:** 1302 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	155.9	124.2	155.2	78.9	82.9	107.8	65.6	99.5	86.6	104.6	100.8	125.2	1287.1
<b>EAF (%)</b>	94.9	92.0	95.3	51.6	53.0	74.4	40.8	66.2	59.1	69.6	69.2	83.2	70.7
<b>UCF (%)</b>	100.0	100.0	100.0	57.9	58.7	80.3	42.6	95.8	90.7	100.0	100.0	100.0	85.4
<b>LF (%)</b>	103.7	91.5	103.3	54.3	55.2	74.1	43.6	66.2	59.5	69.5	69.3	83.3	72.7
<b>OF (%)</b>	100.0	89.6	100.0	61.3	59.8	81.5	47.3	94.5	87.8	99.9	100.0	100.0	85.1
<b>EUf (%)</b>	5.1	8.0	4.7	48.4	47.0	25.6	59.2	33.8	40.9	30.4	30.8	16.8	29.3
<b>PUF (%)</b>	0.0	0.0	0.0	42.1	24.1	0.0	57.4	0.0	0.0	0.0	0.0	0.0	10.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	17.2	19.7	0.0	4.2	9.3	0.0	0.0	0.0	4.2
<b>XUF (%)</b>	5.1	8.0	4.7	6.2	5.8	6.0	1.8	29.7	31.6	30.4	30.8	16.8	14.8

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

UNIT OPERATED AT A REDUCED POWER BETWEEN 70% TO 90% DUE TO LOWER DEMAND FROM GRID.

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1977      **Lifetime Generation:** 13667.8 GW(e).h  
**Date of First Criticality:** 24 Oct 1991      **Cumulative Energy Availability Factor:** 68.6%  
**Date of Grid Connection:** 05 Jan 1992      **Cumulative Load Factor:** 67.8%  
**Date of Commercial Operation:** 01 Jul 1992      **Cumulative Unit Capability Factor:** 80.4%  
**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 (%)
1992	567.0	201.0	0.0	0.0	82.0	100.0	32.2	0.0	3553	40.6
1993	83.3	200.0	4.8	4.8	4.8	4.8	4.8	4.8	548	6.3
1994	761.7	200.0	53.1	29.0	43.5	24.2	43.5	24.1	5494	62.7
1995	1036.8	200.0	68.6	42.2	66.1	38.2	59.2	35.8	5798	66.2
1996	1227.5	200.0	79.4	51.5	69.9	46.1	69.9	44.3	6572	74.8
1997	1568.7	200.0	91.4	59.5	89.2	54.7	89.5	53.4	8121	92.7
1998	1333.2	200.0	80.0	62.9	75.1	58.1	76.1	57.2	6829	78.0
1999	1425.9	200.0	87.0	66.4	85.8	62.1	81.4	60.6	7468	85.3
2000	1340.8	200.0	80.6	68.1	79.9	64.3	76.3	62.6	7182	81.8
2001	1343.0	200.0	75.4	69.0	74.5	65.4	76.7	64.1	6897	78.7
2002	1692.8	202.0	95.7	71.7	94.8	68.4	95.7	67.3	8416	96.1
2003	1287.1	202.0	85.4	72.9	70.7	68.6	72.7	67.8	7458	85.1

## IN-8 NARORA-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
19 Feb	77.0	15.5	XF5	J31	TURBINE TRIPPED ON OVER FREQUENCY DUE TO GRID DISTURBANCE.
19 Apr	482.0	97.3	PF	D	UNIT WAS SHUTDOWN TO CARRY OUT ANNUAL SHUTDOWN ACTIVITIES.
27 May	246.0	54.5	UF	A11	UNIT WAS SHUTDOWN TO ARREST HEAVY WATER LEAK FROM MODERATOR PUMP-5 CASING VENT LINE.
06 Jul	392.0	86.3	PF	D16	UNIT WAS SHUTDOWN TO IDENTIFY AND RECTIFY THE STEAM GENERATOR-4 TUBE LEAK.
14 Aug	41.0	6.3	UF4	A42	UNIT TRANSFORMER BREAKER TRIPPED ON GROUND OVER CURRENT PROTECTION. 6.6 KV POWER SUPPLY SYSTEM AUTO TRANSFER DID NOT TOOK PLACE AS PER DESIGN.
17 Sep	64.0	13.5	UF4	A12	PRIMARY CIRCULATING PUMP-1 TO 4 TRIPPED LEADING TO REACTOR TRIP ON PHT PRESSURE HIGH. REACTOR PROTECTIVE CHANNEL-E OF PRIMARY SHUTDOWN SYSTEM AND SECONDARY SHUTDOWN SYSTEM TRIPPED DUE TO RANDOM FAILURE OF POWER SUPPLY. PRIMARY SHUTDOWN SYSTEM ROD M-7 SLIPPED DURING THE INCIDENT AND REACTOR TRIPPED ON ONE OR MORE PRIMARY SHUTDOWN SYSTEM ROD LEFT PARKED POSITION.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1992 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		351			664	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling				107		
D. Inspection, maintenance or repair without refuelling	874			977		
E. Testing of plant systems or component					33	
H. Nuclear regulatory requirement				20	38	
J. Grid failure or grid unavailability			77		3	131
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					8	
Subtotal	874	351	77	1104	760	131
Total		1302			1995	

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

System	2003 Hours Lost	1992 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	246	43
12. Reactor I&C Systems	64	46
13. Reactor Auxiliary System:		7
15. Reactor Cooling System:		83
16. Steam generation system:		4
17. Safety I&C Systems (excluding reactor I&C)		20
31. Turbine and auxiliaries:		264
32. Feedwater and Main Steam System		36
41. Main Generator System:		36
42. Electrical Power Supply System:	41	83
Total	351	622

# IN-3 RAJASTHAN-1

**Operator:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)  
**Contractor:** AECL (ATOMIC ENERGY OF CANADA LTD.)

## 1. Station Details

**Type:** PHWR  
**Maximum Net Capacity at the beginning of 2003:** 134.0 MW(e)  
**Design Net Capacity:** 207.0 MW(e)  
**Design Discharge Burnup:** 6700 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 0.0 GW(e).h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

## 3. 2003 Monthly Performance Data

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

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1965  
**Date of First Criticality:** 11 Aug 1972  
**Date of Grid Connection:** 30 Nov 1972  
**Date of Commercial Operation:** 16 Dec 1973

**Lifetime Generation:** 9834.6 GW(e).h  
**Cumulative Energy Availability Factor:** 25.5%  
**Cumulative Load Factor:** 22.7%  
**Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 74.5%

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	441.5	220.0	22.9	43.8	22.9	36.0	22.9	35.8	3732	42.6		
1982	38.2	206.0	2.1	39.2	2.1	32.2	2.1	32.1	496	5.7		
1983	0.0	202.0	0.0	35.4	0.0	29.1	0.0	29.0	0	0.0		
1984	0.0	180.0	0.0	32.6	0.0	26.8	0.0	26.7	0	0.0		
1985	226.2	204.0	12.7	30.9	12.7	25.6	12.7	25.5	1914	21.8		
1986	0.0	207.0	0.0	28.5	0.0	23.6	0.0	23.5	0	0.0		
1987	169.9	207.0	16.6	27.6	9.4	22.6	9.4	22.5	2555	29.2		
1988	376.5	207.0	25.3	27.5	20.7	22.4	20.7	22.4	5793	65.9		
1989	312.8	207.0	18.7	26.9	17.3	22.1	17.3	22.0	4779	54.6		
1990	364.1	192.0	22.3	26.7	19.4	22.0	21.6	22.0	5789	66.1		
1991	197.5	192.0	74.8	29.2	74.8	24.7	11.7	21.5	2858	32.6		
1992	57.7	84.0	12.2	28.8	12.2	24.4	7.8	21.2	1070	12.2		
1993	167.6	84.0	22.8	28.7	22.8	24.4	22.8	21.2	2435	27.8		
1994	2.9	84.0	2.2	28.1	2.2	23.9	0.4	20.8	195	2.2		
1995	0.0	84.0	0.0	27.5	0.0	23.4	0.0	20.3	0	0.0		
1996	0.0	84.0	0.0	27.0	0.0	23.0	0.0	19.9	0	0.0		
1997	264.6	84.0	39.1	27.2	31.9	23.1	36.0	20.2	2792	31.9		
1998	567.4	134.0	63.8	28.3	62.2	24.3	48.3	21.1	5448	62.2		
1999	795.0	134.0	81.0	29.9	73.6	25.8	67.7	22.5	6443	73.6		
2000	681.3	134.0	57.5	30.7	57.0	26.7	57.9	23.6	5008	57.0		
2001	173.2	134.0	10.5	30.2	10.0	26.3	14.8	23.3	860	9.8		
2003	0.0	134.0	0.0	29.3	0.0	25.5	0.0	22.7	0	0.0		



**IN-3 RAJASTHAN-1****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	8760.0	1173.8	PF	H11	REACTOR COOLANT CHANNEL ISI AND SAFETY UPGRADING STARTED IN APRIL 2002

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

Outage Cause	2003 Hours Lost			1973 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure				159	2599	
B. Refuelling without a maintenance					40	
D. Inspection, maintenance or repair without refuelling				2204		
E. Testing of plant systems or components					7	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				9	22	
H. Nuclear regulatory requirements	8760			51		
J. Grid failure or grid unavailability					2	115
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				17		51
Subtotal	8760	0	0	2440	2670	166
Total		8760			5276	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1973 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		1293
12. Reactor I&C Systems		178
13. Reactor Auxiliary Systems		59
14. Safety Systems		34
15. Reactor Cooling Systems		439
16. Steam generation systems		6
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		487
32. Feedwater and Main Steam System		11
41. Main Generator Systems		105
42. Electrical Power Supply Systems		115
XX. Miscellaneous Systems		7
Total	0	2735

**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  
**Maximum Net Capacity at the beginning of 2003:** 187.0 MW(e)  
**Design Net Capacity:** 207.0 MW(e)  
**Design Discharge Burnup:** 6700 MW.d/t

**2. Production Summary 2003**

**Energy Production:** 1391.5 GW(e).h  
**Energy Availability Factor:** 84.7%  
**Load Factor:** 84.9%  
**Operating Factor:** 91.5%  
**Energy Unavailability Factor:** 15.3%  
**Total Off-line Time:** 742 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	145.8	132.5	142.5	117.7	136.0	130.5	134.5	76.3	87.9	102.2	76.7	109.0	1391.5
<b>EAF (%)</b>	100.0	100.0	100.0	89.0	100.0	100.0	100.0	62.0	67.9	73.1	54.6	70.4	84.7
<b>UCF (%)</b>	100.0	100.0	100.0	89.0	100.0	100.0	100.0	62.0	100.0	100.0	70.6	86.5	92.3
<b>LF (%)</b>	104.8	105.4	102.4	87.5	97.7	96.9	96.7	54.8	65.3	73.3	56.9	78.4	84.9
<b>OF (%)</b>	100.0	100.0	100.0	88.9	100.0	100.0	100.0	62.1	100.0	99.9	64.3	83.6	91.5
<b>EUf (%)</b>	0.0	0.0	0.0	11.0	0.0	0.0	0.0	38.0	32.1	26.9	45.4	29.6	15.3
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.0	0.0	0.0	0.0	0.0	3.2
<b>UCLF (%)</b>	0.0	0.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0	29.4	13.5	4.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.1	26.9	16.0	16.0	7.6

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation**

DURING SEPTEMBER TO DECEMBER 2003 THE UNIT OPERATED AT REDUCED POWER LEVEL BETWEEN 70% TO 90% DUE TO LOWER DEMAND FROM GRID.

**5. Historical Summary**

**Date of Construction Start:** 01 Apr 1968      **Lifetime Generation:** 20109.8 GW(e).h  
**Date of First Criticality:** 08 Oct 1980      **Cumulative Energy Availability Factor:** 55.3%  
**Date of Grid Connection:** 01 Nov 1980      **Cumulative Load Factor:** 52.7%  
**Date of Commercial Operation:** 01 Apr 1981      **Cumulative Unit Capability Factor:** 77.4%  
**Cumulative Energy Unavailability Factor:** 44.7%

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	957.2	202.0	54.1	37.2	54.1	37.2	54.1	37.2	6673	76.2
1984	908.7	185.0	56.1	43.1	49.1	41.0	55.9	43.1	5870	66.8
1985	959.9	184.0	73.3	50.3	71.3	48.1	59.6	47.0	6243	71.3
1986	1080.5	207.0	65.2	53.4	59.6	50.5	59.6	49.6	6743	77.0
1987	1031.1	207.0	63.2	55.1	56.9	51.6	56.9	50.9	6277	71.7
1988	1234.0	207.0	70.1	57.4	67.9	54.0	67.9	53.4	7935	90.3
1989	1084.2	207.0	60.5	57.8	59.8	54.8	59.8	54.2	6980	79.7
1990	1173.8	192.0	68.7	58.9	68.7	56.3	69.8	55.9	7151	81.6
1991	895.1	192.0	63.0	59.3	62.9	56.9	53.2	55.6	5416	61.8
1992	874.4	184.0	90.3	61.9	58.1	57.0	54.1	55.5	5297	60.3
1993	1153.5	184.0	74.2	62.9	71.1	58.1	71.6	56.8	6983	79.7
1994	519.4	184.0	39.4	61.2	32.2	56.2	32.2	55.0	3244	37.0
1995	0.0	184.0	0.0	57.1	0.0	52.4	0.0	51.3	0	0.0
1996	0.0	184.0	0.0	53.5	0.0	49.1	0.0	48.0	0	0.0
1997	0.0	184.0	0.0	50.3	0.0	46.2	0.0	45.2	0	0.0
1998	512.4	184.0	49.6	50.2	49.6	46.4	31.8	44.4	3728	42.6
1999	1162.3	184.0	87.6	52.2	83.1	48.3	72.1	45.9	7264	82.9
2000	1308.1	184.0	92.3	54.3	92.3	50.6	80.9	47.7	8104	92.3
2001	1348.3	184.0	86.9	55.8	85.5	52.2	83.6	49.4	7486	85.5
2002	1430.9	187.0	90.7	57.4	89.0	54.0	87.3	51.2	7768	88.7
2003	1391.5	187.0	92.3	59.0	84.7	55.3	84.9	52.7	8018	91.5

## IN-4 RAJASTHAN-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
23 Apr	81.0	14.9	UF2	A15	UNIT WAS SHUTDOWN DUE TO HIGH TEMPERATURE OF ONE OF THE PRIMARY CIRCULATING PUMP LOWER BEARING.
16 Aug	282.0	52.8	PF	D	UNIT WAS PLANNED SHUTDOWN FOR CARRYING OUT VARIOUS JOBS AND SURVEILLANCE TESTS.
20 Nov	334.0	61.5	UF2	A13	UNIT WAS SHUTDOWN DUE TO HIGH DAC IN BOILER ROOM AND HIGH STACK LOSS.
29 Dec	45.0	8.3	UF4	A12	REACTOR TRIPPED ON PHT STORAGE TANK LOW LEVEL PROTECTION.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1980 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		460			858	
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling				120		
D. Inspection, maintenance or repair without refuelling	282			1582		
E. Testing of plant systems or components					15	
G. Major back-fitting, refurbishment or upgrading activities without refuelling						18
H. Nuclear regulatory requirements				153	2	2
J. Grid failure or grid unavailability					30	204
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				55	24	2
Z. Others					1	2
Subtotal	282	460	0	1910	936	228
Total		742			3074	

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

System	2003 Hours Lost	1980 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		25
12. Reactor I&C Systems	45	161
13. Reactor Auxiliary Systems	334	3
14. Safety Systems		32
15. Reactor Cooling Systems	81	88
16. Steam generation systems		9
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		298
32. Feedwater and Main Steam System		46
35. All other I&C Systems		17
41. Main Generator Systems		77
42. Electrical Power Supply Systems		64
XX. Miscellaneous Systems		13
Total	460	834

## 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  
**Maximum Net Capacity at the beginning of 2003:** 202.0 MW(e)  
**Design Net Capacity:** 220.0 MW(e)  
**Design Discharge Burnup:** 6700 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 1442.1 GW(e).h  
**Energy Availability Factor:** 84.5%  
**Load Factor:** 81.5%  
**Operating Factor:** 94.6%  
**Energy Unavailability Factor:** 15.5%  
**Total Off-line Time:** 475 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	142.8	137.1	151.4	128.0	131.2	135.3	125.6	92.2	85.5	79.7	111.8	121.4	1442.1
<b>EAF (%)</b>	93.8	100.0	100.0	91.2	92.1	100.0	89.6	66.7	62.3	61.5	78.2	80.3	84.5
<b>UCF (%)</b>	93.8	100.0	100.0	91.2	92.1	100.0	89.6	99.3	95.0	83.3	100.0	100.0	95.3
<b>LF (%)</b>	95.0	101.0	100.7	88.2	87.3	93.0	83.6	61.4	58.8	52.9	76.9	80.8	81.5
<b>OF (%)</b>	93.7	99.7	100.0	91.2	91.9	100.0	89.5	99.1	92.4	78.1	100.0	100.0	94.6
<b>EUf (%)</b>	6.2	0.0	0.0	8.8	7.9	0.0	10.4	33.3	37.7	38.5	21.8	19.7	15.5
<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>	6.2	0.0	0.0	8.8	7.9	0.0	10.4	0.7	5.1	16.7	0.0	0.1	4.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.7	32.7	21.8	21.8	19.6	10.8

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

UNIT OPERATED AT REDUCED POWER LEVEL BETWEEN 70% TO 90% FP DUE TO LOWER DEMAND FROM GRID.

### 5. Historical Summary

**Date of Construction Start:** 01 Feb 1990  
**Date of First Criticality:** 24 Dec 1999  
**Date of Grid Connection:** 10 Mar 2000  
**Date of Commercial Operation:** 01 Jun 2000

**Lifetime Generation:** 5019.9 GW(e).h  
**Cumulative Energy Availability Factor:** 81.2%  
**Cumulative Load Factor:** 78.0%  
**Cumulative Unit Capability Factor:** 83.5%  
**Cumulative Energy Unavailability Factor:** 18.8%

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	893.8	200.0	0.0	0.0	69.2	100.0	62.9	0.0	4794	67.5
2001	1366.1	200.0	84.8	84.8	83.6	83.6	78.0	78.0	7317	83.5
2002	1317.9	202.0	81.2	83.0	75.5	79.5	74.5	76.2	6715	76.7
2003	1442.1	202.0	95.3	87.1	84.5	81.2	81.5	78.0	8285	94.6

## IN-11 RAJASTHAN-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
04 Jan	46.8	0.2	UF4	A12	REACTOR TRIP DUE TO MODERATOR LEVEL VERY HIGH.
02 Apr	63.7	12.7	UF4	L12	REACTOR TRIP ON 2 OR MORE SECONDARY SHUTDOWN SYSTEM BANK UNAVAILABLE.
11 May	59.7	11.9	UF4	L11	REACTOR TRIP ON PHT PRESSURE HIGH DUE TO OIL SUPPLY UNIT TROUBLE.
28 Jul	85.8	17.2	UF1	A32	REACTOR WAS SHUTDOWN TO ATTEND LIGHT WATER LEAK IN STEAM GENERATOR -1
28 Sep	179.2	26.8	UF2	A42	TURBINE TRIPPED ON CLASS-B PROTECTION DUE TO CONTROL POWER SUPPLY-4 FAILURE.
06 Oct	37.1	5.8	UF4	A12	REACTOR TRIP ON SG LEVEL VERY HIGH.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			2000 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		348			738	
D. Inspection, maintenance or repair without refuelling				326		
E. Testing of plant systems or components					50	
J. Grid failure or grid unavailability						157
L. Human factor related		123				
Subtotal	0	471	0	326	788	157
Total		471			1271	

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

System	2003 Hours Lost	2000 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	83	220
15. Reactor Cooling Systems		66
16. Steam generation systems		102
31. Turbine and auxiliaries		139
32. Feedwater and Main Steam System	85	97
41. Main Generator Systems		57
42. Electrical Power Supply Systems	179	
Total	347	681

**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  
 Maximum Net Capacity  
 at the beginning of 2003: 202.0 MW(e)  
 Design Net Capacity: 220.0 MW(e)  
 Design Discharge Burnup: 6700 MW.d/t

**2. Production Summary 2003**

Energy Production: 1318.2 GW(e).h  
 Energy Availability Factor: 74.8%  
 Load Factor: 74.5%  
 Operating Factor: 87.1%  
 Energy Unavailability Factor: 25.2%  
 Total Off-line Time: 1127 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	155.4	123.5	152.9	146.4	40.5	111.3	77.1	99.2	87.1	102.1	99.4	123.4	1318.2
EAF (%)	99.9	90.7	99.8	100.0	29.2	80.2	58.8	67.3	60.5	67.3	67.3	78.2	74.8
UCF (%)	99.9	90.7	99.8	100.0	29.2	80.2	58.8	100.0	93.2	100.0	100.0	100.0	87.6
LF (%)	103.4	91.0	101.7	100.7	26.9	76.5	51.3	66.0	59.9	67.9	68.3	82.1	74.5
OF (%)	99.9	90.5	99.7	100.0	28.5	80.0	58.3	100.0	89.7	100.0	100.0	100.0	87.1
EUf (%)	0.1	9.3	0.2	0.0	70.8	19.8	41.2	32.7	39.5	32.7	32.7	21.8	25.2
PUF (%)	0.0	0.0	0.0	0.0	70.8	13.1	0.0	0.0	0.0	0.0	0.0	0.0	7.1
UCLF (%)	0.1	9.4	0.2	0.0	0.0	6.8	41.2	0.0	6.8	0.0	0.0	0.0	5.4
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.7	32.7	32.7	32.7	21.8	12.8

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Oct 1990      Lifetime Generation: 4248.0 GW(e).h  
 Date of First Criticality: 03 Nov 2000      Cumulative Energy Availability Factor: 80.1%  
 Date of Grid Connection: 17 Nov 2000      Cumulative Load Factor: 79.2%  
 Date of Commercial Operation: 23 Dec 2000      Cumulative Unit Capability Factor: 83.5%  
    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 (%)
2000	57.5	200.0	0.0	0.0	51.3	100.0	27.2	0.0	518	49.1
2001	1200.8	200.0	82.0	82.0	71.0	71.0	68.5	68.5	6214	70.9
2002	1671.5	202.0	96.5	89.3	94.3	82.7	94.5	81.6	8255	94.2
2003	1318.2	202.0	87.5	88.7	74.8	80.1	74.5	79.2	7633	87.1

**IN-12 RAJASTHAN-4****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
20 Feb	59.0	11.8	UF2	A31	MANUAL SHUTDOWN DUE TO CONDENSER TUBE LEAK.
09 May	626.9	125.4	PF	D41	TURBINE TRIPPED ON CLASS-A PROTECTION. SUBSEQUENTLY REACTOR TRIPPED. THIS WAS DECLARED ANNUAL MAINTENANCE SHUTDOWN.
23 Jun	49.2	9.8	UF4	A42	UNIT SHUTDOWN DUE TO GENERATOR CLASS-C TRIPPED FOLLOWED BY CLASS-IV POWER SUPPLY FAILURE.
03 Jul	81.7	16.3	UF2	A41	MANUAL SHUTDOWN TO REPLACE ONE OF THE HYDROGEN COOLER.
09 Jul	228.0	45.6	UF2	A42	MANUAL SHUTDOWN DUE TO FLASH OVER IN CLASS-III, 415 VOLT SWITCH GEAR.
24 Sep	74.1	9.9	UF4	A16	REACTOR SHUTDOWN ON HIGH SG DELTA-T DURING THE PROCESS OF PLANNED SHUTDOWN TO ATTEND LIGHT WATER LEAK.

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

Outage Cause	2003 Hours Lost			2000 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		492			168	
D. Inspection, maintenance or repair without refuelling	626			13		
J. Grid failure or grid unavailability						263
Subtotal	626	492	0	13	168	263
Total		1118			444	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	2000 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		78
15. Reactor Cooling System:		37
16. Steam generation system:	74	
31. Turbine and auxiliaries:	59	3
32. Feedwater and Main Steam System		48
41. Main Generator System:	81	
42. Electrical Power Supply System:	277	
Total	491	166

**IN-1 TARAPUR-1**

Operator: NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

Contractor: GE (GENERAL ELECTRIC COMPANY (US))

**1. Station Details**

Type: BWR  
 Maximum Net Capacity  
 at the beginning of 2003: 150.0 MW(e)  
 Design Net Capacity: 200.0 MW(e)  
 Design Discharge Burnup: 24000 MW.d/t

**2. Production Summary 2003**

Energy Production: 1100.4 GW(e).h  
 Energy Availability Factor: 85.2%  
 Load Factor: 83.7%  
 Operating Factor: 90.2%  
 Energy Unavailability Factor: 14.8%  
 Total Off-line Time: 859 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	104.6	91.9	69.2	37.7	90.3	106.2	108.3	110.4	106.1	105.9	87.9	81.8	1100.4
EAF (%)	96.5	93.8	62.3	32.8	81.7	100.0	100.0	100.0	100.0	97.4	83.7	74.3	85.2
UCF (%)	100.0	100.0	72.3	32.8	81.7	100.0	100.0	100.0	100.0	97.8	84.0	74.3	86.9
LF (%)	93.8	91.1	62.0	34.9	80.9	98.4	97.0	99.0	98.3	94.8	81.4	73.3	83.7
OF (%)	100.0	100.0	74.1	47.6	86.3	100.0	100.0	100.0	100.0	99.9	86.7	87.9	90.2
EUf (%)	3.5	6.2	37.7	67.2	18.3	0.0	0.0	0.0	0.0	2.6	16.3	25.7	14.8
PUF (%)	0.0	0.0	27.7	67.2	18.3	0.0	0.0	0.0	0.0	1.1	14.3	24.4	12.8
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.7	1.3	0.4
XUF (%)	3.5	6.2	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.0	1.7

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation**

17TH REFUELLING OUTAGE WAS COMPLETED WITHIN A PERIOD OF 20 DAYS, WHICH IS THE SHORTEST REFUELLING OUTAGE PERIOD EVER ACHIEVED IN THIS PLANT.

**5. Historical Summary**

Date of Construction Start: 01 Oct 1964      Lifetime Generation: 30557.0 GW(e).h  
 Date of First Criticality: 01 Feb 1969      Cumulative Energy Availability Factor: 63.4%  
 Date of Grid Connection: 01 Apr 1969      Cumulative Load Factor: 57.7%  
 Date of Commercial Operation: 28 Oct 1969      Cumulative Unit Capability Factor: 77.3%  
    Cumulative Energy Unavailability Factor: 36.6%

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	730.0	200.0	100.0	80.8	41.7	55.4	41.7	50.0	5396	61.6
1984	826.9	200.0	90.3	81.4	89.6	57.7	47.1	49.8	7688	87.5
1985	790.9	170.0	64.6	80.5	64.6	58.0	53.1	50.0	6194	70.7
1986	1090.2	150.0	84.5	80.7	83.0	59.1	83.0	51.5	7954	90.8
1987	193.4	150.0	14.7	77.9	14.7	57.3	14.7	49.9	1533	17.5
1988	1085.5	150.0	83.8	78.1	82.4	58.3	82.4	51.2	8010	91.2
1989	800.3	150.0	61.6	77.5	61.4	58.4	60.9	51.6	6177	70.5
1990	1045.2	150.0	80.5	77.6	80.2	59.2	79.5	52.7	7772	88.7
1991	566.9	150.0	82.4	77.8	80.4	60.0	43.1	52.3	6536	74.6
1992	762.3	150.0	58.7	77.1	57.9	59.9	57.9	52.5	5487	62.5
1993	967.7	150.0	76.9	77.1	74.4	60.4	73.6	53.2	7291	83.2
1994	280.6	150.0	22.9	75.3	21.4	59.1	21.4	52.2	2450	28.0
1995	1092.3	150.0	91.0	75.8	83.1	59.9	83.1	53.2	7893	90.1
1996	403.3	150.0	32.3	74.5	30.6	59.0	30.6	52.5	3872	44.1
1997	985.5	150.0	75.9	74.5	75.0	59.5	75.0	53.1	7347	83.9
1998	1162.6	150.0	92.8	75.1	91.6	60.4	88.5	54.2	8283	94.6
1999	852.6	150.0	67.9	74.9	67.0	60.6	64.9	54.5	6405	73.1
2000	1181.1	150.0	91.6	75.3	91.6	61.4	89.6	55.4	8337	94.9
2001	1084.2	150.0	84.3	75.6	83.6	62.0	82.5	56.1	7635	87.2
2002	1180.7	150.0	93.8	76.0	92.0	62.8	89.9	57.0	8394	95.8
2003	1100.4	150.0	86.9	76.3	85.2	63.4	83.7	57.7	7901	90.2



**IN-1 TARAPUR-1****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
23 Mar	476.0	80.0	PF	C21	UNIT WAS SHUTDOWN FOR ITS 17TH REFUELLING OUTAGE.
14 Apr	95.0	24.8	PF	D41	UNIT WAS SHUTDOWN FOR ATTENDING THE MAIN GENERATOR CASING HYDROGEN LEAK REPAIR.
02 May	102.0	20.5	PF	D15	UNIT WAS SHUTDOWN FOR REACTOR RECIRCULATION PUMP MOTOR STATOR REPLACEMENT.
27 Nov	133.0	24.7	PF	D34	UNIT WAS SHUTDOWN FOR ATTENDING THE TWO UNIT OUTAGE WORK, SSW OUTAGE AND OTHER UNIT-1 RELATED DEFICIENCIES.
09 Dec	53.0	19.2	PF	D33	UNIT WAS SHUTDOWN FOR MAIN CONDENSER TUBE LEAK REPAIR AND CIRCULATING WATER HEADER LEAK REPAIR.

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

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					377	1
B. Refuelling without a maintenanc					0	
C. Inspection, maintenance or repai combined with refuelling	476			1455	22	
D. Inspection, maintenance or repai without refuelling	383			220		
E. Testing of plant systems or component				6		
J. Grid failure or grid unavailabilit					0	51
K. Load-following (frequency contro reserve shutdown due to reduced energ demand)				0	2	4
Subtotal	859	0	0	1681	401	56
Total		859			2138	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		4
12. Reactor I&C Systems		11
13. Reactor Auxiliary System:		1
14. Safety Systems		2
15. Reactor Cooling System:		63
16. Steam generation system:		20
17. Safety I&C Systems (excluding reactor I&C		1
31. Turbine and auxiliaries:		179
32. Feedwater and Main Steam Syster		54
41. Main Generator System:		0
42. Electrical Power Supply System:		37
XX. Miscellaneous Systems:		0
Total	0	372

**IN-2 TARAPUR-2**

Operator: NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

Contractor: GE (GENERAL ELECTRIC COMPANY (US))

**1. Station Details**

Type: BWR  
 Maximum Net Capacity  
 at the beginning of 2003: 150.0 MW(e)  
 Design Net Capacity: 200.0 MW(e)  
 Design Discharge Burnup: 24000 MW.d/t

**2. Production Summary 2003**

Energy Production: 1117.1 GW(e).h  
 Energy Availability Factor: 85.9%  
 Load Factor: 85.0%  
 Operating Factor: 90.1%  
 Energy Unavailability Factor: 14.1%  
 Total Off-line Time: 870 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	112.5	101.4	106.4	104.8	108.5	104.5	98.3	100.9	101.3	85.7	30.4	62.6	1117.1
EAF (%)	100.0	100.0	97.5	100.0	100.0	98.9	89.7	91.7	95.8	78.1	23.9	55.8	85.9
UCF (%)	100.0	100.0	97.5	100.0	100.0	98.9	89.7	91.7	95.8	79.0	25.0	55.8	86.1
LF (%)	100.8	100.5	95.3	97.0	97.2	96.7	88.1	90.4	93.8	76.8	28.1	56.1	85.0
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	94.8	94.8	100.0	88.4	29.7	73.1	90.1
EUf (%)	0.0	0.0	2.5	0.0	0.0	1.1	10.3	8.3	4.2	21.9	76.1	44.2	14.1
PUF (%)	0.0	0.0	0.0	0.0	0.0	1.0	2.1	0.0	4.2	16.3	75.0	31.2	10.8
UCLF (%)	0.0	0.0	2.5	0.0	0.0	0.1	8.2	8.3	0.0	4.6	0.0	13.1	3.1
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.1	0.0	0.2

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Oct 1964      Lifetime Generation: 30566.9 GW(e).h  
 Date of First Criticality: 28 Feb 1969      Cumulative Energy Availability Factor: 62.4%  
 Date of Grid Connection: 05 May 1969      Cumulative Load Factor: 57.7%  
 Date of Commercial Operation: 28 Oct 1969      Cumulative Unit Capability Factor: 77.3%  
    Cumulative Energy Unavailability Factor: 37.6%

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	556.7	210.0	55.4	77.6	55.4	57.2	30.3	50.6	4844	55.3
1983	867.7	200.0	100.0	79.2	49.5	56.7	49.5	50.6	7519	85.8
1984	803.1	200.0	70.6	78.6	69.6	57.5	45.7	50.3	5615	63.9
1985	1070.9	170.0	83.5	78.8	83.5	58.8	71.9	51.4	8059	92.0
1986	769.5	150.0	58.9	78.0	58.6	58.8	58.6	51.7	5615	64.1
1987	1167.2	150.0	91.5	78.5	88.8	60.1	88.8	53.3	8221	93.8
1988	813.5	150.0	62.1	77.9	61.7	60.2	61.7	53.6	6077	69.2
1989	427.1	150.0	34.8	76.2	34.8	59.2	32.5	52.8	3052	34.8
1990	762.4	150.0	58.7	75.6	58.7	59.2	58.0	53.0	7827	89.3
1991	848.5	150.0	76.4	75.6	75.0	59.7	64.6	53.4	6265	71.5
1992	819.8	150.0	62.8	75.2	62.2	59.8	62.2	53.7	6076	69.2
1993	779.7	150.0	60.7	74.7	59.3	59.8	59.3	53.9	5750	65.6
1994	843.6	150.0	64.9	74.3	64.2	59.9	64.2	54.2	6722	76.7
1995	640.0	150.0	55.6	73.8	48.7	59.6	48.7	54.0	4911	56.1
1996	361.2	150.0	30.4	72.4	27.4	58.6	27.4	53.2	3203	36.5
1997	775.7	150.0	59.6	72.1	59.0	58.6	59.0	53.4	6978	79.7
1998	881.1	150.0	71.2	72.0	67.8	58.9	67.1	53.8	6522	74.5
1999	1103.5	150.0	87.6	72.5	86.4	59.7	84.0	54.6	7711	88.0
2000	1023.1	150.0	79.0	72.7	79.0	60.2	77.6	55.3	7162	81.5
2001	1197.4	150.0	93.9	73.2	93.3	61.1	91.1	56.2	8364	95.5
2002	1163.3	150.0	90.8	73.7	90.2	61.8	88.5	57.0	7978	91.1
2003	1117.1	150.0	86.1	74.0	85.9	62.4	85.0	57.7	7890	90.1

**IN-2 TARAPUR-2****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
04 Jul	39.0	9.1	UF4	A31	DURING ROUTINE CHANGEOVER OF LUBE OIL COOLERS, MOMENTARY DIP IN BEARING OIL HEADER PRESSURE INITIATED TURBINE THRUST BEARING WEAR PROTECTION TRIP. THIS CAUSED TURBINE TRIP AND REACTOR SCRAMMED ON PRM HIGH FLUX.
20 Aug	39.0	9.3	UF5	A15	UNIT WAS SCRAMMED MANUALLY DUE TO SPURIOUS OPERATION OF REACTOR RELIEF VALVE.
19 Oct	86.0	17.7	PF	D31	UNIT WAS SHUTDOWN FOR MAIN CONDENSER TUBE LEAK CHECKS AND REPAIR.
09 Nov	626.0	102.3	PF	C21	UNIT WAS SHUTDOWN FOR ITS 18TH REFUELLING OUTAGE.
07 Dec	28.0	14.6	UF4	A31	DURING TEST CLOSURE OF TURBINE STOP VALVE SV-1P, OTHER STOP VALVE SV-2P FULLY CLOSED SPURIOUSLY. THIS CAUSED REACTOR SCRAM ON PRM HIGH FLUX.
15 Dec	52.0	13.7	PF	D15	UNIT WAS SHUTDOWN FOR REACTOR RECIRCULATION PUMP MOTOR STATOR INSTALLATION.

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

Outage Cause	2003 Hours Lost			1972 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		106			622	2
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	626			1473		
D. Inspection, maintenance or repair without refuelling	138			206		
E. Testing of plant systems or component				2	4	
H. Nuclear regulatory requirement					7	
J. Grid failure or grid unavailability						36
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					1	17
Subtotal	764	106	0	1681	636	55
Total		870			2372	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1972 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		22
12. Reactor I&C Systems		5
13. Reactor Auxiliary System:		54
14. Safety Systems		5
15. Reactor Cooling System:	39	88
16. Steam generation system:		18
31. Turbine and auxiliaries:	67	73
32. Feedwater and Main Steam System		71
41. Main Generator System:		124
42. Electrical Power Supply System:		134
XX. Miscellaneous Systems		14
Total	106	608

# JP-5 FUKUSHIMA-DAIICHI-1

**Operator:** TEPCO (TOKYO ELECTRIC POWER CO.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 439.0 MW(e)  
**Design Net Capacity:** 439.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 0.0 GW(e).h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0	91.5
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	8.5
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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 25 Jul 1967  
**Date of First Criticality:** 10 Oct 1970  
**Date of Grid Connection:** 17 Nov 1970  
**Date of Commercial Operation:** 26 Mar 1971

**Lifetime Generation:** 69270.2 GW(e).h  
**Cumulative Energy Availability Factor:** 55.0%  
**Cumulative Load Factor:** 54.4%  
**Cumulative Unit Capability Factor:** 77.2%  
**Cumulative Energy Unavailability Factor:** 45.0%

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 (%)
1982	2355.0	439.0	61.0	44.4	61.0	40.1	61.2	39.1	5741	65.5
1983	3019.5	439.0	78.5	47.2	78.5	43.2	78.5	42.3	7384	84.3
1984	2669.8	439.0	69.5	48.9	69.5	45.3	69.2	44.4	6222	70.8
1985	1699.3	439.0	44.4	48.6	44.4	45.2	44.2	44.4	4005	45.7
1986	2524.7	439.0	66.1	49.8	66.1	46.6	65.7	45.8	5836	66.6
1987	3308.9	439.0	87.8	52.1	87.3	49.1	86.0	48.3	7727	88.2
1988	2794.5	439.0	72.8	53.4	72.8	50.5	72.5	49.7	6431	73.2
1989	1440.8	439.0	38.6	52.5	38.6	49.8	37.5	49.0	3457	39.5
1990	2352.4	439.0	61.4	53.0	61.4	50.4	61.2	49.7	5487	62.6
1991	1280.0	439.0	33.4	52.0	33.4	49.6	33.3	48.9	2985	34.1
1992	1794.1	439.0	46.9	51.8	46.9	49.5	46.5	48.7	4166	47.4
1993	2500.7	439.0	65.5	52.4	65.4	50.2	65.0	49.5	5811	66.3
1994	3337.5	439.0	87.2	53.9	87.2	51.8	86.8	51.1	7667	87.5
1995	3030.8	439.0	79.3	55.0	79.3	52.9	78.8	52.2	6977	79.6
1996	2298.6	439.0	60.0	55.2	60.0	53.2	59.6	52.5	5276	60.1
1997	3258.9	439.0	85.0	56.3	85.0	54.4	84.7	53.8	7445	85.0
1998	3287.2	439.0	86.2	57.4	85.9	55.6	85.5	54.9	7581	86.5
1999	2556.9	439.0	67.0	57.8	67.0	56.0	66.5	55.4	5876	67.1
2000	3706.3	439.0	96.9	59.1	96.9	57.4	96.1	56.8	8517	97.0
2001	487.5	439.0	12.9	57.6	12.9	55.9	12.7	55.3	1131	12.9
2002	3120.2	439.0	81.6	58.3	81.6	56.8	81.1	56.1	7146	81.6
2003	0.0	439.0	0.0	56.5	0.0	55.0	0.0	54.4	0	0.0

# JP-5 FUKUSHIMA-DAIICHI-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	8016.0	3519.0	PF	C	PERIODICAL INSPECTION AND REFUELLING
01 Dec	744.0	326.6	UF3	A12	EXTENSION OF PERIODICAL INSPECTION DUE TO THE REPLACE OF CONTROL ROD DRIVE PIPING, ETC.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		744			457	
C. Inspection, maintenance or repair combined with refuelling	8016			2826		
D. Inspection, maintenance or repair without refuelling				86		
H. Nuclear regulatory requirements					10	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					45	
Subtotal	8016	744	0	2912	512	0
Total		8760			3424	

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	744	40
13. Reactor Auxiliary Systems		71
14. Safety Systems		6
15. Reactor Cooling Systems		9
31. Turbine and auxiliaries		11
32. Feedwater and Main Steam System		2
41. Main Generator Systems		30
42. Electrical Power Supply Systems		4
XX. Miscellaneous Systems		0
Total	744	173

# JP-9 FUKUSHIMA-DAIICHI-2

Operator: TEPCO (TOKYO ELECTRIC POWER CO.)

Contractor: TOSHI/GE (TOSHIBA CORPORATION/GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR  
 Maximum Net Capacity at the beginning of 2003: 760.0 MW(e)  
 Design Net Capacity: 760.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

## 2. Production Summary 2003

Energy Production: 1601.1 GW(e).h  
 Energy Availability Factor: 24.3%  
 Load Factor: 24.0%  
 Operating Factor: 24.4%  
 Energy Unavailability Factor: 75.7%  
 Total Off-line Time: 6624 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	559.6	504.6	536.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1601.1
EAF (%)	100.0	100.0	96.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.3
UCF (%)	100.0	100.0	96.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.3
LF (%)	99.0	98.8	95.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.0
OF (%)	100.0	100.0	96.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.4
EUf (%)	0.0	0.0	3.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	75.7
PUF (%)	0.0	0.0	3.8	100.0	100.0	100.0	100.0	100.0	100.0	64.6	0.0	0.0	55.9
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.4	100.0	100.0	19.7
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. 2003 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 09 Jun 1969      Lifetime Generation: 118009.2 GW(e).h  
 Date of First Criticality: 10 May 1973      Cumulative Energy Availability Factor: 60.0%  
 Date of Grid Connection: 24 Dec 1973      Cumulative Load Factor: 59.2%  
 Date of Commercial Operation: 18 Jul 1974      Cumulative Unit Capability Factor: 77.1%  
    Cumulative Energy Unavailability Factor: 40.0%

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 (%)
1982	5290.2	760.0	79.4	44.8	79.4	44.8	79.5	44.5	7531	86.0
1983	3422.7	760.0	51.4	45.5	51.4	45.5	51.4	45.3	4934	56.3
1984	3698.7	760.0	56.0	46.6	56.0	46.6	55.4	46.3	5069	57.7
1985	4266.3	760.0	65.1	48.3	65.1	48.2	64.1	47.9	5952	67.9
1986	5541.1	760.0	84.3	51.3	84.3	51.2	83.2	50.9	7478	85.4
1987	3851.1	760.0	58.6	51.8	58.6	51.8	57.8	51.4	5260	60.0
1988	4101.3	760.0	62.3	52.6	62.3	52.6	61.4	52.1	5724	65.2
1989	6516.4	760.0	100.0	55.7	97.9	55.7	97.9	55.2	8760	100.0
1990	3122.8	760.0	47.6	55.2	47.6	55.2	46.9	54.7	4385	50.1
1991	3853.1	760.0	59.3	55.5	59.3	55.5	57.9	54.8	5291	60.4
1992	4568.5	760.0	69.8	56.3	69.7	56.3	68.4	55.6	6261	71.3
1993	4186.7	760.0	64.3	56.7	64.3	56.7	62.9	56.0	5659	64.6
1994	2266.0	760.0	36.0	55.6	34.7	55.6	34.0	54.9	3138	35.8
1995	6396.5	760.0	97.2	57.6	97.2	57.6	96.1	56.8	8520	97.3
1996	5192.3	760.0	78.8	58.6	78.8	58.5	77.8	57.8	6948	79.1
1997	4618.9	760.0	70.3	59.1	70.3	59.0	69.4	58.3	6197	70.7
1998	3976.2	760.0	60.9	59.2	60.6	59.1	59.7	58.4	5352	61.1
1999	3158.4	760.0	48.1	58.7	48.1	58.7	47.4	57.9	4216	48.1
2000	5167.2	760.0	78.5	59.5	78.6	59.4	77.4	58.7	6904	78.6
2001	5996.5	760.0	91.3	60.7	91.3	60.6	90.1	59.8	8036	91.7
2002	5101.0	760.0	77.8	61.3	77.8	61.2	76.6	60.4	6815	77.8
2003	1601.1	760.0	24.3	60.0	24.3	60.0	24.0	59.2	2136	24.4

## JP-9 FUKUSHIMA-DAIICHI-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
30 Mar	4900.0	3724.2	PF	C	PERIODICAL INSPECTION AND REFUELLING
21 Oct	1724.0	1313.3	UF3	A12	EXTENSION OF PERIODICAL INSPECTION DUE TO THE DERAY OF THE REPLACE OF CONTROL ROD DRIVE PIPING, ETC.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		1724			98	
B. Refuelling without a maintenance					51	
C. Inspection, maintenance or repair combined with refuelling	4900			2652		
D. Inspection, maintenance or repair without refuelling				113		
H. Nuclear regulatory requirements						16
J. Grid failure or grid unavailability						2
Subtotal	4900	1724	0	2765	149	18
Total		6624			2932	

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

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	1724	3
15. Reactor Cooling Systems		20
31. Turbine and auxiliaries		23
32. Feedwater and Main Steam System		45
42. Electrical Power Supply Systems		6
Total	1724	97

# JP-10 FUKUSHIMA-DAIICHI-3

**Operator:** TEPCO (TOKYO ELECTRIC POWER CO.)  
**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 760.0 MW(e)  
**Design Net Capacity:** 760.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 2483.6 GW(e).h  
**Energy Availability Factor:** 37.6%  
**Load Factor:** 37.3%  
**Operating Factor:** 37.6%  
**Energy Unavailability Factor:** 62.4%  
**Total Off-line Time:** 5470 hours

## 3. 2003 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	268.5	544.4	562.6	544.7	563.5	2483.6
<b>EAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.6	100.0	100.0	100.0	100.0	37.6
<b>UCF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.6	100.0	100.0	100.0	100.0	37.6
<b>LF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.5	99.5	99.4	99.5	99.7	37.3
<b>OF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.7	100.0	99.9	100.0	100.0	37.6
<b>EUf (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	51.4	0.0	0.0	0.0	0.0	62.4
<b>PUF (%)</b>	100.0	100.0	54.8	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	21.0
<b>UCLF (%)</b>	0.0	0.0	45.2	100.0	100.0	100.0	100.0	48.9	0.0	0.0	0.0	0.0	41.4
<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. 2003 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:** 122612.2 GW(e).h  
**Cumulative Energy Availability Factor:** 64.1%  
**Cumulative Load Factor:** 63.7%  
**Cumulative Unit Capability Factor:** 77.2%  
**Cumulative Energy Unavailability Factor:** 35.9%

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	2886.8	760.0	42.8	51.8	42.8	51.8	43.4	51.9	4037	46.1
1983	4034.0	760.0	60.6	53.1	60.6	53.1	60.6	53.1	5643	64.4
1984	4497.3	760.0	67.7	54.9	67.7	54.9	67.4	54.9	6041	68.8
1985	5798.6	760.0	87.7	58.5	87.7	58.5	87.1	58.5	7738	88.3
1986	4234.2	760.0	63.5	59.0	63.5	59.0	63.6	59.0	5621	64.2
1987	3748.8	760.0	57.4	58.9	56.7	58.8	56.3	58.8	5086	58.1
1988	5123.0	760.0	77.0	60.4	77.0	60.3	76.7	60.3	6822	77.7
1989	5706.7	760.0	86.2	62.4	86.2	62.3	85.7	62.2	7616	86.9
1990	2919.5	760.0	44.3	61.1	44.3	61.0	43.9	60.9	3985	45.5
1991	4491.0	760.0	68.0	61.5	68.0	61.5	67.5	61.3	6003	68.5
1992	6098.7	760.0	92.0	63.5	92.0	63.4	91.4	63.2	8120	92.4
1993	4204.3	760.0	63.7	63.5	63.7	63.4	63.2	63.2	5655	64.6
1994	4202.3	760.0	63.6	63.5	63.6	63.4	63.1	63.2	5647	64.5
1995	5966.5	760.0	90.2	64.9	90.2	64.8	89.6	64.6	8036	91.7
1996	4909.7	760.0	73.9	65.3	73.9	65.3	73.5	65.0	6525	74.3
1997	2516.7	760.0	38.0	64.0	38.1	64.0	37.8	63.8	3345	38.2
1998	2632.7	760.0	42.2	63.0	42.2	63.0	39.5	62.7	3622	41.3
1999	5116.1	760.0	77.4	63.7	77.3	63.6	76.8	63.3	6792	77.5
2000	5932.5	760.0	89.5	64.7	89.4	64.7	88.9	64.3	7859	89.5
2001	5637.3	760.0	85.6	65.6	85.5	65.5	84.7	65.2	7506	85.7
2002	3567.3	760.0	54.1	65.1	54.0	65.1	53.6	64.7	4747	54.2
2003	2483.6	760.0	37.6	64.1	37.6	64.1	37.3	63.7	3290	37.6



**JP-10 FUKUSHIMA-DAIICHI-3****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	1824.0	1386.2	PF	C	PERIODICAL INSPECTION AND REFUELLING
18 Mar	3646.0	2771.3	UF3	A12	EXTENSION OF PERIODICAL INSPECTION DUE TO THE INSPECTION OF CONTROL ROD DRIVE SYSTEM, ETC.

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

Outage Cause	2003 Hours Lost			1976 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		3646			127	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	1824			2525		
D. Inspection, maintenance or repair without refuelling				40		
E. Testing of plant systems or components				26		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					0	0
Subtotal	1824	3646	0	2591	127	0
Total		5470			2718	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1976 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	3646	57
13. Reactor Auxiliary Systems		0
15. Reactor Cooling Systems		48
31. Turbine and auxiliaries		19
42. Electrical Power Supply Systems		0
Total	3646	124

# JP-16 FUKUSHIMA-DAIICHI-4

**Operator:** TEPCO (TOKYO ELECTRIC POWER CO.)  
**Contractor:** HITACHI (HITACHI LTD.)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 760.0 MW(e)  
**Design Net Capacity:** 760.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 0.0 GW(e).h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	16.7	0.0	0.0	0.0	0.0	0.0	0.0	42.7
UCLF (%)	0.0	0.0	0.0	0.0	0.0	83.3	100.0	100.0	100.0	100.0	100.0	100.0	57.3
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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 12 Feb 1973      **Lifetime Generation:** 121938.2 GW(e).h  
**Date of First Criticality:** 28 Jan 1978      **Cumulative Energy Availability Factor:** 71.6%  
**Date of Grid Connection:** 24 Feb 1978      **Cumulative Load Factor:** 71.3%  
**Date of Commercial Operation:** 12 Oct 1978      **Cumulative Unit Capability Factor:** 77.2%  
**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 (%)		
1982	5734.7	760.0	86.1	69.9	86.1	69.9	86.1	69.9	86.1	69.9	7776	88.8
1983	4818.2	760.0	72.4	70.4	72.4	70.4	72.4	70.4	72.4	70.4	6485	74.0
1984	4433.2	760.0	66.8	69.8	66.8	69.8	66.4	69.8	66.4	69.8	5924	67.4
1985	4409.0	760.0	66.6	69.3	66.6	69.3	66.2	69.2	66.2	69.2	5889	67.2
1986	4315.2	760.0	65.0	68.8	65.0	68.8	64.8	68.7	64.8	68.7	5733	65.4
1987	5964.0	760.0	89.9	71.1	89.9	71.1	89.6	71.0	89.6	71.0	7927	90.5
1988	5309.9	760.0	79.7	72.0	79.7	72.0	79.5	71.9	79.5	71.9	7066	80.4
1989	4232.6	760.0	63.8	71.3	63.8	71.3	63.6	71.1	63.6	71.1	5661	64.6
1990	4273.8	760.0	64.6	70.7	64.6	70.7	64.2	70.5	64.2	70.5	5715	65.2
1991	6483.4	760.0	98.0	72.8	98.0	72.8	97.4	72.6	97.4	72.6	8630	98.5
1992	4082.7	760.0	61.4	72.0	61.4	72.0	61.2	71.8	61.2	71.8	5475	62.3
1993	4206.6	760.0	63.5	71.4	63.4	71.4	63.2	71.2	63.2	71.2	5597	63.9
1994	6323.3	760.0	95.3	72.9	95.3	72.9	95.0	72.7	95.0	72.7	8416	96.1
1995	5485.7	760.0	82.8	73.5	82.7	73.5	82.4	73.3	82.4	73.3	7339	83.8
1996	4949.9	760.0	74.4	73.5	74.4	73.5	74.1	73.3	74.1	73.3	6545	74.5
1997	4556.8	760.0	68.6	73.3	68.6	73.3	68.4	73.1	68.4	73.1	6038	68.9
1998	5441.4	760.0	82.0	73.7	82.0	73.7	81.7	73.5	81.7	73.5	7216	82.4
1999	5890.5	760.0	88.8	74.4	88.8	74.4	88.5	74.2	88.5	74.2	7826	89.3
2000	4415.9	760.0	66.5	74.1	66.5	74.1	66.1	73.8	66.1	73.8	5856	66.7
2001	5858.5	760.0	88.7	74.7	88.4	74.7	88.0	74.5	88.0	74.5	7772	88.7
2002	4687.7	760.0	70.9	74.5	70.9	74.5	70.4	74.3	70.4	74.3	6191	70.7
2003	0.0	760.0	0.0	71.6	0.0	71.6	0.0	71.3	0.0	71.3	0	0.0

## JP-16 FUKUSHIMA-DAIICHI-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	3744.0	2845.4	PF	C	PERIODICAL INSPECTION AND REFUELLING
06 Jun	5016.0	3812.2	UF3	A11	EXTENSION OF PERIODICAL INSPECTION DUE TO THE DERAY OF THE REPAIR OF CORE SHROUD, ETC.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1978 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		5016			129	
C. Inspection, maintenance or repair combined with refuelling	3744			1731		
D. Inspection, maintenance or repair without refuelling				31		
E. Testing of plant systems or components				0		
Subtotal	3744	5016	0	1762	129	0
Total		8760			1891	

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

System	2003 Hours Lost	1978 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	5016	97
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		7
15. Reactor Cooling Systems		4
31. Turbine and auxiliaries		3
41. Main Generator Systems		10
42. Electrical Power Supply Systems		0
Total	5016	125

**JP-17 FUKUSHIMA-DAIICHI-5**

Operator: TEPCO (TOKYO ELECTRIC POWER CO.)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

**1. Station Details**

Type: BWR  
 Maximum Net Capacity  
 at the beginning of 2003: 760.0 MW(e)  
 Design Net Capacity: 760.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 2723.8 GW(e).h  
 Energy Availability Factor: 41.4%  
 Load Factor: 40.9%  
 Operating Factor: 41.4%  
 Energy Unavailability Factor: 58.6%  
 Total Off-line Time: 5133 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	560.0	172.8	0.0	0.0	0.0	0.0	0.0	0.0	325.5	561.0	543.2	561.3	2723.8
EAF (%)	99.9	35.0	0.0	0.0	0.0	0.0	0.0	0.0	60.9	100.0	100.0	100.0	41.4
UCF (%)	99.9	35.1	0.0	0.0	0.0	0.0	0.0	0.0	60.9	100.0	100.0	100.0	41.4
LF (%)	99.0	33.8	0.0	0.0	0.0	0.0	0.0	0.0	59.5	99.1	99.3	99.3	40.9
OF (%)	100.0	31.5	0.0	0.0	0.0	0.0	0.0	0.0	64.3	99.9	100.0	100.0	41.4
EUf (%)	0.1	65.0	100.0	100.0	100.0	100.0	100.0	100.0	39.1	0.0	0.0	0.0	58.6
PUF (%)	0.1	64.9	100.0	100.0	100.0	100.0	22.6	0.0	1.7	0.0	0.0	0.0	40.5
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	77.4	100.0	37.4	0.0	0.0	0.0	18.1
XUF (%)	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 22 May 1972      Lifetime Generation: 123717.3 GW(e).h  
 Date of First Criticality: 26 Aug 1977      Cumulative Energy Availability Factor: 71.4%  
 Date of Grid Connection: 22 Sep 1977      Cumulative Load Factor: 70.9%  
 Date of Commercial Operation: 18 Apr 1978      Cumulative Unit Capability Factor: 77.2%  
    Cumulative Energy Unavailability Factor: 28.6%

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	4061.3	760.0	60.7	63.0	60.7	62.9	61.0	63.0	5789	66.1
1983	5338.8	760.0	80.2	66.4	80.2	66.4	80.2	66.5	7328	83.7
1984	4691.5	760.0	71.0	67.2	70.9	67.2	70.3	67.1	6293	71.6
1985	4112.4	760.0	62.1	66.4	62.1	66.4	61.8	66.3	5547	63.3
1986	4157.4	760.0	63.2	66.0	63.2	66.0	62.4	65.9	5622	64.2
1987	3995.0	760.0	60.8	65.5	60.5	65.4	60.0	65.2	5399	61.6
1988	5952.7	760.0	90.0	67.9	90.0	67.9	89.2	67.6	7973	90.8
1989	4766.5	760.0	72.2	68.3	72.2	68.3	71.6	68.0	6401	73.1
1990	3956.5	760.0	60.2	67.6	60.2	67.6	59.4	67.3	5354	61.1
1991	6575.8	760.0	100.0	70.1	98.8	70.1	98.8	69.7	8760	100.0
1992	4841.2	760.0	73.3	70.3	73.3	70.3	72.5	69.9	6488	73.9
1993	4059.7	760.0	61.7	69.8	61.7	69.7	61.0	69.3	5448	62.2
1994	4246.2	760.0	64.6	69.5	64.6	69.4	63.8	68.9	5723	65.3
1995	5878.7	760.0	89.1	70.6	89.1	70.6	88.3	70.1	7885	90.0
1996	5666.9	760.0	85.6	71.4	85.6	71.4	84.9	70.9	7521	85.6
1997	4609.4	760.0	69.8	71.3	69.8	71.3	69.2	70.8	6139	70.1
1998	5369.9	760.0	81.7	71.9	81.5	71.8	80.7	71.3	7217	82.4
1999	6154.1	760.0	93.3	72.9	93.2	72.9	92.4	72.3	8184	93.4
2000	1647.0	760.0	24.9	70.7	24.9	70.7	24.7	70.1	2187	24.9
2001	5905.1	760.0	89.7	71.5	89.6	71.5	88.7	71.0	7869	89.8
2002	6590.5	760.0	100.0	72.7	99.8	72.7	99.0	72.1	8760	100.0
2003	2723.8	760.0	41.4	71.5	41.4	71.4	40.9	70.9	3627	41.4

## JP-17 FUKUSHIMA-DAIICHI-5

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
10 Feb	3532.0	2684.6	PF	C	PERIODICAL INSPECTION AND REFUELLING
08 Jul	1601.0	1217.3	UF3	Z	EXTENSION OF PERIODICAL INSPECTION DUE TO THE DERAY OF THE LEAK RATE INSPECTION OF PRIMARY CONTAINMENT VESSEL, ETC.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1978 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					37	
C. Inspection, maintenance or repair combined with refuelling	3532			1996		
D. Inspection, maintenance or repair without refuelling				31		
E. Testing of plant systems or components				0		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					0	
Z. Others		1601				
Subtotal	3532	1601	0	2027	37	0
Total		5133			2064	

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

System	2003 Hours Lost	1978 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		15
13. Reactor Auxiliary Systems		3
15. Reactor Cooling Systems		9
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		5
42. Electrical Power Supply Systems		2
Total	0	35

# JP-18 FUKUSHIMA-DAIICHI-6

Operator: TEPCO (TOKYO ELECTRIC POWER CO.)

Contractor: TOSHI/GE (TOSHIBA CORPORATION/GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR  
 Maximum Net Capacity at the beginning of 2003: 1067.0 MW(e)  
 Design Net Capacity: 1067.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

## 2. Production Summary 2003

Energy Production: 4623.9 GW(e).h  
 Energy Availability Factor: 49.7%  
 Load Factor: 49.5%  
 Operating Factor: 49.5%  
 Energy Unavailability Factor: 50.3%  
 Total Off-line Time: 4422 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	791.0	714.9	791.6	348.0	0.0	0.0	453.7	791.4	733.2	0.0	0.0	0.0	4623.9
EAF (%)	100.0	100.0	100.0	45.8	0.0	0.0	57.9	100.0	95.9	0.0	0.0	0.0	49.7
UCF (%)	100.0	100.0	100.0	45.8	0.0	0.0	57.9	100.0	95.9	0.0	0.0	0.0	49.7
LF (%)	99.6	99.7	99.7	45.4	0.0	0.0	57.2	99.7	95.4	0.0	0.0	0.0	49.5
OF (%)	100.0	100.0	100.0	46.7	0.0	0.0	54.0	100.0	96.7	0.0	0.0	0.0	49.5
EUf (%)	0.0	0.0	0.0	54.2	100.0	100.0	42.1	0.0	4.1	100.0	100.0	100.0	50.3
PUf (%)	0.0	0.0	0.0	54.2	77.4	0.0	2.0	0.0	4.1	100.0	100.0	100.0	36.7
UCLF (%)	0.0	0.0	0.0	0.0	22.6	100.0	40.1	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. 2003 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 26 Oct 1973      Lifetime Generation: 164036.6 GW(e).h  
 Date of First Criticality: 09 Mar 1979      Cumulative Energy Availability Factor: 72.2%  
 Date of Grid Connection: 04 May 1979      Cumulative Load Factor: 71.7%  
 Date of Commercial Operation: 24 Oct 1979      Cumulative Unit Capability Factor: 77.3%  
    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 (%)
1982	6666.5	1067.0	71.2	74.2	71.2	74.2	71.3	73.6	6577	75.1
1983	5387.8	1067.0	57.6	70.1	57.6	70.1	57.6	69.6	5308	60.6
1984	5933.2	1067.0	64.2	68.9	64.2	68.9	63.3	68.3	5708	65.0
1985	5384.8	1067.0	58.1	67.1	58.1	67.1	57.6	66.5	5196	59.3
1986	7783.5	1067.0	84.3	69.5	84.3	69.5	83.3	68.9	7390	84.4
1987	7789.2	1067.0	84.1	71.4	84.1	71.4	83.3	70.7	7406	84.5
1988	5593.1	1067.0	60.1	70.1	60.1	70.1	59.7	69.5	5385	61.3
1989	5128.4	1067.0	55.8	68.7	55.8	68.7	54.9	68.0	4956	56.6
1990	7727.1	1067.0	82.9	70.0	82.9	70.0	82.7	69.4	7394	84.4
1991	6948.7	1067.0	75.1	70.4	75.1	70.4	74.3	69.8	6627	75.7
1992	5213.6	1067.0	56.0	69.3	56.0	69.3	55.6	68.7	4993	56.8
1993	6530.9	1067.0	70.2	69.3	70.2	69.4	69.9	68.8	6168	70.4
1994	8079.4	1067.0	86.8	70.5	86.7	70.5	86.4	70.0	7679	87.7
1995	6850.8	1067.0	73.7	70.7	73.6	70.7	73.3	70.2	6517	74.4
1996	6157.8	1067.0	66.0	70.4	66.0	70.4	65.7	69.9	5804	66.1
1997	9307.7	1067.0	99.9	72.1	99.8	72.1	99.6	71.5	8760	100.0
1998	6329.0	1067.0	68.1	71.9	68.0	71.9	67.7	71.3	6026	68.8
1999	7960.5	1067.0	85.8	72.6	85.5	72.5	85.2	72.0	7523	85.9
2000	7495.6	1067.0	80.4	72.9	80.4	72.9	80.0	72.4	7074	80.5
2001	7778.9	1067.0	83.7	73.4	83.7	73.4	83.2	72.9	7417	84.7
2002	6270.9	1067.0	67.5	73.2	67.5	73.1	67.1	72.7	5912	67.5
2003	4623.9	1067.0	49.7	72.2	49.7	72.2	49.5	71.7	4338	49.5

**JP-18 FUKUSHIMA-DAIICHI-6****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
14 Apr	965.0	1030.3	PF	D14	PLANNED INSPECTION DUE TO THE LEAK RATE INSPECTION OF PRIMARY CONTAINMENT VESSEL.
25 May	1220.0	1281.4	UF3	Z	EXTENSION OF PLANNED INSPECTION DUE TO THE DELAY OF THE LEAK RATE INSPECTION OF PRIMARY CONTAINMENT VESSEL, ETC.
29 Sep	2237.0	2387.7	PF	C	PERIODICAL INSPECTION AND REFUELLING

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

Outage Cause	2003 Hours Lost			1979 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					57	
C. Inspection, maintenance or repair combined with refuelling	2237			1909		
D. Inspection, maintenance or repair without refuelling	965			100		
E. Testing of plant systems or components				0		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					8	
Z. Others		1220				
Subtotal	3202	1220	0	2009	65	0
Total		4422			2074	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1979 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		8
13. Reactor Auxiliary Systems		16
31. Turbine and auxiliaries		9
32. Feedwater and Main Steam System		11
41. Main Generator Systems		12
Total	0	56

# JP-25 FUKUSHIMA-DAINI-1

**Operator:** TEPCO (TOKYO ELECTRIC POWER CO.)  
**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1067.0 MW(e)  
**Design Net Capacity:** 1067.0 MW(e)  
**Design Discharge Burnup:** 33000 IN MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3239.3 GW(e).h  
**Energy Availability Factor:** 34.9%  
**Load Factor:** 34.7%  
**Operating Factor:** 34.9%  
**Energy Unavailability Factor:** 65.1%  
**Total Off-line Time:** 5699 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	139.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	752.0	789.9	766.0	791.9	3239.3
<b>EAF (%)</b>	18.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	98.8	100.0	100.0	100.0	34.9
<b>UCF (%)</b>	18.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	98.8	100.0	100.0	100.0	34.9
<b>LF (%)</b>	17.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	97.9	99.4	99.7	99.8	34.7
<b>OF (%)</b>	17.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	99.9	100.0	100.0	34.9
<b>EUF (%)</b>	81.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	1.2	0.0	0.0	0.0	65.1
<b>PUF (%)</b>	81.2	100.0	74.2	0.0	0.0	0.0	0.0	0.7	1.2	0.0	0.0	0.0	21.0
<b>UCLF (%)</b>	0.0	0.0	25.8	100.0	100.0	100.0	100.0	99.3	0.0	0.0	0.0	0.0	44.0
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 16 Mar 1976      **Lifetime Generation:** 154892.9 GW(e).h  
**Date of First Criticality:** 17 Jun 1981      **Cumulative Energy Availability Factor:** 75.4%  
**Date of Grid Connection:** 31 Jul 1981      **Cumulative Load Factor:** 74.6%  
**Date of Commercial Operation:** 20 Apr 1982      **Cumulative Unit Capability Factor:** 77.6%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	7503.8	1067.0	0.0	0.0	80.2	100.0	80.3	0.0	7343	83.8
1983	6282.2	1067.0	67.2	67.2	67.2	67.2	67.2	67.2	6130	70.0
1984	6344.4	1067.0	68.6	67.9	68.6	67.9	67.7	67.5	6175	70.3
1985	8152.9	1067.0	88.0	74.6	88.0	74.6	87.2	74.0	7776	88.8
1986	7741.0	1067.0	83.6	76.8	83.6	76.8	82.8	76.2	7404	84.5
1987	6992.1	1067.0	75.8	76.6	75.8	76.6	74.8	75.9	6710	76.6
1988	5959.3	1067.0	64.4	74.6	64.4	74.6	63.6	73.9	5744	65.4
1989	6246.2	1067.0	67.4	73.6	67.4	73.6	66.8	72.9	6029	68.8
1990	8217.0	1067.0	88.9	75.5	88.9	75.5	87.9	74.8	7914	90.3
1991	6191.1	1067.0	67.2	74.6	67.2	74.6	66.2	73.8	5927	67.7
1992	6901.5	1067.0	75.1	74.6	74.6	74.6	73.6	73.8	6656	75.8
1993	5613.1	1067.0	60.9	73.4	60.9	73.3	60.1	72.5	5384	61.5
1994	8309.1	1067.0	90.0	74.8	90.1	74.7	88.9	73.9	7936	90.6
1995	7727.5	1067.0	83.5	75.4	83.5	75.4	82.7	74.6	7333	83.7
1996	6761.4	1067.0	73.1	75.3	73.1	75.2	72.1	74.4	6425	73.1
1997	7304.8	1067.0	79.2	75.5	79.2	75.5	78.2	74.7	6993	79.8
1998	7694.1	1067.0	83.3	76.0	83.3	76.0	82.3	75.1	7318	83.5
1999	7389.4	1067.0	80.0	76.3	80.0	76.2	79.1	75.4	7011	80.0
2000	8229.0	1067.0	89.1	77.0	89.1	76.9	87.8	76.1	7824	89.1
2001	5902.6	1067.0	64.4	76.3	64.4	76.3	63.2	75.4	5645	64.4
2002	9238.2	1067.0	100.0	77.5	99.9	77.5	98.8	76.5	8760	100.0
2003	3239.3	1067.0	34.9	75.5	34.9	75.4	34.7	74.6	3061	34.9



## JP-25 FUKUSHIMA-DAINI-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
06 Jan	1828.0	1950.9	PF	C	PERIODICAL INSPECTION AND REFUELLING
24 Mar	3871.0	4131.3	UF3	A15	EXTENSION OF PERIODICAL INSPECTION DUE TO THE REPAIR OF THE PRIMARY LOOP RECIRCULATION PIPING, ETC.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		3871			193	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	1828			1455		
D. Inspection, maintenance or repair without refuelling				41		
Subtotal	1828	3871	0	1496	195	0
Total		5699			1691	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		118
15. Reactor Cooling Systems	3871	32
31. Turbine and auxiliaries		22
41. Main Generator Systems		2
42. Electrical Power Supply Systems		18
Total	3871	192

# JP-26 FUKUSHIMA-DAINI-2

**Operator:** TEPCO (TOKYO ELECTRIC POWER CO.)  
**Contractor:** HITACHI (HITACHI LTD.)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1067.0 MW(e)  
**Design Net Capacity:** 1067.0 MW(e)  
**Design Discharge Burnup:** 33000IN. MW.d/t

## 2. Production Summary 2003

**Energy Production:** 0.0 GW(e).h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	80.6	0.0	96.7	100.0	100.0	71.0	87.1
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	19.4	100.0	3.3	0.0	0.0	29.0	12.9
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 25 May 1979      **Lifetime Generation:** 141528.3 GW(e).h  
**Date of First Criticality:** 26 Apr 1983      **Cumulative Energy Availability Factor:** 74.4%  
**Date of Grid Connection:** 23 Jun 1983      **Cumulative Load Factor:** 73.8%  
**Date of Commercial Operation:** 03 Feb 1984      **Cumulative Unit Capability Factor:** 77.8%  
**Cumulative Energy Unavailability Factor:** 25.6%

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	1601.2	1067.0	0.0	0.0	62.2	100.0	18.2	0.0	2476	30.1
1984	8732.2	1067.0	0.0	0.0	93.2	100.0	93.2	0.0	8315	94.7
1985	6760.1	1067.0	73.0	73.0	72.9	72.9	72.3	72.3	6534	74.6
1986	7063.9	1067.0	76.2	74.6	76.2	74.6	75.6	73.9	6727	76.8
1987	6844.9	1067.0	74.3	74.5	74.3	74.5	73.2	73.7	6607	75.4
1988	7628.4	1067.0	82.1	76.4	82.1	76.4	81.4	75.6	7238	82.4
1989	8308.8	1067.0	89.4	79.0	89.4	79.0	88.9	78.3	7920	90.4
1990	6261.3	1067.0	67.3	77.0	67.3	77.0	67.0	76.4	5956	68.0
1991	6887.3	1067.0	74.3	76.7	74.3	76.7	73.7	76.0	6579	75.1
1992	8116.3	1067.0	87.1	78.0	87.1	78.0	86.6	77.3	7656	87.2
1993	6785.7	1067.0	73.2	77.4	73.2	77.4	72.6	76.8	6427	73.4
1994	7058.2	1067.0	76.0	77.3	76.0	77.3	75.5	76.7	6696	76.4
1995	6786.7	1067.0	73.1	76.9	73.1	76.9	72.6	76.3	6435	73.5
1996	9327.9	1067.0	100.0	78.8	100.0	78.8	99.5	78.3	8784	100.0
1997	7405.6	1067.0	79.8	78.9	79.8	78.9	79.2	78.3	7021	80.1
1998	7447.1	1067.0	80.2	79.0	80.2	79.0	79.7	78.4	7104	81.1
1999	8231.6	1067.0	88.7	79.7	88.6	79.6	88.1	79.1	7765	88.6
2000	8874.5	1067.0	95.2	80.6	95.2	80.6	94.7	80.0	8372	95.3
2001	6761.9	1067.0	73.1	80.2	73.1	80.2	72.3	79.6	6378	72.8
2002	4645.2	1067.0	50.2	78.5	50.2	78.5	49.7	77.9	4398	50.2
2003	0.0	1067.0	0.0	74.4	0.0	74.4	0.0	73.8	0	0.0

**JP-26 FUKUSHIMA-DAINI-2****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	2472.0	2637.6	PF	D11	PLANNED INSPECTION DUE TO THE INSPECTION OF CORE SHROUD, ETC.
14 Apr	2472.0	2637.6	PF	C	PERIODICAL INSPECTION AND REFUELLING DUE TO THE REPAIR OF PRIMARY LOOP RECIRCULATION PIPING, ETC. (EARLY START OF PERIODICAL INSPECTION)
26 Jul	912.0	973.1	UF3	A15	PERIODICAL INSPECTION AND REFUELLING DUE TO THE REPAIR OF PRIMARY LOOP RECIRCULATION PIPING, ETC. (EARLY START OF PERIODICAL INSPECTION)
02 Sep	2688.0	2868.1	PF	C	PERIODICAL INSPECTION AND REFUELLING
23 Dec	216.0	230.5	UF3	A15	EXTENSION OF PERIODICAL INSPECTION DUE TO THE DERAY OF THE REPAIR OF PRIMARY LOOP RECIRCULATION PIPING, ETC.

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

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		1128			237	
C. Inspection, maintenance or repair combined with refuelling	5160			1464		
D. Inspection, maintenance or repair without refuelling	2472			44		
Subtotal	7632	1128	0	1508	237	0
Total		8760			1745	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		151
12. Reactor I&C Systems		36
13. Reactor Auxiliary Systems		27
14. Safety Systems		8
15. Reactor Cooling Systems	1128	13
Total	1128	235

**JP-35 FUKUSHIMA-DAINI-3**

Operator: TEPCO (TOKYO ELECTRIC POWER CO.)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

**1. Station Details**

Type: BWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1067.0 MW(e)  
 Design Net Capacity: 1067.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 0.0 GW(e).h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	86.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.8
UCLF (%)	0.0	0.0	0.0	13.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	68.2
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. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 23 Mar 1981      Lifetime Generation: 115419.7 GW(e).h  
 Date of First Criticality: 18 Oct 1984      Cumulative Energy Availability Factor: 65.6%  
 Date of Grid Connection: 14 Dec 1984      Cumulative Load Factor: 64.8%  
 Date of Commercial Operation: 21 Jun 1985      Cumulative Unit Capability Factor: 77.8%  
    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 (%)
1984	38.3	1067.0	0.0	0.0	95.3	100.0	0.4	0.0	240	2.8
1985	6334.4	1067.0	0.0	0.0	97.3	100.0	67.8	0.0	6758	77.1
1986	6837.4	1067.0	74.4	74.4	74.4	74.4	73.2	73.2	6559	74.9
1987	7459.9	1067.0	80.8	77.6	80.8	77.6	79.8	76.5	7104	81.1
1988	8389.1	1067.0	90.7	82.0	90.7	82.0	89.5	80.8	8126	92.5
1989	120.2	1067.0	1.3	61.8	1.3	61.8	1.3	61.0	144	1.6
1990	912.9	1067.0	9.8	51.4	9.8	51.4	9.8	50.7	1037	11.8
1991	7695.1	1067.0	83.1	56.7	83.1	56.7	82.3	56.0	7344	83.8
1992	7533.2	1067.0	81.3	60.2	81.3	60.2	80.4	59.5	7195	81.9
1993	6810.5	1067.0	73.8	61.9	73.8	61.9	72.9	61.2	6494	74.1
1994	4841.6	1067.0	52.5	60.9	52.5	60.9	51.8	60.1	4669	53.3
1995	8992.5	1067.0	97.2	64.5	97.2	64.5	96.2	63.7	8557	97.7
1996	8060.6	1067.0	87.0	66.5	87.0	66.5	86.0	65.8	7642	87.0
1997	7487.4	1067.0	81.2	67.8	81.2	67.8	80.1	66.9	7120	81.3
1998	8284.7	1067.0	89.9	69.5	89.7	69.4	88.6	68.6	7905	90.2
1999	8566.8	1067.0	92.7	71.1	92.7	71.1	91.7	70.3	8127	92.8
2000	7643.9	1067.0	82.5	71.9	82.5	71.9	81.6	71.0	7258	82.6
2001	3288.0	1067.0	35.9	69.6	35.8	69.6	35.2	68.8	3185	36.4
2002	6123.4	1067.0	66.3	69.4	66.3	69.4	65.5	68.6	5806	66.3
2003	0.0	1067.0	0.0	65.6	0.0	65.6	0.0	64.8	0	0.0

**JP-35 FUKUSHIMA-DAINI-3****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	2784.0	2970.5	PF	C	PERIODICAL INSPECTION AND REFUELLING
27 Apr	5976.0	6376.4	UF3	A15	EXTENSION OF PERIODICAL INSPECTION DUE TO THE DERAY OF THE REPAIR OF PRIMARY LOOP RECIRCULATION PIPING, ETC.

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

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		5976			214	
C. Inspection, maintenance or repair combined with refuelling	2784			1894		
D. Inspection, maintenance or repair without refuelling				71		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					195	
Subtotal	2784	5976	0	1965	409	0
Total		8760			2374	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		187
15. Reactor Cooling Systems	5976	10
32. Feedwater and Main Steam System		15
Total	5976	212

# JP-38 FUKUSHIMA-DAINI-4

**Operator:** TEPCO (TOKYO ELECTRIC POWER CO.)  
**Contractor:** HITACHI (HITACHI LTD.)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1067.0 MW(e)  
**Design Net Capacity:** 1067.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 0.0 GW(e).h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>LF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>OF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EUF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>PUF (%)</b>	100.0	100.0	100.0	100.0	51.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.2
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	48.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	62.8
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 28 May 1981  
**Date of First Criticality:** 24 Oct 1986  
**Date of Grid Connection:** 17 Dec 1986  
**Date of Commercial Operation:** 25 Aug 1987

**Lifetime Generation:** 119798.6 GW(e).h  
**Cumulative Energy Availability Factor:** 77.0%  
**Cumulative Load Factor:** 76.3%  
**Cumulative Unit Capability Factor:** 78.2%  
**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 (%)
1986	27.6	1067.0	0.0	0.0	0.3	100.0	0.3	0.0	172	2.1
1987	5572.3	1067.0	0.0	0.0	100.0	100.0	59.6	0.0	6169	70.4
1988	7010.3	1067.0	75.5	75.5	75.5	75.5	74.8	74.8	6739	76.7
1989	9137.9	1067.0	99.2	87.4	99.2	87.4	97.8	86.3	8728	99.6
1990	7051.4	1067.0	76.0	83.6	76.0	83.6	75.4	82.7	6757	77.1
1991	7278.9	1067.0	79.0	82.5	79.0	82.5	77.9	81.5	7029	80.2
1992	5901.7	1067.0	63.8	78.7	63.5	78.7	63.0	77.8	5646	64.3
1993	9049.0	1067.0	97.6	81.9	97.5	81.8	96.8	80.9	8608	98.3
1994	6735.5	1067.0	73.5	80.7	72.7	80.5	72.1	79.7	6481	74.0
1995	7782.7	1067.0	83.9	81.1	83.9	80.9	83.3	80.1	7385	84.3
1996	6842.6	1067.0	73.7	80.3	73.7	80.1	73.0	79.3	6470	73.7
1997	9275.9	1067.0	99.9	82.2	99.9	82.1	99.2	81.3	8760	100.0
1998	8075.0	1067.0	87.2	82.7	87.2	82.6	86.4	81.8	7678	87.6
1999	8136.0	1067.0	87.8	83.1	87.8	83.0	87.0	82.2	7699	87.9
2000	6685.2	1067.0	72.0	82.2	72.0	82.2	71.3	81.4	6329	72.1
2001	9250.2	1067.0	99.9	83.5	99.7	83.4	99.0	82.6	8760	100.0
2002	5986.6	1067.0	64.7	82.3	64.7	82.2	64.0	81.4	5668	64.7
2003	0.0	1067.0	0.0	77.1	0.0	77.0	0.0	76.3	0	0.0

**JP-38 FUKUSHIMA-DAINI-4****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	3264.0	3482.7	PF	C	PERIODICAL INSPECTION AND REFUELLING
17 May	5496.0	5864.2	UF3	A15	EXTENSION OF PERIODICAL INSPECTION DUE TO THE DERAY OF THE REPAIR OF PRIMARY LOOP RECIRCULATION PIPING, ETC.

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

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		5496			95	
C. Inspection, maintenance or repair combined with refuelling	3264			1212		
D. Inspection, maintenance or repair without refuelling				120		
Subtotal	3264	5496	0	1332	95	0
Total		8760			1427	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		45
15. Reactor Cooling Systems	5496	14
21. Fuel Handling and Storage Facilities		33
33. Circulating Water System		2
Total	5496	94

# JP-12 GENKAI-1

**Operator:** KYUSHU (KYUSHU ELECTRIC POWER CO.)  
**Contractor:** M (MITSUBISHI HEAVY INDUSTRY LTD)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 529.0 MW(e)  
**Design Net Capacity:** 529.0 MW(e)  
**Design Discharge Burnup:** 30000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3622.8 GW(e).h  
**Energy Availability Factor:** 76.4%  
**Load Factor:** 78.2%  
**Operating Factor:** 76.4%  
**Energy Unavailability Factor:** 23.6%  
**Total Off-line Time:** 2068 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	404.0	365.4	405.0	391.4	403.6	389.8	401.1	400.5	381.0	0.0	0.0	81.1	3622.8
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.6	0.0	0.0	20.2	76.4
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.6	0.0	0.0	20.2	76.4
<b>LF (%)</b>	102.6	102.8	102.9	102.9	102.5	102.3	101.9	101.8	100.0	0.0	0.0	20.6	78.2
<b>OF (%)</b>	100.0	100.0	100.0	100.1	100.0	100.0	100.0	100.0	96.7	0.0	0.0	22.0	76.4
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	100.0	100.0	79.8	23.6
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	100.0	100.0	79.8	23.6
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 15 Sep 1971      **Lifetime Generation:** 94327.8 GW(e).h  
**Date of First Criticality:** 28 Jan 1975      **Cumulative Energy Availability Factor:** 70.9%  
**Date of Grid Connection:** 14 Feb 1975      **Cumulative Load Factor:** 71.1%  
**Date of Commercial Operation:** 15 Oct 1975      **Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	3744.7	529.0	80.7	70.7	80.7	70.7	80.8	70.5	7072	80.7
1983	3960.5	529.0	85.4	72.5	85.4	72.5	85.5	72.3	7678	87.6
1984	3139.7	529.0	67.5	71.9	67.5	71.9	67.6	71.8	6072	69.1
1985	3089.7	529.0	66.7	71.4	66.7	71.4	66.7	71.3	6056	69.1
1986	2867.2	529.0	61.8	70.5	61.8	70.6	61.9	70.4	5425	61.9
1987	3762.7	529.0	81.3	71.4	81.1	71.4	81.2	71.3	7285	83.2
1988	2365.6	529.0	51.0	69.9	50.9	69.9	50.9	69.8	4743	54.0
1989	2183.2	529.0	47.1	68.3	47.1	68.2	47.1	68.2	4310	49.2
1990	2725.7	529.0	58.9	67.6	58.8	67.6	58.8	67.5	5159	58.9
1991	3357.5	529.0	72.7	67.9	72.4	67.9	72.5	67.8	6542	74.7
1992	3291.7	529.0	70.8	68.1	70.7	68.1	70.8	68.0	6397	72.8
1993	2797.4	529.0	60.3	67.7	60.3	67.7	60.4	67.6	5459	62.3
1994	2530.6	529.0	54.5	67.0	54.5	67.0	54.6	66.9	4787	54.6
1995	4151.0	529.0	89.4	68.1	89.4	68.1	89.6	68.0	7842	89.5
1996	4107.8	529.0	88.3	69.1	88.3	69.0	88.4	69.0	7829	89.1
1997	3653.4	529.0	78.7	69.5	78.7	69.5	78.8	69.5	6984	79.7
1998	3703.2	529.0	79.8	70.0	79.8	69.9	79.9	69.9	7057	80.6
1999	3305.9	529.0	71.2	70.0	71.2	70.0	71.3	70.0	6362	72.6
2000	4435.5	529.0	95.3	71.0	95.3	71.0	95.5	71.0	8400	95.6
2001	2512.3	529.0	54.1	70.4	54.1	70.4	54.2	70.3	4745	54.2
2002	3822.9	529.0	81.0	70.8	81.0	70.7	82.5	70.8	7097	81.0
2003	3622.8	529.0	76.3	71.0	76.4	70.9	78.2	71.1	6692	76.4



## JP-12 GENKAI-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
30 Sep	2068.0	1094.1	PF	C	PERIODICAL INSPECTION AND REFUELLING.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1975 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					166	
C. Inspection, maintenance or repair combined with refuelling	2068			2156		
D. Inspection, maintenance or repair without refuelling				24		
Subtotal	2068	0	0	2180	166	0
Total	2068			2346		

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

System	2003 Hours Lost	1975 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		12
13. Reactor Auxiliary Systems		57
15. Reactor Cooling Systems		22
16. Steam generation systems		71
42. Electrical Power Supply Systems		2
Total	0	164

# JP-27 GENKAI-2

**Operator:** KYUSHU (KYUSHU ELECTRIC POWER CO.)  
**Contractor:** M (MITSUBISHI HEAVY INDUSTRY LTD)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 529.0 MW(e)  
**Design Net Capacity:** 529.0 MW(e)  
**Design Discharge Burnup:** 30000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4490.5 GW(e).h  
**Energy Availability Factor:** 93.7%  
**Load Factor:** 96.9%  
**Operating Factor:** 93.7%  
**Energy Unavailability Factor:** 6.3%  
**Total Off-line Time:** 551 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	106.7	368.9	409.1	395.5	408.3	393.7	405.5	404.7	389.7	405.7	394.2	408.5	4490.5
<b>EAF (%)</b>	26.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.7
<b>UCF (%)</b>	26.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.7
<b>LF (%)</b>	27.1	103.8	104.0	104.0	103.7	103.4	103.0	102.8	102.3	102.9	103.5	103.8	96.9
<b>OF (%)</b>	25.9	100.0	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	93.7
<b>EUf (%)</b>	73.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3
<b>PUf (%)</b>	73.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1977  
**Date of First Criticality:** 21 May 1980  
**Date of Grid Connection:** 03 Jun 1980  
**Date of Commercial Operation:** 30 Mar 1981

**Lifetime Generation:** 88723.7 GW(e).h  
**Cumulative Energy Availability Factor:** 80.8%  
**Cumulative Load Factor:** 81.3%  
**Cumulative Unit Capability Factor:** 77.4%  
**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 (%)
1982	3598.1	529.0	77.4	77.4	77.4	77.4	77.6	77.6	6931	79.1
1983	3671.7	529.0	79.0	78.2	79.0	78.2	79.2	78.4	7056	80.5
1984	3803.5	529.0	81.6	79.3	81.6	79.3	81.9	79.6	7359	83.8
1985	3857.5	529.0	82.9	80.2	82.9	80.2	83.2	80.5	7423	84.7
1986	4631.7	529.0	99.5	84.1	99.5	84.1	99.9	84.4	8760	100.0
1987	3874.4	529.0	83.3	84.0	83.3	83.9	83.6	84.3	7426	84.8
1988	3458.4	529.0	74.2	82.5	74.2	82.5	74.4	82.8	6630	75.5
1989	3241.4	529.0	69.8	81.0	69.8	81.0	69.9	81.2	6230	71.1
1990	4654.8	529.0	100.0	83.1	100.0	83.1	100.4	83.4	8760	100.0
1991	3732.4	529.0	80.2	82.8	80.2	82.8	80.5	83.1	7141	81.5
1992	3480.6	529.0	74.5	82.0	74.5	82.0	74.9	82.3	6638	75.6
1993	3722.3	529.0	79.9	81.8	79.9	81.8	80.3	82.2	7007	80.0
1994	4013.5	529.0	86.2	82.2	86.2	82.2	86.6	82.5	7561	86.3
1995	3784.1	529.0	81.3	82.1	81.3	82.1	81.7	82.5	7225	82.5
1996	3644.7	529.0	78.1	81.8	78.1	81.8	78.4	82.2	6991	79.6
1997	3448.3	529.0	74.1	81.4	74.1	81.4	74.4	81.7	6541	74.7
1998	3701.4	529.0	79.6	81.3	79.6	81.3	79.9	81.6	6978	79.7
1999	4347.9	529.0	93.4	81.9	93.4	81.9	93.8	82.3	8186	93.4
2000	3473.3	529.0	74.4	81.5	74.4	81.5	74.7	81.9	6541	74.5
2001	2216.4	529.0	47.7	79.8	47.7	79.8	47.8	80.2	4177	47.7
2002	4107.5	529.0	86.7	80.2	86.7	80.2	88.6	80.6	7598	86.7
2003	4490.5	529.0	93.7	80.8	93.7	80.8	96.9	81.3	8209	93.7

## JP-27 GENKAI-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	547.0	289.5	PF	C	PERIODICAL INSPECTION AND REFUELLING.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1982 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure C. Inspection, maintenance or repair combined with refuelling	547			1582	23	
Subtotal	547	0	0	1582	23	0
Total	547			1605		

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

System	2003 Hours Lost	1982 to 2003 Average Hours Lost Per Year
16. Steam generation systems		23
Total	0	23

**JP-45 GENKAI-3**

Operator: KYUSHU (KYUSHU ELECTRIC POWER CO.)

Contractor: M (MITSUBISHI HEAVY INDUSTRY LTD)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1127.0 MW(e)  
 Design Net Capacity: 1127.0 MW(e)  
 Design Discharge Burnup: 31000 AV MW.d/t

**2. Production Summary 2003**

Energy Production: 8667.8 GW(e).h  
 Energy Availability Factor: 85.6%  
 Load Factor: 87.8%  
 Operating Factor: 85.6%  
 Energy Unavailability Factor: 14.4%  
 Total Off-line Time: 1263 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	0.0	175.2	855.2	832.5	862.0	833.3	860.9	860.2	830.7	861.2	834.3	862.2	8667.8
EAF (%)	0.0	23.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	85.6
UCF (%)	0.0	23.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	85.6
LF (%)	0.0	23.1	102.0	102.7	102.8	102.7	102.7	102.6	102.4	102.6	102.8	102.8	87.8
OF (%)	0.0	22.8	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	85.6
EUf (%)	100.0	77.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.4
PUf (%)	100.0	77.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.4
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. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Jun 1988      Lifetime Generation: 85958.2 GW(e).h  
 Date of First Criticality: 28 May 1993      Cumulative Energy Availability Factor: 84.0%  
 Date of Grid Connection: 15 Jun 1993      Cumulative Load Factor: 84.6%  
 Date of Commercial Operation: 18 Mar 1994      Cumulative Unit Capability Factor: 81.2%  
    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 (%)
1993	1924.1	1127.0	0.0	0.0	20.3	100.0	20.3	0.0	2897	34.4
1994	8795.8	1127.0	0.0	0.0	97.7	100.0	89.1	0.0	7828	89.4
1995	7356.3	1127.0	74.1	74.1	74.1	74.1	74.5	74.5	6588	75.2
1996	7444.9	1127.0	74.9	74.5	74.9	74.5	75.2	74.9	6663	75.9
1997	8259.9	1127.0	83.3	77.4	83.3	77.4	83.7	77.8	7358	84.0
1998	9633.1	1127.0	97.1	82.3	97.1	82.4	97.6	82.7	8514	97.2
1999	7999.8	1127.0	80.7	82.0	80.7	82.0	81.0	82.4	7068	80.7
2000	8109.7	1127.0	81.5	81.9	81.6	81.9	81.9	82.3	7164	81.6
2001	8205.1	1127.0	82.7	82.0	82.7	82.1	83.1	82.4	7249	82.8
2002	9561.5	1127.0	96.4	83.8	96.4	83.8	96.9	84.2	8446	96.4
2003	8667.8	1127.0	85.6	84.0	85.6	84.0	87.8	84.6	7497	85.6

## JP-45 GENKAI-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	1261.0	1421.7	PF	C	PERIODICAL INSPECTION AND REFUELLING.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1994 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling	1261			1128		
Subtotal	1261	0	0	1128	0	0
Total	1261			1128		

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

System	2003 Hours Lost	1994 to 2003 Average Hours Lost Per Year

**JP-46 GENKAI-4**

Operator: KYUSHU (KYUSHU ELECTRIC POWER CO.)

Contractor: M (MITSUBISHI HEAVY INDUSTRY LTD)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1127.0 MW(e)  
 Design Net Capacity: 1127.0 MW(e)  
 Design Discharge Burnup: 31000 AV MW.d/t

**2. Production Summary 2003**

Energy Production: 9678.7 GW(e).h  
 Energy Availability Factor: 96.1%  
 Load Factor: 98.0%  
 Operating Factor: 96.1%  
 Energy Unavailability Factor: 3.9%  
 Total Off-line Time: 338 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	852.4	768.5	855.3	828.6	856.4	828.4	855.2	855.2	825.9	856.6	829.5	466.8	9678.7
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	54.5	96.1
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	54.5	96.1
LF (%)	101.7	101.5	102.0	102.3	102.1	102.1	102.0	102.0	101.8	102.0	102.2	55.7	98.0
OF (%)	100.0	100.0	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	54.6	96.1
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.5	3.9
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.5	3.9
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. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 15 Jul 1992      Lifetime Generation: 57577.8 GW(e).h  
 Date of First Criticality: 23 Oct 1996      Cumulative Energy Availability Factor: 86.1%  
 Date of Grid Connection: 12 Nov 1996      Cumulative Load Factor: 86.9%  
 Date of Commercial Operation: 25 Jul 1997      Cumulative Unit Capability Factor: 82.5%  
    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 (%)
1996	210.5	1127.0	0.0	0.0	2.2	100.0	2.2	0.0	705	8.3
1997	5841.0	1127.0	0.0	0.0	100.0	100.0	59.2	0.0	5901	67.4
1998	7634.5	1127.0	76.8	76.8	76.7	76.7	77.3	77.3	6783	77.4
1999	9716.3	1127.0	97.7	87.2	97.7	87.2	98.4	87.9	8559	97.7
2000	8181.2	1127.0	82.0	85.5	82.0	85.5	82.6	86.1	7205	82.0
2001	8107.2	1127.0	81.5	84.5	81.5	84.5	82.1	85.1	7142	81.5
2002	8208.3	1127.0	82.4	84.1	82.4	84.1	83.1	84.7	7217	82.4
2003	9678.7	1127.0	96.1	86.1	96.1	86.1	98.0	86.9	8422	96.1

## JP-46 GENKAI-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
17 Dec	338.0	381.4	PF	C	PERIODICAL INSPECTION AND REFUELLING.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1998 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling	338			1153		
Subtotal	338	0	0	1153	0	0
Total	338			1153		

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

System	2003 Hours Lost	1998 to 2003 Average Hours Lost Per Year

# JP-11 HAMAOKA-1

**Operator:** CHUBU (CHUBU ELECTRIC POWER CO.)  
**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 515.0 MW(e)  
**Design Net Capacity:** 516.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 0.0 GW(e).h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	0.0	0.0	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	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 10 Jun 1971      **Lifetime Generation:** 73604.6 GW(e).h  
**Date of First Criticality:** 20 Jun 1974      **Cumulative Energy Availability Factor:** 57.2%  
**Date of Grid Connection:** 13 Aug 1974      **Cumulative Load Factor:** 56.7%  
**Date of Commercial Operation:** 17 Mar 1976      **Cumulative Unit Capability Factor:** 77.2%  
**Cumulative Energy Unavailability Factor:** 42.8%

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	2997.6	515.0	66.7	51.0	66.6	51.0	66.4	51.0	6237	71.2
1983	3054.9	515.0	67.7	53.4	67.7	53.4	67.7	53.4	6236	71.2
1984	2377.5	515.0	53.6	53.4	53.6	53.4	52.6	53.3	4822	54.9
1985	4437.1	515.0	100.0	58.6	100.0	58.6	98.4	58.3	8760	100.0
1986	2919.8	515.0	65.0	59.3	65.0	59.2	64.7	58.9	5804	66.3
1987	3290.7	515.0	73.1	60.5	73.1	60.5	72.9	60.2	6560	74.9
1988	1838.7	515.0	40.7	58.9	40.7	58.9	40.6	58.6	3649	41.5
1989	1950.7	515.0	43.4	57.7	43.4	57.7	43.2	57.4	3904	44.6
1990	2040.6	515.0	49.0	57.0	49.0	57.1	45.2	56.5	4015	45.8
1991	2162.8	515.0	48.3	56.5	48.2	56.5	47.9	55.9	4319	49.3
1992	2730.1	515.0	60.6	56.7	60.7	56.7	60.3	56.2	5384	61.3
1993	2872.6	515.0	64.4	57.2	64.1	57.2	63.7	56.7	5681	64.9
1994	1642.1	515.0	36.6	56.0	36.6	56.0	36.4	55.5	3216	36.7
1995	3499.6	515.0	78.2	57.2	78.1	57.2	77.6	56.7	6892	78.7
1996	3662.3	515.0	81.5	58.4	81.4	58.4	81.0	57.9	7158	81.5
1997	4118.0	515.0	92.1	60.0	91.9	60.0	91.3	59.5	8086	92.3
1998	3609.8	515.0	80.5	61.0	80.5	60.9	80.0	60.4	7070	80.7
1999	2878.7	515.0	64.3	61.1	64.2	61.1	63.8	60.6	5630	64.3
2000	3198.0	515.0	71.3	61.5	71.2	61.5	70.7	61.0	6268	71.4
2001	3069.8	515.0	68.5	61.8	68.5	61.8	68.0	61.3	6000	68.5
2002	0.0	515.0	0.0	59.4	0.0	59.4	0.0	58.9	0	0.0
2003	0.0	515.0	0.0	57.2	0.0	57.2	0.0	56.7	0	0.0



# JP-11 HAMAOKA-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	8760.0	4511.4	UF3	A11	EXTENSION OF PERIODICAL INSPECTION AND REFUELLING. REASON: MAINTENANCE OF PLR-PIPING AND SHROUD INSPECTION.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		8760			666	
C. Inspection, maintenance or repair combined with refuelling				2410		
D. Inspection, maintenance or repair without refuelling				103		
E. Testing of plant systems or components				0		
Subtotal	0	8760	0	2513	666	0
Total		8760			3179	

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

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	8760	113
12. Reactor I&C Systems		211
13. Reactor Auxiliary Systems		135
15. Reactor Cooling Systems		181
21. Fuel Handling and Storage Facilities		17
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		6
Total	8760	663

# JP-24 HAMAOKA-2

**Operator:** CHUBU (CHUBU ELECTRIC POWER CO.)  
**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 806.0 MW(e)  
**Design Net Capacity:** 814.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6950.1 GW(e).h  
**Energy Availability Factor:** 97.8%  
**Load Factor:** 98.4%  
**Operating Factor:** 98.4%  
**Energy Unavailability Factor:** 2.2%  
**Total Off-line Time:** 143 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	488.5	545.2	603.4	583.7	602.7	582.7	599.5	597.6	578.3	600.5	583.0	584.9	6950.1
<b>EAF (%)</b>	80.8	100.0	100.0	100.0	100.0	99.9	99.4	99.2	99.1	99.6	99.9	96.5	97.8
<b>UCF (%)</b>	80.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.5	98.1
<b>LF (%)</b>	81.5	100.7	100.6	100.7	100.5	100.4	100.0	99.7	99.6	100.0	100.5	97.5	98.4
<b>OF (%)</b>	80.8	100.0	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	98.4
<b>EUf (%)</b>	19.2	0.0	0.0	0.0	0.0	0.1	0.6	0.8	0.9	0.4	0.1	3.5	2.2
<b>PUF (%)</b>	19.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.1	0.6	0.8	0.9	0.4	0.1	0.0	0.2

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 14 Jun 1974      **Lifetime Generation:** 128629.6 GW(e).h  
**Date of First Criticality:** 28 Mar 1978      **Cumulative Energy Availability Factor:** 70.9%  
**Date of Grid Connection:** 04 May 1978      **Cumulative Load Factor:** 71.0%  
**Date of Commercial Operation:** 29 Nov 1978      **Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1982	6223.6	814.0	87.3	71.3	87.3	71.3	87.3	71.2	8074	92.2
1983	4888.1	814.0	68.5	70.7	68.6	70.7	68.6	70.7	6250	71.3
1984	4693.8	815.0	66.3	70.0	66.3	70.0	65.6	69.8	5877	66.9
1985	4397.2	815.0	62.5	68.9	62.5	68.9	61.6	68.7	5553	63.4
1986	4845.5	815.0	68.1	68.8	68.1	68.8	67.9	68.6	6145	70.1
1987	7002.0	815.0	98.7	72.1	98.7	72.1	98.1	71.8	8760	100.0
1988	4015.9	815.0	56.4	70.5	56.4	70.5	56.1	70.3	5108	58.2
1989	4613.0	806.0	64.4	70.0	64.4	70.0	65.3	69.8	5864	66.9
1990	5828.1	806.0	82.2	71.0	82.2	71.0	82.5	70.9	7289	83.2
1991	5299.5	806.0	74.8	71.3	74.7	71.3	75.1	71.2	6625	75.6
1992	4319.6	806.0	60.6	70.5	60.6	70.5	61.0	70.5	5421	61.7
1993	5347.9	806.0	75.3	70.8	75.3	70.8	75.7	70.8	6657	76.0
1994	4537.8	806.0	64.1	70.4	64.1	70.4	64.3	70.4	5643	64.4
1995	6922.2	806.0	97.8	72.0	97.7	72.0	98.0	72.0	8577	97.9
1996	6152.7	806.0	86.5	72.8	86.5	72.8	86.9	72.8	7613	86.7
1997	5106.5	806.0	72.3	72.8	72.1	72.8	72.3	72.8	6350	72.5
1998	5191.8	806.0	73.4	72.8	73.2	72.8	73.5	72.9	6462	73.8
1999	5221.5	806.0	74.0	72.9	73.6	72.8	74.0	72.9	6481	74.0
2000	4972.9	806.0	70.0	72.8	69.9	72.7	70.2	72.8	6146	70.0
2001	5134.2	806.0	72.6	72.8	72.2	72.7	72.7	72.8	6362	72.6
2002	164.0	806.0	2.3	69.8	2.3	69.8	2.3	69.9	198	2.3
2003	6950.1	806.0	98.1	71.0	97.8	70.9	98.4	71.0	8617	98.4

## JP-24 HAMAOKA-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
05 Jan	142.0	115.2	PF	D	PLANNED INSPECTION
12 Dec	26.0	21.1	UP1	A15	CORRECTIVE MAINTENANCE OF PLR-MG SET

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1978 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					105	
C. Inspection, maintenance or repair combined with refuelling				1868		
D. Inspection, maintenance or repair without refuelling	142			121		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					44	
Z. Others					188	
Subtotal	142	0	0	1989	337	0
Total		142			2326	

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

System	2003 Hours Lost	1978 to 2003 Average Hours Lost Per Year
13. Reactor Auxiliary Systems		70
32. Feedwater and Main Steam System		35
XX. Miscellaneous Systems		0
Total	0	105

# JP-36 HAMAOKA-3

**Operator:** CHUBU (CHUBU ELECTRIC POWER CO.)  
**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1056.0 MW(e)  
**Design Net Capacity:** 1056.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 1486.6 GW(e).h  
**Energy Availability Factor:** 16.1%  
**Load Factor:** 16.1%  
**Operating Factor:** 16.0%  
**Energy Unavailability Factor:** 83.9%  
**Total Off-line Time:** 7357 hours

## 3. 2003 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	69.3	626.4	790.9	1486.6
<b>EAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.3	82.4	100.0	16.1
<b>UCF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.3	82.4	100.0	16.1
<b>LF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.8	82.4	100.7	16.1
<b>OF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9	82.4	100.0	16.0
<b>EUF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.7	17.6	0.0	83.9
<b>PUF (%)</b>	0.0	32.1	100.0	100.0	61.3	0.0	0.0	0.0	0.0	89.7	17.6	0.0	33.4
<b>UCLF (%)</b>	100.0	67.9	0.0	0.0	38.7	100.0	100.0	100.0	100.0	0.0	0.0	0.0	50.4
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 18 Apr 1983      **Lifetime Generation:** 117969.6 GW(e).h  
**Date of First Criticality:** 21 Nov 1986      **Cumulative Energy Availability Factor:** 76.6%  
**Date of Grid Connection:** 20 Jan 1987      **Cumulative Load Factor:** 75.8%  
**Date of Commercial Operation:** 28 Aug 1987      **Cumulative Unit Capability Factor:** 78.2%  
**Cumulative Energy Unavailability Factor:** 23.4%

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	5586.6	1066.0	0.0	0.0	99.8	100.0	59.8	0.0	6360	72.6
1988	7066.8	1066.0	75.8	75.8	75.8	75.8	75.5	75.5	6862	78.1
1989	8542.0	1066.0	92.4	84.1	92.4	84.1	91.5	83.5	8167	93.2
1990	6601.3	1056.0	71.4	79.9	71.4	79.9	71.4	79.5	6366	72.7
1991	6763.1	1056.0	73.5	78.3	73.5	78.3	73.1	77.9	6472	73.9
1992	6585.4	1056.0	71.7	77.0	71.4	76.9	71.0	76.5	6371	72.5
1993	8768.0	1056.0	95.3	80.0	95.3	80.0	94.8	79.5	8359	95.4
1994	6490.5	1056.0	77.4	79.7	77.4	79.6	70.2	78.2	6784	77.4
1995	7725.7	1056.0	84.7	80.3	84.1	80.2	83.5	78.9	7429	84.8
1996	6891.6	1056.0	74.8	79.7	74.7	79.6	74.3	78.4	6573	74.8
1997	8109.7	1056.0	88.3	80.5	88.3	80.4	87.7	79.3	7863	89.8
1998	9200.7	1056.0	100.0	82.3	100.0	82.2	99.5	81.1	8760	100.0
1999	7618.3	1056.0	82.8	82.3	82.8	82.3	82.4	81.2	7255	82.8
2000	7706.0	1056.0	83.6	82.4	83.6	82.4	83.1	81.4	7340	83.6
2001	6476.8	1056.0	70.4	81.6	70.4	81.5	70.0	80.6	6171	70.4
2002	6350.9	1056.0	69.0	80.7	69.0	80.7	68.7	79.8	6044	69.0
2003	1486.6	1056.0	16.1	76.7	16.1	76.6	16.1	75.8	1403	16.0

## JP-36 HAMAOKA-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	1200.0	1267.2	UF2	Z15	UNPLANNED OUTAGE FOR CONFIRMING THE INTEGRITY OF THE REACTOR SYSTEM
20 Feb	2136.0	2255.6	PF	C	PERIODICAL INSPECTION AND REFUELLING
20 May	3895.0	4113.6	UF3	A11	EXTENSION OF PERIODICAL INSPECTION AND REFUELLING. REASON: INSPECTION OF PLR-PIPING AND SHROUD
03 Nov	126.0	133.5	PF	D	PLANNED INSPECTION

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		3895			34	
C. Inspection, maintenance or repair combined with refuelling	2136			1231		
D. Inspection, maintenance or repair without refuelling	126			33		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					7	
Z. Others		1200			144	
Subtotal	2262	5095	0	1264	185	0
Total		7357			1449	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	3895	
35. All other I&C Systems		0
Total	3895	0

**JP-49 HAMAOKA-4**

Operator: CHUBU (CHUBU ELECTRIC POWER CO.)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

**1. Station Details**

Type: BWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1092.0 MW(e)  
 Design Net Capacity: 1092.0 MW(e)  
 Design Discharge Burnup: —

**2. Production Summary 2003**

Energy Production: 3729.8 GW(e).h  
 Energy Availability Factor: 39.1%  
 Load Factor: 39.0%  
 Operating Factor: 39.0%  
 Energy Unavailability Factor: 60.9%  
 Total Off-line Time: 5345 hours

**3. 2003 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	531.6	783.9	811.3	785.6	817.3	3729.8
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.6	99.9	100.0	100.0	100.0	39.1
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.8	100.0	100.0	100.0	100.0	39.1
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	65.4	99.7	99.7	99.9	100.6	39.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	65.5	100.0	99.9	100.0	100.0	39.0
EUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	33.4	0.1	0.0	0.0	0.0	60.9
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.2	0.0	0.0	0.0	0.0	2.8
UCLF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	58.1
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 13 Oct 1989      Lifetime Generation: 82590.8 GW(e).h  
 Date of First Criticality: 02 Dec 1992      Cumulative Energy Availability Factor: 80.3%  
 Date of Grid Connection: 27 Jan 1993      Cumulative Load Factor: 80.2%  
 Date of Commercial Operation: 03 Sep 1993      Cumulative Unit Capability Factor: 80.8%  
    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 (%)
1993	5877.6	1092.0	0.0	0.0	100.0	100.0	61.4	0.0	6326	72.2
1994	7110.4	1092.0	74.9	74.9	74.7	74.7	74.3	74.3	6576	75.1
1995	9546.0	1092.0	100.0	87.5	100.0	87.3	99.8	87.1	8760	100.0
1996	8301.3	1092.0	86.7	87.2	86.7	87.1	86.5	86.9	7615	86.7
1997	7883.0	1092.0	83.1	86.2	82.6	86.0	82.4	85.8	7302	83.4
1998	7154.1	1092.0	75.0	83.9	74.9	83.8	74.8	83.6	6604	75.4
1999	9545.1	1092.0	100.0	86.6	99.9	86.5	99.8	86.3	8760	100.0
2000	8233.7	1092.0	86.3	86.5	86.0	86.4	85.8	86.2	7577	86.3
2001	8773.5	1092.0	91.8	87.2	91.8	87.1	91.7	86.9	8046	91.8
2002	6436.4	1092.0	67.4	85.0	67.4	84.9	67.3	84.7	5906	67.4
2003	3729.8	1092.0	39.1	80.4	39.1	80.3	39.0	80.2	3415	39.0

## JP-49 HAMAOKA-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	5243.0	5725.9	UF3	A11	EXTENSION OF PERIODICAL INSPECTION. REASON: INSPECTION OF PLR-PIPING AND SHROUD.
12 Aug	102.0	111.4	PF	D	PLANNED INSPECTION

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1994 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		5243				
C. Inspection, maintenance or repair combined with refuelling				1018		
D. Inspection, maintenance or repair without refuelling	102			50		
Z. Others					105	
Subtotal	102	5243	0	1068	105	0
Total		5345			1173	

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

System	2003 Hours Lost	1994 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	5243	
Total	5243	0

# JP-23 IKATA-1

**Operator:** SHIKOKU (SHIKOKU ELECTRIC POWER CO.)  
**Contractor:** M (MITSUBISHI HEAVY INDUSTRY LTD)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 538.0 MW(e)  
**Design Net Capacity:** 538.0 MW(e)  
**Design Discharge Burnup:** 30000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3734.6 GW(e).h  
**Energy Availability Factor:** 77.8%  
**Load Factor:** 79.2%  
**Operating Factor:** 77.8%  
**Energy Unavailability Factor:** 22.2%  
**Total Off-line Time:** 1941 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	412.8	373.2	411.6	344.6	0.0	0.0	197.8	403.8	388.0	402.8	392.0	408.0	3734.6
<b>EAF (%)</b>	100.0	99.9	100.0	86.4	0.0	0.0	49.1	100.0	100.0	100.0	100.0	100.0	77.8
<b>UCF (%)</b>	100.0	100.0	100.0	86.4	0.0	0.0	49.1	100.0	100.0	100.0	100.0	100.0	77.8
<b>LF (%)</b>	103.1	103.2	102.8	89.1	0.0	0.0	49.4	100.9	100.2	100.5	101.2	101.9	79.2
<b>OF (%)</b>	100.0	100.0	100.0	83.3	0.0	0.0	52.2	100.0	100.0	99.9	100.0	100.0	77.8
<b>EUf (%)</b>	0.0	0.1	0.0	13.6	100.0	100.0	50.9	0.0	0.0	0.0	0.0	0.0	22.2
<b>PUf (%)</b>	0.0	0.1	0.0	13.6	100.0	100.0	41.2	0.0	0.0	0.0	0.0	0.0	21.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	9.7	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 15 Jun 1973      **Lifetime Generation:** 97682.9 GW(e).h  
**Date of First Criticality:** 29 Jan 1977      **Cumulative Energy Availability Factor:** 77.9%  
**Date of Grid Connection:** 17 Feb 1977      **Cumulative Load Factor:** 77.8%  
**Date of Commercial Operation:** 30 Sep 1977      **Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1982	3527.3	538.0	74.8	66.1	74.8	66.1	74.8	66.1	6662	76.1
1983	4667.6	538.0	99.0	71.6	99.1	71.6	99.0	71.6	8754	99.9
1984	3318.2	538.0	70.5	71.5	70.5	71.5	70.2	71.4	6283	71.5
1985	3674.1	538.0	78.2	72.3	78.2	72.3	78.0	72.2	6962	79.5
1986	3719.6	538.0	79.2	73.1	79.2	73.1	78.9	73.0	7044	80.4
1987	4696.0	538.0	100.0	75.8	100.0	75.8	99.6	75.6	8760	100.0
1988	3533.9	538.0	75.0	75.7	75.0	75.7	74.8	75.6	6719	76.5
1989	3563.6	538.0	76.2	75.7	76.2	75.7	75.6	75.6	6791	77.5
1990	3632.2	538.0	76.4	75.8	76.4	75.8	77.1	75.7	6932	79.1
1991	4382.4	538.0	93.4	77.0	93.4	77.0	93.0	76.9	8184	93.4
1992	3675.4	538.0	78.5	77.1	78.5	77.1	77.8	77.0	6995	79.6
1993	3494.2	538.0	74.4	77.0	74.4	77.0	74.1	76.8	6630	75.7
1994	3601.3	538.0	76.6	76.9	76.6	76.9	76.4	76.8	6717	76.7
1995	3598.7	538.0	76.5	76.9	76.5	76.9	76.4	76.8	6815	77.8
1996	3579.1	538.0	75.9	76.9	75.9	76.9	75.7	76.7	6768	77.0
1997	4688.9	538.0	99.7	78.0	99.7	78.0	99.5	77.8	8760	100.0
1998	3239.2	538.0	68.9	77.6	68.9	77.6	68.7	77.4	6128	70.0
1999	3783.2	538.0	80.4	77.7	80.4	77.7	80.3	77.5	7051	80.5
2000	3194.1	538.0	67.7	77.3	67.7	77.3	67.6	77.1	5953	67.8
2001	4477.6	538.0	95.2	78.0	95.2	78.0	95.0	77.8	8412	96.0
2002	3527.9	538.0	74.2	77.9	74.2	77.9	74.9	77.7	6505	74.3
2003	3734.6	538.0	77.8	77.9	77.8	77.9	79.2	77.8	6819	77.8



## JP-23 IKATA-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
26 Apr	1868.0	1005.1	PF	C	PERIODICAL INSPECTION AND REFUELLING.
03 Jul	48.0	25.8	UF3	Z15	EXTENSION OF PERIODICAL INSPECTION.(SEAT LEAKAGE FROM PRESSURIZER SAFETY VALVE LINE DURING RCS LEAK TEST.)
09 Jul	24.0	12.9	UF3	Z15	EXTENSION OF PERIODICAL INSPECTION.(LEAKAGE FROM THE VALVE FOR THE FLOW METER OF RCP SEAL WATER INLET.)

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1977 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					36	
C. Inspection, maintenance or repair combined with refuelling	1868			1630		
D. Inspection, maintenance or repair without refuelling				15		
J. Grid failure or grid unavailability						0
Z. Others		72			15	
Subtotal	1868	72	0	1645	51	0
Total		1940			1696	

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

System	2003 Hours Lost	1977 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		22
31. Turbine and auxiliaries		14
42. Electrical Power Supply Systems		0
Total	0	36

**JP-32 IKATA-2**

Operator: SHIKOKU (SHIKOKU ELECTRIC POWER CO.)

Contractor: M (MITSUBISHI HEAVY INDUSTRY LTD)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 538.0 MW(e)  
 Design Net Capacity: 538.0 MW(e)  
 Design Discharge Burnup: 30000 MW.d/t

**2. Production Summary 2003**

Energy Production: 3904.7 GW(e).h  
 Energy Availability Factor: 81.6%  
 Load Factor: 82.9%  
 Operating Factor: 81.6%  
 Energy Unavailability Factor: 18.4%  
 Total Off-line Time: 1610 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	344.9	0.0	0.0	355.3	410.5	393.3	403.5	404.8	388.6	402.9	392.5	408.4	3904.7
EAF (%)	83.7	0.0	0.0	90.1	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.0	81.6
UCF (%)	83.7	0.0	0.0	90.1	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.0	81.6
LF (%)	86.2	0.0	0.0	91.9	102.6	101.5	100.8	101.1	100.3	100.5	101.3	102.0	82.9
OF (%)	80.6	0.0	0.0	93.2	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	81.6
EUf (%)	16.3	100.0	100.0	9.9	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	18.4
PUf (%)	16.3	100.0	100.0	9.9	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	18.4
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. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 21 Feb 1978      Lifetime Generation: 86639.8 GW(e).h  
 Date of First Criticality: 31 Jul 1981      Cumulative Energy Availability Factor: 82.6%  
 Date of Grid Connection: 19 Aug 1981      Cumulative Load Factor: 82.5%  
 Date of Commercial Operation: 19 Mar 1982      Cumulative Unit Capability Factor: 77.6%  
    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 (%)
1982	4273.8	538.0	0.0	0.0	90.7	100.0	90.7	0.0	8107	92.5
1983	3575.0	538.0	75.9	75.9	75.9	75.9	75.9	75.9	6798	77.6
1984	3776.6	538.0	80.3	78.1	80.1	78.0	79.9	77.9	7157	81.5
1985	3694.1	538.0	78.6	78.3	78.6	78.2	78.4	78.1	6995	79.9
1986	4698.6	538.0	100.0	83.7	100.0	83.6	99.7	83.5	8760	100.0
1987	3758.7	538.0	80.5	83.1	80.5	83.0	79.8	82.7	7137	81.5
1988	3541.5	538.0	75.1	81.7	75.1	81.7	74.9	81.4	6743	76.8
1989	3751.3	538.0	79.8	81.5	79.8	81.4	79.6	81.2	7128	81.4
1990	4694.9	538.0	100.0	83.8	99.9	83.7	99.6	83.5	8760	100.0
1991	3526.2	538.0	75.2	82.8	75.2	82.8	74.8	82.5	6731	76.8
1992	3479.9	538.0	74.3	82.0	74.3	82.0	73.6	81.6	6639	75.6
1993	3588.6	538.0	76.4	81.5	76.4	81.4	76.1	81.1	6799	77.6
1994	4700.6	538.0	99.9	83.0	99.9	83.0	99.7	82.7	8760	100.0
1995	3720.9	538.0	79.0	82.7	79.0	82.7	79.0	82.4	7014	80.1
1996	3664.8	538.0	77.7	82.3	77.7	82.3	77.5	82.0	6935	79.0
1997	3610.4	538.0	76.8	82.0	76.8	82.0	76.6	81.7	6831	78.0
1998	4701.1	538.0	99.9	83.1	99.9	83.1	99.7	82.8	8760	100.0
1999	3734.4	538.0	79.5	82.9	79.5	82.9	79.2	82.6	6973	79.6
2000	3695.0	538.0	78.3	82.6	78.3	82.6	78.2	82.4	6888	78.4
2001	3145.7	538.0	67.0	81.8	66.9	81.8	66.7	81.5	5875	67.1
2002	4718.5	538.0	99.2	82.7	99.2	82.7	100.1	82.5	8698	99.3
2003	3904.7	538.0	81.6	82.6	81.6	82.6	82.9	82.5	7150	81.6

## JP-32 IKATA-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
26 Jan	1609.0	865.6	PF	C	PERIODICAL INSPECTION AND REFUELLING.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1982 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling	1609			1338		
J. Grid failure or grid unavailability						0
Subtotal	1609	0	0	1338	0	0
Total	1609			1338		

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

System	2003 Hours Lost	1982 to 2003 Average Hours Lost Per Year

**JP-47 IKATA-3**

Operator: SHIKOKU (SHIKOKU ELECTRIC POWER CO.)

Contractor: M (MITSUBISHI HEAVY INDUSTRY LTD)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 846.0 MW(e)  
 Design Net Capacity: 846.0 MW(e)  
 Design Discharge Burnup: 22000 MW.d/t

**2. Production Summary 2003**

Energy Production: 5862.1 GW(e).h  
 Energy Availability Factor: 74.9%  
 Load Factor: 79.1%  
 Operating Factor: 74.9%  
 Energy Unavailability Factor: 25.1%  
 Total Off-line Time: 2200 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	667.8	601.9	666.2	646.1	666.6	643.9	664.6	662.5	381.4	0.0	0.0	260.9	5862.1
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	59.8	0.0	0.0	39.9	74.9
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	59.8	0.0	0.0	39.9	74.9
LF (%)	106.1	105.9	105.8	106.2	105.9	105.7	105.6	105.3	62.6	0.0	0.0	41.5	79.1
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	56.7	0.0	0.0	43.1	74.9
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.2	100.0	100.0	60.1	25.1
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.2	100.0	100.0	60.1	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. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Nov 1986      Lifetime Generation: 59281.7 GW(e).h  
 Date of First Criticality: 23 Feb 1994      Cumulative Energy Availability Factor: 84.0%  
 Date of Grid Connection: 29 Mar 1994      Cumulative Load Factor: 85.5%  
 Date of Commercial Operation: 15 Dec 1994      Cumulative Unit Capability Factor: 81.2%  
    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 (%)
1994	2195.5	846.0	0.0	0.0	31.6	100.0	31.6	0.0	3669	44.7
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	87.1	74.2	87.1	75.1	88.1	6621	75.4
1997	6134.7	846.0	81.9	85.4	81.9	85.4	82.8	86.3	7242	82.7
1998	6250.4	846.0	83.4	84.9	83.4	84.9	84.3	85.8	7374	84.2
1999	6298.4	846.0	84.1	84.7	84.1	84.7	85.0	85.6	7368	84.1
2000	6660.3	846.0	88.7	85.4	88.7	85.4	89.6	86.3	7790	88.7
2001	6210.7	846.0	82.9	85.0	82.9	85.0	83.8	86.0	7267	83.0
2002	6599.5	846.0	85.8	85.1	85.8	85.1	89.1	86.3	7518	85.8
2003	5862.1	846.0	74.9	84.0	74.9	84.0	79.1	85.5	6560	74.9

## JP-47 IKATA-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
18 Sep	2199.0	1862.0	PF	C	PERIODICAL INSPECTION AND REFUELLING.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1996 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure C. Inspection, maintenance or repair combined with refuelling	2199			1125	147	
Subtotal	2199	0	0	1125	147	0
Total	2199			1272		

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

System	2003 Hours Lost	1996 to 2003 Average Hours Lost Per Year
41. Main Generator Systems		30
42. Electrical Power Supply Systems		117
Total	0	147

**JP-33 KASHIWAZAKI KARIWA-1**

Operator: TEPCO (TOKYO ELECTRIC POWER CO.)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

**1. Station Details**

Type: BWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1067.0 MW(e)  
 Design Net Capacity: 1067.0 MW(e)  
 Design Discharge Burnup: 33000IN. MW.d/t

**2. Production Summary 2003**

Energy Production: 0.0 GW(e).h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	80.0	0.0	0.0	0.0	0.0	0.0	0.0	47.9
UCLF (%)	0.0	0.0	0.0	0.0	0.0	20.0	100.0	100.0	100.0	100.0	100.0	100.0	52.1
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. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 05 Jun 1980      Lifetime Generation: 130148.7 GW(e).h  
 Date of First Criticality: 12 Dec 1984      Cumulative Energy Availability Factor: 75.4%  
 Date of Grid Connection: 13 Feb 1985      Cumulative Load Factor: 74.4%  
 Date of Commercial Operation: 18 Sep 1985      Cumulative Unit Capability Factor: 77.8%  
    Cumulative Energy Unavailability Factor: 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 (%)
1985	4960.2	1067.0	0.0	0.0	54.9	100.0	54.9	0.0	5793	68.4
1986	6703.7	1067.0	73.0	73.0	73.0	73.0	71.7	71.7	6463	73.8
1987	9195.5	1067.0	100.0	86.5	100.0	86.5	98.4	85.1	8760	100.0
1988	6959.7	1067.0	75.0	82.7	75.0	82.7	74.3	81.4	6660	75.8
1989	6442.3	1067.0	69.7	79.4	69.7	79.4	68.9	78.3	6236	71.2
1990	5987.4	1067.0	65.0	76.5	65.0	76.5	64.1	75.5	5711	65.2
1991	9031.6	1067.0	97.9	80.1	97.9	80.1	96.6	79.0	8618	98.4
1992	6958.1	1067.0	75.8	79.5	75.4	79.4	74.2	78.3	6728	76.6
1993	6874.3	1067.0	74.7	78.9	74.7	78.8	73.5	77.7	6575	75.1
1994	7020.2	1067.0	76.1	78.6	76.1	78.5	75.1	77.4	6744	77.0
1995	9235.2	1067.0	100.0	80.7	100.0	80.7	98.8	79.6	8760	100.0
1996	6814.4	1067.0	73.6	80.1	73.6	80.0	72.7	78.9	6469	73.6
1997	7899.9	1067.0	85.7	80.5	85.7	80.5	84.5	79.4	7525	85.9
1998	6176.2	1067.0	67.4	79.5	67.4	79.5	66.1	78.4	5960	68.0
1999	9198.8	1067.0	99.8	81.0	99.7	80.9	98.4	79.8	8760	100.0
2000	7714.7	1067.0	83.6	81.2	83.6	81.1	82.3	80.0	7346	83.6
2001	7070.5	1067.0	76.9	80.9	76.9	80.9	75.6	79.7	6743	77.0
2002	5906.2	1067.0	64.2	79.9	64.2	79.9	63.2	78.7	5628	64.2
2003	0.0	1067.0	0.0	75.5	0.0	75.4	0.0	74.4	0	0.0

**JP-33 KASHIWAZAKI KARIWA-1****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	4200.0	4481.4	PF	C	PERIODICAL INSPECTION AND REFUELLING
25 Jun	4560.0	4865.5	UF3	A15	EXTENSION OF PERIODICAL INSPECTION DUE TO THE DERAY OF THE REPAIR OF PRIMARY LOOP RECIRCULATION PIPING, ETC.

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

Outage Cause	2003 Hours Lost			1986 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		4560			142	
C. Inspection, maintenance or repair combined with refuelling	4200			1417		
D. Inspection, maintenance or repair without refuelling				47		
Z. Others					28	
Subtotal	4200	4560	0	1464	170	0
Total		8760			1634	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1986 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		68
15. Reactor Cooling Systems	4560	20
21. Fuel Handling and Storage Facilities		53
Total	4560	141

**JP-39 KASHIWAZAKI KARIWA-2**

Operator: TEPCO (TOKYO ELECTRIC POWER CO.)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

**1. Station Details**

Type: BWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1067.0 MW(e)  
 Design Net Capacity: 1067.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 0.0 GW(e).h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	45.2	0.0	0.0	0.0	0.0	61.9
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.8	100.0	100.0	100.0	100.0	38.1
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. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 18 Nov 1985  
 Date of First Criticality: 30 Nov 1989  
 Date of Grid Connection: 08 Feb 1990  
 Date of Commercial Operation: 28 Sep 1990

Lifetime Generation: 97324.1 GW(e).h  
 Cumulative Energy Availability Factor: 76.7%  
 Cumulative Load Factor: 75.6%  
 Cumulative Unit Capability Factor: 79.3%  
 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 (%)
1990	5386.3	1067.0	0.0	0.0	100.0	100.0	57.6	0.0	6071	69.3
1991	6642.4	1067.0	72.4	72.4	72.4	72.4	71.1	71.1	6440	73.5
1992	9046.9	1067.0	97.9	85.2	97.9	85.2	96.5	83.8	8623	98.2
1993	7212.6	1067.0	78.5	83.0	78.3	82.9	77.2	81.6	6911	78.9
1994	7291.1	1067.0	79.0	82.0	79.0	81.9	78.0	80.7	6962	79.5
1995	7696.8	1067.0	83.4	82.3	83.4	82.2	82.3	81.0	7329	83.7
1996	8811.1	1067.0	95.3	84.4	95.2	84.4	94.0	83.2	8396	95.6
1997	7284.4	1067.0	79.1	83.7	79.1	83.6	77.9	82.4	6913	78.9
1998	8142.1	1067.0	88.4	84.3	88.4	84.2	87.1	83.0	7769	88.7
1999	8208.8	1067.0	89.2	84.8	89.1	84.8	87.8	83.6	7814	89.2
2000	8140.0	1067.0	88.3	85.2	88.3	85.1	86.8	83.9	7760	88.3
2001	7595.5	1067.0	82.5	84.9	82.4	84.9	81.3	83.7	7223	82.5
2002	5866.2	1067.0	63.1	83.1	63.1	83.1	62.8	81.9	5532	63.2
2003	0.0	1067.0	0.0	76.7	0.0	76.7	0.0	75.6	0	0.0



**JP-39 KASHIWAZAKI KARIWA-2****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	5424.0	5787.4	PF	C	PERIODICAL INSPECTION AND REFUELLING
15 Aug	3336.0	3559.5	UF3	A15	EXTENSION OF PERIODICAL INSPECTION DUE TO THE DERAY OF THE REPAIR OF PRIMARY LOOP RECIRCULATION PIPING, ETC.

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

Outage Cause	2003 Hours Lost			1991 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		3336			246	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling	5424			1075		
D. Inspection, maintenance or repair without refuelling				18		
Subtotal	5424	3336	0	1093	260	0
Total		8760			1353	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1991 to 2003 Average Hours Lost Per Year
13. Reactor Auxiliary Systems		17
15. Reactor Cooling Systems	3336	189
31. Turbine and auxiliaries		40
Total	3336	246

# JP-52 KASHIWAZAKI KARIWA-3

**Operator:** TEPCO (TOKYO ELECTRIC POWER CO.)  
**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1067.0 MW(e)  
**Design Net Capacity:** 1067.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 0.0 GW(e).h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>LF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>OF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EUf (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>PUF (%)</b>	100.0	100.0	100.0	100.0	54.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	45.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	62.5
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 07 Mar 1989  
**Date of First Criticality:** 19 Oct 1992  
**Date of Grid Connection:** 08 Dec 1992  
**Date of Commercial Operation:** 11 Aug 1993

**Lifetime Generation:** 75280.1 GW(e).h  
**Cumulative Energy Availability Factor:** 74.4%  
**Cumulative Load Factor:** 73.5%  
**Cumulative Unit Capability Factor:** 80.8%  
**Cumulative Energy Unavailability Factor:** 25.6%

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 (%)
1992	53.0	1067.0	0.0	0.0	0.6	100.0	0.6	0.0	367	4.2
1993	6488.4	1067.0	0.0	0.0	100.0	100.0	69.4	0.0	6755	77.1
1994	7264.4	1067.0	78.9	78.9	78.9	78.9	77.7	77.7	6961	79.5
1995	9253.9	1067.0	100.0	89.5	100.0	89.5	99.0	88.4	8760	100.0
1996	7921.6	1067.0	85.5	88.1	85.5	88.1	84.5	87.1	7508	85.5
1997	8016.2	1067.0	86.8	87.8	86.8	87.8	85.8	86.8	7601	86.8
1998	6748.0	1067.0	73.1	84.8	73.1	84.8	72.2	83.8	6467	73.8
1999	9028.3	1067.0	97.8	87.0	97.7	87.0	96.6	86.0	8568	97.8
2000	7945.1	1067.0	85.8	86.8	85.8	86.8	84.8	85.8	7539	85.8
2001	6985.7	1067.0	75.8	85.5	75.8	85.4	74.7	84.4	6639	75.8
2002	5575.5	1067.0	60.4	82.7	60.4	82.7	59.7	81.7	5300	60.5
2003	0.0	1067.0	0.0	74.4	0.0	74.4	0.0	73.5	0	0.0

**JP-52 KASHIWAZAKI KARIWA-3****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	3288.0	3508.3	PF	C	PERIODICAL INSPECTION AND REFUELLING
18 May	5472.0	5838.6	UF3	A11	EXTENSION OF PERIODICAL INSPECTION DUE TO THE DERAY OF THE REPAIR OF CORE SHROUD, ETC.

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

Outage Cause	2003 Hours Lost			1994 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		5472			258	
C. Inspection, maintenance or repair combined with refuelling	3288			1095		
Subtotal	3288	5472	0	1095	258	0
Total	8760			1353		

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1994 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	5472	235
15. Reactor Cooling Systems		23
Total	5472	258

# JP-53 KASHIWAZAKI KARIWA-4

**Operator:** TEPCO (TOKYO ELECTRIC POWER CO.)  
**Contractor:** HITACHI (HITACHI LTD.)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1067.0 MW(e)  
**Design Net Capacity:** 1067.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 4185.8 GW(e).h  
**Energy Availability Factor:** 45.0%  
**Load Factor:** 44.8%  
**Operating Factor:** 45.0%  
**Energy Unavailability Factor:** 55.0%  
**Total Off-line Time:** 4814 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	131.7	0.0	0.0	0.0	0.0	0.0	130.8	792.7	766.5	795.7	771.2	797.3	4185.8
<b>EAF (%)</b>	17.6	0.0	0.0	0.0	0.0	0.0	18.2	100.0	100.0	100.0	100.0	99.9	45.0
<b>UCF (%)</b>	18.6	0.0	0.0	0.0	0.0	0.0	18.2	100.0	100.0	100.0	100.0	99.9	45.1
<b>LF (%)</b>	16.6	0.0	0.0	0.0	0.0	0.0	16.5	99.9	99.8	100.1	100.4	100.4	44.8
<b>OF (%)</b>	16.1	0.0	0.0	0.0	0.0	0.0	20.7	100.0	100.0	99.9	100.0	100.0	45.0
<b>EUf (%)</b>	82.4	100.0	100.0	100.0	100.0	100.0	81.8	0.0	0.0	0.0	0.0	0.1	55.0
<b>PUF (%)</b>	81.4	100.0	100.0	70.1	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.1	29.0
<b>UCLF (%)</b>	0.0	0.0	0.0	29.9	100.0	100.0	79.6	0.0	0.0	0.0	0.0	0.0	25.9
<b>XUF (%)</b>	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 05 Mar 1990  
**Date of First Criticality:** 01 Nov 1993  
**Date of Grid Connection:** 21 Dec 1993  
**Date of Commercial Operation:** 11 Aug 1994

**Lifetime Generation:** 71155.3 GW(e).h  
**Cumulative Energy Availability Factor:** 78.3%  
**Cumulative Load Factor:** 77.3%  
**Cumulative Unit Capability Factor:** 81.2%  
**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 (%)
1993	11.6	1067.0	0.0	0.0	0.1	100.0	0.1	0.0	74	0.8
1994	6040.1	1067.0	0.0	0.0	99.9	100.0	64.6	0.0	6638	75.8
1995	6182.5	1067.0	67.0	67.0	67.0	67.0	66.1	66.1	5889	67.2
1996	8068.0	1067.0	87.0	77.0	87.1	77.0	86.1	76.1	7651	87.1
1997	7516.7	1067.0	81.7	78.6	81.5	78.5	80.4	77.6	7207	82.3
1998	9258.7	1067.0	100.0	83.9	100.0	83.9	99.1	82.9	8760	100.0
1999	8141.7	1067.0	88.1	84.8	88.1	84.7	87.1	83.8	7719	88.1
2000	6918.9	1067.0	75.1	83.2	75.1	83.1	73.8	82.1	6602	75.2
2001	5591.4	1067.0	60.6	79.9	60.6	79.9	59.8	78.9	5343	61.0
2002	9239.9	1067.0	100.0	82.4	99.9	82.4	98.9	81.4	8760	100.0
2003	4185.8	1067.0	45.0	78.3	45.0	78.3	44.8	77.3	3946	45.0

**JP-53 KASHIWAZAKI KARIWA-4****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
06 Jan	2525.0	2694.8	PF	C	PERIODICAL INSPECTION AND REFUELLING
22 Apr	2288.0	2441.9	UF3	A15	EXTENSION OF PERIODICAL INSPECTION DUE TO THE REPAIR OF PRIMARY LOOP RECIRCULATION PIPING, ETC.

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

Outage Cause	2003 Hours Lost			1995 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		2288			359	
C. Inspection, maintenance or repair combined with refuelling	2525			925		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					70	
Subtotal	2525	2288	0	925	429	0
Total		4813			1354	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1995 to 2003 Average Hours Lost Per Year
15. Reactor Cooling Systems	2288	
31. Turbine and auxiliaries		56
41. Main Generator Systems		207
42. Electrical Power Supply Systems		95
Total	2288	358

**JP-40 KASHIWAZAKI KARIWA-5**

Operator: TEPCO (TOKYO ELECTRIC POWER CO.)

Contractor: HITACHI (HITACHI LTD.)

**1. Station Details**

Type: BWR  
 Maximum Net Capacity  
 at the beginning of 2003: 1067.0 MW(e)  
 Design Net Capacity: 1067.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

**2. Production Summary 2003**

Energy Production: 1503.1 GW(e).h  
 Energy Availability Factor: 16.1%  
 Load Factor: 16.1%  
 Operating Factor: 15.9%  
 Energy Unavailability Factor: 83.9%  
 Total Off-line Time: 7368 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	793.6	709.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1503.1
EAF (%)	99.9	99.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.1
UCF (%)	99.9	99.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.1
LF (%)	100.0	98.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.1
OF (%)	100.0	96.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.9
EUf (%)	0.1	1.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	83.9
PUF (%)	0.1	1.0	100.0	100.0	100.0	43.3	0.0	0.0	0.0	0.0	0.0	0.0	28.8
UCLF (%)	0.0	0.0	0.0	0.0	0.0	56.7	100.0	100.0	100.0	100.0	100.0	100.0	55.1
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. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 20 Jun 1985  
 Date of First Criticality: 20 Jul 1989  
 Date of Grid Connection: 12 Sep 1989  
 Date of Commercial Operation: 10 Apr 1990

Lifetime Generation: 104808.4 GW(e).h  
 Cumulative Energy Availability Factor: 79.8%  
 Cumulative Load Factor: 78.8%  
 Cumulative Unit Capability Factor: 79.3%  
 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 (%)
1989	1041.5	1067.0	0.0	0.0	11.1	100.0	11.1	0.0	1850	21.1
1990	7910.6	1067.0	0.0	0.0	100.0	100.0	84.6	0.0	7597	86.7
1991	7093.3	1067.0	76.7	76.7	76.7	76.7	75.9	75.9	6789	77.5
1992	6977.5	1067.0	75.5	76.1	75.5	76.1	74.4	75.2	6715	76.4
1993	9238.2	1067.0	99.9	84.0	99.9	84.0	98.8	83.0	8760	100.0
1994	7154.7	1067.0	77.5	82.4	77.5	82.4	76.5	81.4	6825	77.9
1995	7508.3	1067.0	81.5	82.2	81.5	82.2	80.3	81.2	7183	82.0
1996	7905.8	1067.0	85.6	82.8	85.6	82.8	84.4	81.7	7524	85.7
1997	8919.1	1067.0	96.6	84.8	96.6	84.8	95.4	83.7	8472	96.7
1998	7352.6	1067.0	79.6	84.1	79.6	84.1	78.7	83.1	6995	79.9
1999	7771.8	1067.0	84.3	84.1	84.3	84.1	83.1	83.1	7383	84.3
2000	7042.7	1067.0	76.4	83.4	76.3	83.3	75.1	82.3	6712	76.4
2001	9198.6	1067.0	99.6	84.8	99.6	84.8	98.4	83.7	8760	100.0
2002	8191.0	1067.0	88.3	85.1	88.3	85.1	87.6	84.1	7743	88.4
2003	1503.1	1067.0	16.1	79.8	16.1	79.8	16.1	78.8	1392	15.9

**JP-40 KASHIWAZAKI KARIWA-5****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
28 Feb	2527.0	2693.7	PF	C	PERIODICAL INSPECTION AND REFUELLING
14 Jun	4824.0	5147.2	UF3	A15	EXTENSION OF PERIODICAL INSPECTION DUE TO THE DERAY OF THE REPAIR OF PRIMARY LOOP RECIRCULATION PIPING, ETC.

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

Outage Cause	2003 Hours Lost			1991 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		4824			9	
C. Inspection, maintenance or repair combined with refuelling	2527			1159		
D. Inspection, maintenance or repair without refuelling				18		
Subtotal	2527	4824	0	1177	9	0
Total		7351			1186	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1991 to 2003 Average Hours Lost Per Year
15. Reactor Cooling Systems	4824	
31. Turbine and auxiliaries		9
Total	4824	9

# JP-55 KASHIWAZAKI KARIWA-6

**Operator:** TEPCO (TOKYO ELECTRIC POWER CO.)

**Contractor:** TOSHI/GE (TOSHIBA CORPORATION/GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** ABWR  
**Maximum Net Capacity at the beginning of 2003:** 1315.0 MW(e)  
**Design Net Capacity:** 0.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 8401.2 GW(e).h  
**Energy Availability Factor:** 71.5%  
**Load Factor:** 72.9%  
**Operating Factor:** 70.4%  
**Energy Unavailability Factor:** 28.5%  
**Total Off-line Time:** 2597 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	809.0	0.0	0.0	0.0	668.0	944.6	1004.2	1001.3	970.2	1009.8	980.4	1013.6	8401.2
<b>EAF (%)</b>	83.0	0.0	0.0	0.0	68.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	71.5
<b>UCF (%)</b>	83.0	0.0	0.0	0.0	68.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	71.5
<b>LF (%)</b>	82.7	0.0	0.0	0.0	68.3	99.8	102.6	102.3	102.5	103.1	103.6	103.6	72.9
<b>OF (%)</b>	80.6	0.0	0.0	0.0	57.4	100.0	100.0	100.0	100.0	99.9	100.0	100.0	70.4
<b>EUf (%)</b>	17.0	100.0	100.0	100.0	31.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.5
<b>PUF (%)</b>	17.0	100.0	96.8	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.5
<b>UCLF (%)</b>	0.0	0.0	3.2	100.0	28.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.9
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 03 Nov 1992      **Lifetime Generation:** 74824.3 GW(e).h  
**Date of First Criticality:** 18 Dec 1995      **Cumulative Energy Availability Factor:** 85.8%  
**Date of Grid Connection:** 29 Jan 1996      **Cumulative Load Factor:** 85.7%  
**Date of Commercial Operation:** 07 Nov 1996      **Cumulative Unit Capability Factor:** 81.9%  
**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 (%)
1996	5663.2	1315.0	0.0	0.0	49.0	100.0	49.0	0.0	5240	59.7
1997	10161.5	1315.0	88.4	88.4	88.4	88.4	88.2	88.2	7752	88.5
1998	10702.3	1315.0	93.3	90.8	93.3	90.9	92.9	90.6	8217	93.8
1999	9710.4	1315.0	84.8	88.8	84.8	88.8	84.3	88.5	7480	85.4
2000	9411.6	1315.0	81.8	87.0	81.8	87.1	81.5	86.7	7183	81.8
2001	9270.0	1315.0	80.7	85.8	80.7	85.8	80.5	85.5	7079	80.8
2002	11504.1	1315.0	100.0	88.2	100.0	88.2	99.9	87.9	8760	100.0
2003	8401.2	1315.0	71.5	85.8	71.5	85.8	72.9	85.7	6163	70.4



**JP-55 KASHIWAZAKI KARIWA-6****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
26 Jan	1520.0	2151.0	PF	C	PERIODICAL INSPECTION AND REFUELLING
31 Mar	1060.0	1283.4	UF3	Z14	EXTENSION OF PERIODICAL INSPECTION DUE TO THE DERAY OF THE LEAK RATE INSPECTION OF PRIMARY CONTAINMENT VESSEL, ETC.

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

Outage Cause	2003 Hours Lost			1997 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					104	
C. Inspection, maintenance or repair combined with refuelling	1520			768		
Z. Others		1060				
Subtotal	1520	1060	0	768	104	0
Total		2580			872	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1997 to 2003 Average Hours Lost Per Year
13. Reactor Auxiliary Systems		12
21. Fuel Handling and Storage Facilities		48
41. Main Generator Systems		30
42. Electrical Power Supply Systems		14
Total	0	104

# JP-56 KASHIWAZAKI KARIWA-7

**Operator:** TEPCO (TOKYO ELECTRIC POWER CO.)  
**Contractor:** HITA/GE (HITACHI LTD./GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** ABWR  
**Maximum Net Capacity at the beginning of 2003:** 1315.0 MW(e)  
**Design Net Capacity:** 0.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 5778.5 GW(e).h  
**Energy Availability Factor:** 49.2%  
**Load Factor:** 50.2%  
**Operating Factor:** 49.1%  
**Energy Unavailability Factor:** 50.8%  
**Total Off-line Time:** 4458 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	1008.1	910.1	900.6	0.0	0.0	269.6	1000.8	995.0	694.2	0.0	0.0	0.0	5778.5
<b>EAF (%)</b>	100.0	100.0	89.7	0.0	0.0	30.0	100.0	100.0	72.5	0.0	0.0	0.0	49.2
<b>UCF (%)</b>	100.0	100.0	89.7	0.0	0.0	30.0	100.0	100.0	72.5	0.0	0.0	0.0	49.2
<b>LF (%)</b>	103.0	103.0	92.1	0.0	0.0	28.5	102.3	101.7	73.3	0.0	0.0	0.0	50.2
<b>OF (%)</b>	100.0	100.0	87.1	0.0	0.0	34.2	100.0	100.0	70.0	0.0	0.0	0.0	49.1
<b>EUf (%)</b>	0.0	0.0	10.3	100.0	100.0	70.0	0.0	0.0	27.5	100.0	100.0	100.0	50.8
<b>PUF (%)</b>	0.0	0.0	10.3	100.0	22.6	4.1	0.0	0.0	27.5	100.0	100.0	48.4	34.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	77.4	65.8	0.0	0.0	0.0	0.0	0.0	51.6	16.4
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jul 1993      **Lifetime Generation:** 61434.3 GW(e).h  
**Date of First Criticality:** 01 Nov 1996      **Cumulative Energy Availability Factor:** 77.0%  
**Date of Grid Connection:** 17 Dec 1996      **Cumulative Load Factor:** 77.0%  
**Date of Commercial Operation:** 02 Jul 1997      **Cumulative Unit Capability Factor:** 82.5%  
**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 (%)
1996	58.3	1315.0	0.0	0.0	0.5	100.0	0.5	0.0	257	3.0
1997	8127.9	1315.0	0.0	0.0	70.6	100.0	70.6	0.0	6764	77.2
1998	9715.6	1315.0	84.7	84.7	84.7	84.7	84.3	84.3	7452	85.1
1999	8445.4	1315.0	73.7	79.2	73.7	79.2	73.3	78.8	6458	73.7
2000	11240.2	1315.0	97.6	85.3	97.6	85.3	97.3	85.0	8587	97.8
2001	10078.4	1315.0	87.8	85.9	87.8	85.9	87.5	85.6	7752	88.5
2002	7990.0	1315.0	69.5	82.7	68.9	82.5	69.4	82.4	6089	69.5
2003	5778.5	1315.0	49.2	77.1	49.2	77.0	50.2	77.0	4302	49.1

## JP-56 KASHIWAZAKI KARIWA-7

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
28 Mar	965.0	1268.9	PF	D	PLANNED INSPECTION DUE TO THE LEAK RATE INSPECTION OF PRIMARY CONTAINMENT VESSEL.
08 May	1080.0	1419.9	UF3	A11	EXTENSION OF PLANNED INSPECTION DUE TO THE INSPECTION OF CORE SHROUD.
22 Sep	2022.0	2658.9	PF	C	PERIODICAL INSPECTION AND REFUELLING
16 Dec	384.0	505.0	UF3	Z	EXTENSION OF PERIODICAL INSPECTION DUE TO THE INSPECTION OF SUPPRESSION POOL.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1998 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		1080			283	
C. Inspection, maintenance or repair combined with refuelling	2022			964		
D. Inspection, maintenance or repair without refuelling	965					
Z. Others		384				
Subtotal	2987	1464	0	964	283	0
Total		4451			1247	

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

System	2003 Hours Lost	1998 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	1080	
12. Reactor I&C Systems		156
15. Reactor Cooling Systems		126
Total	1080	282

# JP-4 MIHAMA-1

**Operator:** KEPCO (KANSAI ELECTRIC POWER CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 320.0 MW(e)  
**Design Net Capacity:** 320.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 2880.6 GW(e).h  
**Energy Availability Factor:** 99.9%  
**Load Factor:** 102.8%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.1%  
**Total Off-line Time:** 0 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	248.1	223.9	248.2	239.9	246.2	236.1	241.2	238.2	231.5	243.9	237.1	246.4	2880.6
<b>EAF (%)</b>	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9
<b>UCF (%)</b>	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9
<b>LF (%)</b>	104.2	104.1	104.2	104.3	103.4	102.5	101.3	100.1	100.5	102.3	102.9	103.5	102.8
<b>OF (%)</b>	100.0	100.0	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.0
<b>EUf (%)</b>	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<b>PUf (%)</b>	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<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. 2003 Summary of Operation

## 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:** 47596.0 GW(e).h  
**Cumulative Energy Availability Factor:** 49.3%  
**Cumulative Load Factor:** 50.7%  
**Cumulative Unit Capability Factor:** 77.3%  
**Cumulative Energy Unavailability Factor:** 50.7%

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 (%)
1982	92.8	320.0	3.3	39.5	3.3	23.9	3.3	20.9	455	5.2
1983	1164.4	320.0	41.5	39.7	41.5	25.2	41.5	22.5	3731	42.6
1984	1576.6	320.0	56.0	40.9	56.0	27.4	56.1	24.9	5053	57.5
1985	2240.2	320.0	80.0	43.5	80.0	30.9	79.9	28.5	7077	80.8
1986	2707.2	320.0	96.6	46.8	96.3	35.0	96.6	32.8	8482	96.8
1987	2261.5	320.0	81.6	48.8	81.6	37.7	80.7	35.6	7150	81.6
1988	2075.4	320.0	75.4	50.3	75.4	39.8	73.8	37.7	6623	75.4
1989	1693.2	320.0	61.9	50.9	61.8	40.9	60.4	38.9	5418	61.8
1990	1938.2	320.0	66.9	51.7	66.9	42.2	69.1	40.4	6058	69.2
1991	2371.9	320.0	8.8	49.6	4.5	40.4	84.6	42.5	7615	86.9
1992	1041.1	320.0	37.2	49.1	37.2	40.3	37.0	42.2	3511	40.0
1993	1663.3	320.0	58.5	49.5	58.5	41.1	59.3	43.0	5300	60.5
1994	369.9	320.0	13.4	48.0	13.4	39.9	13.2	41.7	1160	13.2
1995	0.0	320.0	0.0	46.1	0.0	38.3	0.0	40.1	0	0.0
1996	2245.9	320.0	79.7	47.4	79.7	39.9	79.9	41.6	7186	81.8
1997	2271.5	320.0	80.8	48.6	80.8	41.4	81.0	43.1	7083	80.9
1998	2321.5	320.0	82.5	49.8	82.5	42.9	82.8	44.5	7304	83.4
1999	2530.4	320.0	90.0	51.2	90.0	44.5	90.3	46.1	8013	91.5
2000	2381.2	320.0	84.6	52.3	84.5	45.9	84.7	47.3	7439	84.7
2001	2104.4	320.0	75.0	53.0	74.9	46.8	75.1	48.2	6574	75.0
2002	2158.6	320.0	77.2	53.8	76.6	47.7	77.0	49.1	6767	77.2
2003	2880.6	320.0	99.9	55.2	99.9	49.3	102.8	50.7	8760	100.0

# JP-4 MIHAMA-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					1881	
C. Inspection, maintenance or repair combined with refuelling				1880		
D. Inspection, maintenance or repair without refuelling				333		
E. Testing of plant systems or components				0	0	
J. Grid failure or grid unavailability						1
Subtotal	0	0	0	2213	1881	1
Total	0			4095		

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		7
12. Reactor I&C Systems		8
15. Reactor Cooling Systems		21
16. Steam generation systems		1699
31. Turbine and auxiliaries		100
32. Feedwater and Main Steam System		35
42. Electrical Power Supply Systems		0
Total	0	1870

# JP-6 MIHAMA-2

**Operator:** KEPCO (KANSAI ELECTRIC POWER CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 470.0 MW(e)  
**Design Net Capacity:** 470.0 MW(e)  
**Design Discharge Burnup:** 43000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3400.2 GW(e).h  
**Energy Availability Factor:** 81.5%  
**Load Factor:** 82.6%  
**Operating Factor:** 82.0%  
**Energy Unavailability Factor:** 18.5%  
**Total Off-line Time:** 1578 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	357.8	323.1	357.6	345.5	336.7	340.9	348.5	344.5	121.0	0.0	166.2	358.4	3400.2
<b>EAF (%)</b>	99.9	99.9	99.9	99.9	95.0	99.9	99.9	99.9	36.2	0.0	47.9	99.9	81.5
<b>UCF (%)</b>	99.9	99.9	99.9	99.9	95.0	99.9	99.9	99.9	36.2	0.0	47.9	99.9	81.5
<b>LF (%)</b>	102.3	102.3	102.3	102.2	96.3	100.7	99.7	98.5	35.8	0.0	49.1	102.5	82.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	33.3	0.0	51.0	100.0	82.0
<b>EUf (%)</b>	0.1	0.1	0.1	0.1	5.0	0.1	0.1	0.1	63.8	100.0	52.1	0.1	18.5
<b>PUf (%)</b>	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	63.8	100.0	23.1	0.1	15.7
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	29.0	0.0	2.8
<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. 2003 Summary of Operation

PERIODICAL INSPECTION AND REFUELLING (2003/09/11-2003/11/09)

## 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:** 79122.2 GW(e).h  
**Cumulative Energy Availability Factor:** 60.6%  
**Cumulative Load Factor:** 60.7%  
**Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 39.4%

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	2238.9	470.0	54.2	53.6	54.2	53.5	54.4	53.2	4958	56.6
1983	1433.8	470.0	34.7	51.9	34.7	51.8	34.8	51.5	3262	37.2
1984	3937.3	470.0	96.3	55.6	96.3	55.5	95.4	55.2	8458	96.3
1985	2898.3	470.0	70.2	56.7	70.2	56.7	70.4	56.4	6219	71.0
1986	3301.5	470.0	80.2	58.4	80.0	58.3	80.2	58.1	7100	81.1
1987	2766.2	470.0	67.7	59.0	67.7	59.0	67.2	58.7	5927	67.7
1988	3223.1	470.0	77.8	60.2	77.8	60.1	78.1	59.9	6850	78.0
1989	3325.2	470.0	81.2	61.4	81.2	61.4	80.8	61.1	7112	81.2
1990	3077.1	470.0	72.7	62.0	72.7	62.0	74.7	61.9	6594	75.3
1991	447.1	470.0	10.0	59.3	10.0	59.3	10.9	59.2	950	10.8
1992	0.0	470.0	0.0	56.3	0.0	56.3	0.0	56.2	0	0.0
1993	0.0	470.0	0.0	53.6	0.0	53.6	0.0	53.5	0	0.0
1994	1186.3	470.0	29.9	52.6	29.9	52.5	28.8	52.4	2522	28.8
1995	3335.0	470.0	80.7	53.8	80.5	53.8	81.0	53.7	7138	81.5
1996	3762.4	470.0	90.6	55.3	90.5	55.3	91.1	55.2	8024	91.3
1997	3006.0	470.0	72.6	56.0	72.6	56.0	73.0	55.9	6417	73.3
1998	3396.3	470.0	82.0	57.0	82.0	57.0	82.5	57.0	7228	82.5
1999	2746.4	470.0	66.3	57.4	66.3	57.3	66.7	57.3	5821	66.4
2000	3839.7	470.0	92.5	58.6	92.5	58.6	93.0	58.6	8137	92.6
2001	2911.3	470.0	70.4	59.0	70.3	59.0	70.7	59.0	6177	70.5
2002	3611.3	470.0	87.2	60.0	87.2	59.9	87.7	60.0	7648	87.3
2003	3400.2	470.0	81.5	60.7	81.5	60.6	82.6	60.7	7182	82.0

## JP-6 MIHAMA-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
17 May	146.0	17.6	UP1	A32	LOAD LIMITATION CAUSED BY HIGH PRESSURE FEED WATER HEATER TUBE LEAK.
11 Sep	1368.0	643.6	PF	C	PERIODICAL INSPECTION AND REFUELLING.
09 Nov	209.0	98.2	UF2	A13	MANUAL TRIP CAUSED BY SLIGHT WATER LEAK FROM VENTING PIPE OF PRESSURIZER SPRAY PIPE.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1972 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		209			543	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1368			2587		
D. Inspection, maintenance or repair without refuelling				98		
Subtotal	1368	209	0	2685	544	0
Total		1577			3229	

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

System	2003 Hours Lost	1972 to 2003 Average Hours Lost Per Year
13. Reactor Auxiliary Systems	209	49
15. Reactor Cooling Systems		4
16. Steam generation systems		429
31. Turbine and auxiliaries		27
41. Main Generator Systems		4
42. Electrical Power Supply Systems		29
Total	209	542

# JP-14 MIHAMA-3

**Operator:** KEPCO (KANSAI ELECTRIC POWER CO.)  
**Contractor:** M (MITSUBISHI HEAVY INDUSTRY LTD)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 780.0 MW(e)  
**Design Net Capacity:** 780.0 MW(e)  
**Design Discharge Burnup:** 43000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6111.5 GW(e).h  
**Energy Availability Factor:** 87.9%  
**Load Factor:** 89.4%  
**Operating Factor:** 87.9%  
**Energy Unavailability Factor:** 12.1%  
**Total Off-line Time:** 1059 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	582.4	526.0	581.9	563.2	129.0	192.1	598.0	588.9	569.5	594.0	580.1	606.3	6111.5
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	22.1	33.4	100.0	100.0	100.0	100.0	100.0	100.0	87.9
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	22.1	33.5	100.0	100.0	100.0	100.0	100.0	100.0	87.9
<b>LF (%)</b>	100.4	100.4	100.3	100.4	22.2	34.2	103.0	101.5	101.4	102.2	103.3	104.5	89.4
<b>OF (%)</b>	100.0	100.0	100.0	100.0	19.4	36.4	100.0	100.0	100.0	99.9	100.0	100.0	87.9
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	77.9	66.6	0.0	0.0	0.0	0.0	0.0	0.0	12.1
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	77.9	66.6	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	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 07 Aug 1972      **Lifetime Generation:** 140912.4 GW(e).h  
**Date of First Criticality:** 28 Jan 1976      **Cumulative Energy Availability Factor:** 74.7%  
**Date of Grid Connection:** 19 Feb 1976      **Cumulative Load Factor:** 74.9%  
**Date of Commercial Operation:** 01 Dec 1976      **Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1982	5239.1	780.0	76.4	63.1	76.4	63.1	76.7	63.5	6952	79.4
1983	4818.0	780.0	70.6	64.2	70.6	64.2	70.5	64.5	6330	72.3
1984	5353.7	780.0	77.8	65.9	77.8	65.9	78.1	66.2	6906	78.6
1985	4971.9	780.0	72.7	66.7	72.6	66.7	72.8	66.9	6426	73.4
1986	6848.4	780.0	99.8	70.0	99.8	70.0	100.2	70.2	8760	100.0
1987	4822.7	780.0	71.5	70.1	71.6	70.1	70.6	70.3	6268	71.6
1988	4261.3	780.0	64.0	69.6	64.0	69.6	62.2	69.6	5625	64.0
1989	5299.7	780.0	78.0	70.3	78.0	70.2	77.6	70.2	6834	78.0
1990	6867.0	780.0	100.0	72.4	100.0	72.4	100.5	72.4	8760	100.0
1991	4246.2	780.0	59.7	71.5	59.7	71.5	62.1	71.7	5495	62.7
1992	4709.9	780.0	68.5	71.3	68.5	71.3	68.7	71.5	6095	69.4
1993	4526.6	780.0	66.4	71.0	66.1	71.0	66.2	71.2	5951	67.9
1994	6623.0	780.0	96.8	72.5	96.8	72.5	96.9	72.6	8486	96.9
1995	3389.2	780.0	49.7	71.3	49.6	71.3	49.6	71.4	4534	51.8
1996	4491.4	780.0	65.5	71.0	65.3	71.0	65.6	71.1	5760	65.6
1997	6262.8	780.0	91.2	72.0	91.2	71.9	91.7	72.1	7963	90.9
1998	5979.9	780.0	87.1	72.7	87.1	72.6	87.5	72.8	7788	88.9
1999	5795.3	780.0	84.4	73.2	84.4	73.1	84.8	73.3	7398	84.5
2000	4785.0	780.0	69.6	73.0	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



## JP-14 MIHAMA-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
07 May	1058.0	825.6	PF	C	PERIODICAL INSPECTION AND REFUELLING.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1976 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					115	
B. Refuelling without a maintenance					9	
C. Inspection, maintenance or repair combined with refuelling	1058			1891		
E. Testing of plant systems or components				0	4	
Subtotal	1058	0	0	1891	128	0
Total		1058			2019	

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

System	2003 Hours Lost	1976 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		39
15. Reactor Cooling Systems		13
16. Steam generation systems		34
32. Feedwater and Main Steam System		24
Total	0	110

# JP-15 OHI-1

**Operator:** KEPCO (KANSAI ELECTRIC POWER CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1120.0 MW(e)  
**Design Net Capacity:** 1120.0 MW(e)  
**Design Discharge Burnup:** 44000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8118.7 GW(e).h  
**Energy Availability Factor:** 81.8%  
**Load Factor:** 82.7%  
**Operating Factor:** 81.5%  
**Energy Unavailability Factor:** 18.2%  
**Total Off-line Time:** 1618 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	842.0	760.4	841.8	348.2	0.0	696.0	845.7	836.5	808.7	844.5	822.4	472.5	8118.7
<b>EAF (%)</b>	100.0	100.0	100.0	42.7	0.0	84.6	100.0	100.0	100.0	100.0	100.0	55.5	81.8
<b>UCF (%)</b>	100.0	100.0	100.0	42.7	0.0	84.6	100.0	100.0	100.0	100.0	100.0	55.5	81.8
<b>LF (%)</b>	101.0	101.0	101.0	43.2	0.0	86.3	101.5	100.4	100.3	101.2	102.0	56.7	82.7
<b>OF (%)</b>	100.0	100.0	100.0	40.1	0.0	87.2	100.0	100.0	100.0	99.9	100.0	53.0	81.5
<b>EUf (%)</b>	0.0	0.0	0.0	57.3	100.0	15.4	0.0	0.0	0.0	0.0	0.0	44.5	18.2
<b>PUf (%)</b>	0.0	0.0	0.0	57.3	100.0	15.4	0.0	0.0	0.0	0.0	0.0	0.0	14.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.5	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 26 Oct 1972      **Lifetime Generation:** 159452.9 GW(e).h  
**Date of First Criticality:** 02 Dec 1977      **Cumulative Energy Availability Factor:** 64.5%  
**Date of Grid Connection:** 23 Dec 1977      **Cumulative Load Factor:** 65.1%  
**Date of Commercial Operation:** 27 Mar 1979      **Cumulative Unit Capability Factor:** 77.3%  
**Cumulative Energy Unavailability Factor:** 35.5%

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 (%)
1982	6659.8	1120.0	67.5	45.9	67.5	45.9	67.9	46.1	6076	69.4
1983	8212.6	1120.0	83.0	55.1	82.9	55.1	83.7	55.5	7282	83.1
1984	7015.1	1120.0	70.8	58.3	70.8	58.3	71.3	58.7	6292	71.6
1985	5794.1	1120.0	59.0	58.4	58.7	58.3	59.1	58.7	5217	59.6
1986	5138.8	1120.0	52.2	57.5	52.2	57.5	52.4	57.8	4664	53.2
1987	9421.7	1120.0	95.3	62.2	95.3	62.2	96.0	62.6	8430	96.2
1988	3282.4	1120.0	34.8	59.2	34.8	59.1	33.4	59.3	3053	34.8
1989	2744.9	1120.0	29.5	56.2	29.5	56.2	28.0	56.2	2587	29.5
1990	5446.5	1120.0	52.9	55.9	52.9	55.9	55.5	56.1	4919	56.2
1991	5706.3	1120.0	55.8	55.9	55.8	55.9	58.2	56.3	5160	58.9
1992	5488.2	1120.0	55.5	55.9	55.4	55.8	55.8	56.3	4957	56.4
1993	5010.3	1120.0	50.7	55.5	50.7	55.5	51.1	55.9	4535	51.8
1994	6929.9	1120.0	70.2	56.5	69.9	56.4	70.6	56.9	6202	70.8
1995	6537.9	1120.0	66.1	57.1	66.1	57.0	66.6	57.5	6010	68.6
1996	7026.3	1120.0	70.7	57.9	70.7	57.8	71.4	58.3	6305	71.8
1997	7998.8	1120.0	80.8	59.1	80.7	59.1	81.5	59.6	7080	80.8
1998	9406.5	1120.0	95.0	61.0	95.0	61.0	95.9	61.5	8359	95.4
1999	6933.7	1120.0	70.0	61.5	70.0	61.4	70.7	62.0	6136	70.0
2000	6323.6	1120.0	63.7	61.6	63.6	61.6	64.3	62.1	5668	64.5
2001	9333.1	1120.0	94.5	63.1	94.2	63.0	95.1	63.6	8273	94.4
2002	7935.8	1120.0	80.3	63.8	80.2	63.8	80.9	64.3	7038	80.3
2003	8118.7	1120.0	81.8	64.6	81.8	64.5	82.7	65.1	7142	81.5

# JP-15 OHI-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
13 Apr	1267.0	1418.9	PF	C	PERIODICAL INSPECTION AND REFUELLING
05 Dec	350.0	370.7	UF2	A15	MANUAL TRIP CAUSED BY SLIGHT WATER LEAK FROM THE REACTOR COOLANT PUMP SEAL.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1979 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		350			346	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	1267			2576		
E. Testing of plant systems or components				57		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						0
Subtotal	1267	350	0	2633	349	0
Total		1617			2982	

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

System	2003 Hours Lost	1979 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		9
15. Reactor Cooling Systems	350	16
16. Steam generation systems		263
31. Turbine and auxiliaries		10
32. Feedwater and Main Steam System		15
42. Electrical Power Supply Systems		2
Total	350	316

# JP-19 OHI-2

**Operator:** KEPCO (KANSAI ELECTRIC POWER CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1120.0 MW(e)  
**Design Net Capacity:** 1120.0 MW(e)  
**Design Discharge Burnup:** 44000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 10075.6 GW(e).h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 102.7%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 0 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	866.4	780.6	868.6	837.0	860.3	826.6	845.9	841.1	812.9	850.8	828.0	857.4	10075.6
<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>	104.0	103.7	104.2	103.9	103.2	102.5	101.5	100.9	100.8	102.0	102.7	102.9	102.7
<b>OF (%)</b>	100.0	100.0	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 08 Dec 1972      **Lifetime Generation:** 173921.7 GW(e).h  
**Date of First Criticality:** 14 Sep 1978      **Cumulative Energy Availability Factor:** 71.5%  
**Date of Grid Connection:** 11 Oct 1978      **Cumulative Load Factor:** 71.9%  
**Date of Commercial Operation:** 05 Dec 1979      **Cumulative Unit Capability Factor:** 77.3%  
**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 (%)
1982	8648.6	1120.0	87.6	64.6	87.6	64.6	88.2	65.0	7877	89.9
1983	7443.8	1120.0	75.2	67.3	75.2	67.3	75.9	67.7	6670	76.1
1984	5793.5	1120.0	58.5	65.5	58.5	65.5	58.9	65.9	5208	59.3
1985	6843.0	1120.0	69.2	66.1	69.2	66.1	69.7	66.6	6260	71.5
1986	9858.9	1120.0	99.5	70.9	99.5	70.9	100.5	71.4	8760	100.0
1987	6238.1	1120.0	66.8	70.4	65.3	70.2	63.6	70.4	5789	66.1
1988	6112.3	1120.0	62.9	69.5	62.9	69.4	62.1	69.5	5525	62.9
1989	9828.0	1120.0	99.4	72.5	99.4	72.4	100.2	72.6	8707	99.4
1990	6685.7	1120.0	66.1	71.9	66.1	71.8	68.1	72.2	6069	69.3
1991	6409.5	1120.0	71.3	71.9	69.4	71.6	65.3	71.6	5903	67.4
1992	6973.3	1120.0	70.2	71.8	70.2	71.5	70.9	71.5	6178	70.3
1993	8863.9	1120.0	89.5	73.0	89.5	72.8	90.3	72.9	7903	90.2
1994	6680.0	1120.0	68.0	72.7	67.9	72.5	68.1	72.6	5929	67.7
1995	3273.5	1120.0	33.4	70.2	33.3	70.0	33.4	70.1	3060	34.9
1996	9738.2	1120.0	98.3	71.9	98.0	71.7	99.0	71.8	8662	98.6
1997	5316.5	1120.0	53.7	70.9	53.7	70.7	54.2	70.8	4753	54.3
1998	6501.3	1120.0	65.7	70.6	65.6	70.4	66.3	70.6	5760	65.8
1999	4511.1	1120.0	45.6	69.3	45.6	69.2	46.0	69.4	3994	45.6
2000	7796.8	1120.0	78.6	69.8	78.6	69.6	79.3	69.8	6987	79.5
2001	7163.5	1120.0	71.3	69.9	71.3	69.7	73.0	70.0	6302	71.9
2002	8265.6	1120.0	83.6	70.5	83.6	70.3	84.2	70.6	7326	83.6
2003	10075.6	1120.0	100.0	71.7	100.0	71.5	102.7	71.9	8760	100.0

## JP-19 OHI-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1980 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					362	
B. Refuelling without a maintenance					10	
C. Inspection, maintenance or repair combined with refuelling				2050		
D. Inspection, maintenance or repair without refuelling				18		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						5
Subtotal	0	0	0	2068	372	5
Total	0			2445		

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

System	2003 Hours Lost	1980 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		170
13. Reactor Auxiliary Systems		34
14. Safety Systems		1
15. Reactor Cooling Systems		11
16. Steam generation systems		138
31. Turbine and auxiliaries		4
41. Main Generator Systems		2
Total	0	360

## JP-50 OHI-3

Operator: KEPCO (KANSAI ELECTRIC POWER CO.)

Contractor: M (MITSUBISHI HEAVY INDUSTRY LTD)

### 1. Station Details

Type: PWR  
 Maximum Net Capacity at the beginning of 2003: 1127.0 MW(e)  
 Design Net Capacity: 1125.0 MW(e)  
 Design Discharge Burnup: 24000 MW.d/t

### 2. Production Summary 2003

Energy Production: 8683.2 GW(e).h  
 Energy Availability Factor: 85.9%  
 Load Factor: 88.0%  
 Operating Factor: 85.9%  
 Energy Unavailability Factor: 14.1%  
 Total Off-line Time: 1235 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	131.1	74.3	857.6	832.8	860.6	831.9	858.0	857.2	828.2	859.6	832.5	859.3	8683.2
EAF (%)	15.6	9.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	85.9
UCF (%)	15.6	9.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	85.9
LF (%)	15.6	9.8	102.3	102.8	102.6	102.5	102.3	102.2	102.1	102.4	102.6	102.5	88.0
OF (%)	12.9	12.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	85.9
EUf (%)	84.4	90.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.1
PUf (%)	84.4	90.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.1
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. 2003 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 03 Oct 1987      Lifetime Generation: 108184.5 GW(e).h  
 Date of First Criticality: 17 May 1991      Cumulative Energy Availability Factor: 88.6%  
 Date of Grid Connection: 07 Jun 1991      Cumulative Load Factor: 89.1%  
 Date of Commercial Operation: 18 Dec 1991      Cumulative Unit Capability Factor: 79.8%  
    Cumulative Energy Unavailability Factor: 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 (%)
1991	2524.4	1127.0	0.0	0.0	25.6	100.0	25.6	0.0	3228	36.9
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	89.7	79.4	89.7	79.7	90.1	7025	80.2
1994	8139.1	1127.0	82.5	87.3	82.5	87.3	82.4	87.6	7265	82.9
1995	7701.7	1127.0	77.8	85.0	77.8	85.0	78.0	85.2	6887	78.6
1996	9957.4	1127.0	100.0	88.0	100.0	88.0	100.6	88.3	8784	100.0
1997	8333.0	1127.0	83.9	87.3	83.9	87.3	84.4	87.6	7385	84.3
1998	8872.7	1127.0	89.3	87.6	89.3	87.6	89.9	87.9	7867	89.8
1999	8892.3	1127.0	89.9	87.9	89.5	87.8	90.1	88.2	7875	89.9
2000	8868.9	1127.0	89.1	88.0	89.1	88.0	89.6	88.4	7824	89.1
2001	8474.7	1127.0	85.4	87.7	85.4	87.7	85.8	88.1	7481	85.4
2002	9918.7	1127.0	100.0	88.8	100.0	88.8	100.5	89.2	8760	100.0
2003	8683.2	1127.0	85.9	88.6	85.9	88.6	88.0	89.1	7525	85.9

## JP-50 OHI-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
05 Jan	1235.0	1391.8	PF	C	PERIODICAL INSPECTION AND REFUELLING

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1993 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling	1235			955		
Subtotal	1235	0	0	955	0	0
Total	1235			955		

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

System	2003 Hours Lost	1993 to 2003 Average Hours Lost Per Year

# JP-51 OHI-4

**Operator:** KEPCO (KANSAI ELECTRIC POWER CO.)  
**Contractor:** M (MITSUBISHI HEAVY INDUSTRY LTD)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1127.0 MW(e)  
**Design Net Capacity:** 1125.0 MW(e)  
**Design Discharge Burnup:** 24000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8762.6 GW(e).h  
**Energy Availability Factor:** 86.3%  
**Load Factor:** 88.8%  
**Operating Factor:** 86.3%  
**Energy Unavailability Factor:** 13.7%  
**Total Off-line Time:** 1203 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	863.5	779.0	863.5	836.7	864.3	330.3	0.2	832.9	830.3	862.9	835.7	863.3	8762.6
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	39.5	0.0	96.9	100.0	100.0	100.0	100.0	86.3
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	39.5	0.0	96.9	100.0	100.0	100.0	100.0	86.3
<b>LF (%)</b>	103.0	102.9	103.0	103.3	103.1	40.7	0.0	99.3	102.3	102.8	103.0	103.0	88.8
<b>OF (%)</b>	100.0	100.0	100.0	100.1	100.0	36.7	0.0	99.6	100.0	99.9	100.0	100.0	86.3
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	60.5	100.0	3.1	0.0	0.0	0.0	0.0	13.7
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	60.5	100.0	3.1	0.0	0.0	0.0	0.0	13.7
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 13 Jun 1988  
**Date of First Criticality:** 28 May 1992  
**Date of Grid Connection:** 19 Jun 1992  
**Date of Commercial Operation:** 02 Feb 1993

**Lifetime Generation:** 95636.6 GW(e).h  
**Cumulative Energy Availability Factor:** 84.0%  
**Cumulative Load Factor:** 84.7%  
**Cumulative Unit Capability Factor:** 80.8%  
**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 (%)
1992	1999.3	1127.0	0.0	0.0	20.3	100.0	20.3	0.0	2742	31.3
1993	9923.5	1127.0	0.0	0.0	100.0	100.0	100.5	0.0	8760	100.0
1994	7851.5	1127.0	79.7	79.7	79.7	79.7	79.5	79.5	7063	80.6
1995	7495.1	1127.0	75.6	77.7	75.6	77.7	75.9	77.7	6695	76.4
1996	7051.1	1127.0	70.8	75.4	70.8	75.4	71.2	75.6	6221	70.8
1997	7660.2	1127.0	77.1	75.8	77.1	75.8	77.6	76.1	6756	77.1
1998	8839.4	1127.0	89.0	78.4	89.0	78.4	89.5	78.8	7835	89.4
1999	8903.4	1127.0	89.8	80.3	89.5	80.3	90.2	80.7	7872	89.9
2000	8649.8	1127.0	86.8	81.3	86.8	81.2	87.4	81.6	7629	86.9
2001	9283.6	1127.0	93.4	82.8	93.4	82.7	94.0	83.2	8179	93.4
2002	9217.1	1127.0	91.5	83.7	91.5	83.7	93.4	84.3	8017	91.5
2003	8762.6	1127.0	86.3	84.0	86.3	84.0	88.8	84.7	7557	86.3



## JP-51 OHI-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
12 Jun	1203.0	1355.3	PF	C	PERIODICAL INSPECTION AND REFUELLING

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1994 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure C. Inspection, maintenance or repair combined with refuelling	1203			943	319	
Subtotal	1203	0	0	943	319	0
Total	1203			1262		

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

System	2003 Hours Lost	1994 to 2003 Average Hours Lost Per Year
41. Main Generator Systems		319
Total	0	319

**JP-22 ONAGAWA-1**

Operator: TOHOKU (TOHOKU ELECTRIC POWER CO.)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

**1. Station Details**

Type: BWR  
 Maximum Net Capacity  
 at the beginning of 2003: 498.0 MW(e)  
 Design Net Capacity: 496.0 MW(e)  
 Design Discharge Burnup: 27500 MW.d/t

**2. Production Summary 2003**

Energy Production: 1856.1 GW(e).h  
 Energy Availability Factor: 42.5%  
 Load Factor: 42.5%  
 Operating Factor: 42.5%  
 Energy Unavailability Factor: 57.5%  
 Total Off-line Time: 5035 hours

**3. 2003 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	27.5	370.2	358.3	370.8	358.7	370.7	1856.1
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	7.3	100.0	100.0	100.0	100.0	100.0	42.5
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	7.3	100.0	100.0	100.0	100.0	100.0	42.6
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	7.4	99.9	99.9	99.9	100.0	100.0	42.5
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	7.1	100.0	100.0	99.9	100.0	100.0	42.5
EUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	92.7	0.0	0.0	0.0	0.0	0.0	57.5
PUF (%)	80.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.8
UCLF (%)	19.4	100.0	100.0	100.0	100.0	100.0	92.7	0.0	0.0	0.0	0.0	0.0	50.6
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. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 08 Jul 1980      Lifetime Generation: 65596.7 GW(e).h  
 Date of First Criticality: 18 Oct 1983      Cumulative Energy Availability Factor: 74.6%  
 Date of Grid Connection: 18 Nov 1983      Cumulative Load Factor: 74.8%  
 Date of Commercial Operation: 01 Jun 1984      Cumulative Unit Capability Factor: 77.8%  
    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 (%)
1983	100.6	498.0	0.0	0.0	85.6	100.0	2.3	0.0	766	8.7
1984	3558.2	496.0	0.0	0.0	81.7	100.0	81.7	0.0	7683	87.5
1985	3259.2	496.0	75.6	75.6	75.6	75.6	75.0	75.0	6681	76.3
1986	3366.6	496.0	78.0	76.8	77.9	76.8	77.5	76.2	6871	78.4
1987	3161.7	497.0	72.8	75.4	72.8	75.4	72.6	75.0	6500	74.2
1988	3410.6	496.0	78.6	76.2	78.6	76.2	78.3	75.8	6949	79.1
1989	3013.7	497.0	69.1	74.8	69.1	74.8	69.2	74.5	6177	70.5
1990	2850.7	497.0	65.6	73.3	65.6	73.3	65.5	73.0	5908	67.4
1991	3345.9	497.0	77.0	73.8	77.0	73.8	76.9	73.6	6954	79.4
1992	4120.5	497.0	94.7	76.4	94.7	76.4	94.4	76.2	8342	95.0
1993	2300.1	497.0	52.0	73.7	50.6	73.5	52.8	73.6	4666	53.3
1994	3428.8	497.0	78.7	74.2	78.6	74.1	78.8	74.1	6961	79.5
1995	2936.4	497.0	68.2	73.7	67.8	73.5	67.4	73.5	6000	68.5
1996	3727.2	498.0	85.6	74.7	85.6	74.5	85.2	74.5	7523	85.6
1997	3304.6	498.0	76.2	74.8	76.2	74.6	75.8	74.6	6708	76.6
1998	3359.5	498.0	76.9	74.9	76.4	74.8	77.0	74.7	6841	78.1
1999	4240.2	498.0	97.2	76.4	97.2	76.3	97.2	76.2	8517	97.2
2000	3689.1	498.0	84.7	76.9	84.6	76.8	84.3	76.8	7436	84.7
2001	3425.1	498.0	78.5	77.0	78.4	76.9	78.5	76.9	6873	78.5
2002	3143.2	498.0	68.5	76.5	68.5	76.4	72.1	76.6	6001	68.5
2003	1856.1	498.0	42.5	74.8	42.5	74.6	42.5	74.8	3725	42.5

## JP-22 ONAGAWA-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	600.0	298.8	PF	C	PERIODICAL INSPECTION AND REFUELLING
26 Jan	4434.0	2208.1	UF3	A15	EXTENSION OF PLANNED PERIODICAL INSPECTION (STRESS CORROSION CRACKING OF THE PRIMARY LOOP RECIRCULATION PIPING AND THE CORE SHROUD.)

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		4434			97	
C. Inspection, maintenance or repair combined with refuelling	600			1465		
D. Inspection, maintenance or repair without refuelling				334		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						5
Subtotal	600	4434	0	1799	97	5
Total		5034			1901	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
15. Reactor Cooling Systems	4434	23
31. Turbine and auxiliaries		38
32. Feedwater and Main Steam System		27
42. Electrical Power Supply Systems		7
Total	4434	95

# JP-54 ONAGAWA-2

**Operator:** TOHOKU (TOHOKU ELECTRIC POWER CO.)  
**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 796.0 MW(e)  
**Design Net Capacity:** 796.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 3272.4 GW(e).h  
**Energy Availability Factor:** 47.2%  
**Load Factor:** 46.9%  
**Operating Factor:** 47.2%  
**Energy Unavailability Factor:** 52.8%  
**Total Off-line Time:** 4621 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	589.2	533.2	589.3	569.9	388.5	0.0	0.0	0.0	0.0	0.0	12.4	589.9	3272.4
<b>EAF (%)</b>	100.0	100.0	100.0	99.9	66.1	0.0	0.0	0.0	0.0	0.0	2.5	100.0	47.2
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	67.3	0.0	0.0	0.0	0.0	0.0	2.5	100.0	47.3
<b>LF (%)</b>	99.5	99.7	99.5	99.6	65.6	0.0	0.0	0.0	0.0	0.0	2.2	99.6	46.9
<b>OF (%)</b>	100.0	100.0	100.0	100.1	64.5	0.0	0.0	0.0	0.0	0.0	4.9	100.0	47.2
<b>EUF (%)</b>	0.0	0.0	0.0	0.1	33.9	100.0	100.0	100.0	100.0	100.0	97.5	0.0	52.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	32.7	100.0	48.4	0.0	0.0	0.0	0.0	0.0	15.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	51.6	100.0	100.0	100.0	97.5	0.0	37.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 12 Apr 1991  
**Date of First Criticality:** 02 Nov 1994  
**Date of Grid Connection:** 23 Dec 1994  
**Date of Commercial Operation:** 28 Jul 1995

**Lifetime Generation:** 48987.4 GW(e).h  
**Cumulative Energy Availability Factor:** 79.7%  
**Cumulative Load Factor:** 79.7%  
**Cumulative Unit Capability Factor:** 81.6%  
**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 (%)
1995	4496.6	796.0	0.0	0.0	64.8	100.0	64.5	0.0	6510	74.3
1996	5175.3	796.0	74.4	74.4	74.4	74.4	74.0	74.0	6545	74.5
1997	6931.6	796.0	99.9	87.2	99.9	87.2	99.4	86.7	8760	100.0
1998	5647.7	796.0	81.1	85.2	80.8	85.1	81.0	84.8	7185	82.0
1999	5841.2	796.0	84.2	84.9	84.2	84.8	83.8	84.5	7383	84.3
2000	5858.6	796.0	84.3	84.8	84.2	84.7	83.8	84.4	7402	84.3
2001	6521.2	796.0	94.0	86.3	94.0	86.3	93.5	85.9	8238	94.0
2002	5242.9	796.0	72.4	84.3	72.4	84.3	75.2	84.4	6368	72.7
2003	3272.4	796.0	47.3	79.7	47.2	79.7	46.9	79.7	4139	47.2

## JP-54 ONAGAWA-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
21 May	1327.0	1053.2	PF	C	PERIODICAL INSPECTION AND REFUELLING
16 Jul	3294.0	2622.3	UF3	A15	EXTENSION OF PLANNED PERIODICAL INSPECTION (STRESS CORROSION CRACKING OF THE PRIMARY LOOP RECIRCULATION PIPING AND THE CORE SHROUD.)

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1995 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		3294			174	
C. Inspection, maintenance or repair combined with refuelling	1327			828		
D. Inspection, maintenance or repair without refuelling				69		
Subtotal	1327	3294	0	897	174	0
Total		4621			1071	

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

System	2003 Hours Lost	1995 to 2003 Average Hours Lost Per Year
15. Reactor Cooling Systems	3294	51
31. Turbine and auxiliaries		38
32. Feedwater and Main Steam System		85
Total	3294	174

**JP-57 ONAGAWA-3**

Operator: TOHOKU (TOHOKU ELECTRIC POWER CO.)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

**1. Station Details**

Type: BWR  
 Maximum Net Capacity  
 at the beginning of 2003: 796.0 MW(e)  
 Design Net Capacity: 0.0 MW(e)  
 Design Discharge Burnup: —

**2. Production Summary 2003**

Energy Production: 5978.2 GW(e).h  
 Energy Availability Factor: 83.7%  
 Load Factor: 85.7%  
 Operating Factor: 83.7%  
 Energy Unavailability Factor: 16.3%  
 Total Off-line Time: 1428 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	590.3	434.3	0.0	189.7	540.5	589.4	611.1	610.6	591.7	613.4	593.8	613.4	5978.2
EAF (%)	99.9	81.6	0.0	33.8	88.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	83.7
UCF (%)	99.9	81.6	0.0	33.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	84.7
LF (%)	99.7	81.2	0.0	33.1	91.3	102.8	103.2	103.1	103.2	103.4	103.6	103.6	85.7
OF (%)	100.0	78.6	0.0	36.7	88.7	100.0	100.0	100.0	100.0	99.9	100.0	100.0	83.7
EUf (%)	0.1	18.4	100.0	66.2	11.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.3
PUF (%)	0.1	18.4	100.0	66.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.3
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	11.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 23 Jan 1998  
 Date of First Criticality: 26 Apr 2001  
 Date of Grid Connection: 30 May 2001  
 Date of Commercial Operation: 30 Jan 2002

Lifetime Generation: 12630.8 GW(e).h  
 Cumulative Energy Availability Factor: 91.9%  
 Cumulative Load Factor: 90.6%  
 Cumulative Unit Capability Factor: 83.0%  
 Cumulative Energy Unavailability Factor: 8.1%

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	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

## JP-57 ONAGAWA-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
23 Feb	1343.0	1069.3	PF	C	PERIODICAL INSPECTION AND REFUELLING.(2003/02/23-2003/04/20)
26 May	84.0	66.6	XF	N	UNPLANNED OUTAGE DUE TO THE EARTHQUAKE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			2003 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling	1343					
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)			84			
Subtotal	1343	0	84	0	0	0
Total		1427			0	

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

System	2003 Hours Lost	2003 to 2003 Average Hours Lost Per Year

**JP-28 SENDAI-1**

Operator: KYUSHU (KYUSHU ELECTRIC POWER CO.)

Contractor: M (MITSUBISHI HEAVY INDUSTRY LTD)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 846.0 MW(e)  
 Design Net Capacity: 846.0 MW(e)  
 Design Discharge Burnup: 31000 MW.d/t

**2. Production Summary 2003**

Energy Production: 6282.1 GW(e).h  
 Energy Availability Factor: 83.1%  
 Load Factor: 84.8%  
 Operating Factor: 83.1%  
 Energy Unavailability Factor: 16.9%  
 Total Off-line Time: 1482 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	644.0	582.1	644.4	392.5	0.0	214.3	639.7	639.0	617.6	642.2	622.4	643.9	6282.1
EAF (%)	100.0	100.0	100.0	62.9	0.0	34.6	100.0	100.0	100.0	100.0	100.0	100.0	83.1
UCF (%)	100.0	100.0	100.0	62.9	0.0	34.6	100.0	100.0	100.0	100.0	100.0	100.0	83.1
LF (%)	102.3	102.4	102.4	64.5	0.0	35.2	101.6	101.5	101.4	101.9	102.2	102.3	84.8
OF (%)	100.0	100.0	100.0	60.1	0.0	37.5	100.0	100.0	100.0	99.9	100.0	100.0	83.1
EUf (%)	0.0	0.0	0.0	37.1	100.0	65.4	0.0	0.0	0.0	0.0	0.0	0.0	16.9
PUf (%)	0.0	0.0	0.0	37.1	100.0	65.4	0.0	0.0	0.0	0.0	0.0	0.0	16.9
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. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 15 Dec 1979      Lifetime Generation: 122902.2 GW(e).h  
 Date of First Criticality: 25 Aug 1983      Cumulative Energy Availability Factor: 81.6%  
 Date of Grid Connection: 16 Sep 1983      Cumulative Load Factor: 82.5%  
 Date of Commercial Operation: 04 Jul 1984      Cumulative Unit Capability Factor: 77.8%  
    Cumulative Energy Unavailability Factor: 18.4%

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	666.3	846.0	0.0	0.0	78.8	100.0	9.4	0.0	1760	21.0
1984	6069.8	846.0	0.0	0.0	81.1	100.0	81.7	0.0	7487	85.2
1985	5890.3	846.0	78.7	78.7	78.7	78.7	79.5	79.5	6964	79.5
1986	6084.0	846.0	81.4	80.0	81.4	80.0	82.1	80.8	7224	82.5
1987	6113.4	846.0	81.7	80.6	81.7	80.6	82.5	81.4	7261	82.9
1988	5683.1	846.0	75.8	79.4	75.8	79.4	76.5	80.1	6756	76.9
1989	7381.3	846.0	98.7	83.3	98.7	83.3	99.6	84.0	8641	98.6
1990	6155.0	846.0	82.3	83.1	82.3	83.1	83.1	83.9	7307	83.4
1991	5590.7	846.0	74.8	81.9	74.8	81.9	75.4	82.7	6684	76.3
1992	5713.9	846.0	76.1	81.2	76.1	81.2	76.9	81.9	6780	77.2
1993	6619.2	846.0	88.4	82.0	88.4	82.0	89.3	82.8	7753	88.5
1994	5778.3	846.0	77.2	81.5	77.2	81.5	78.0	82.3	6762	77.2
1995	5780.3	846.0	77.3	81.1	77.3	81.1	78.0	81.9	6863	78.3
1996	5185.4	846.0	69.1	80.1	69.1	80.1	69.8	80.9	6157	70.1
1997	7216.7	846.0	96.4	81.4	96.4	81.4	97.4	82.1	8449	96.4
1998	5291.2	846.0	70.6	80.6	70.6	80.6	71.4	81.4	6311	72.0
1999	6057.6	846.0	80.8	80.6	80.8	80.6	81.7	81.4	7082	80.8
2000	5654.0	846.0	75.2	80.3	75.2	80.3	76.1	81.1	6609	75.2
2001	7367.0	846.0	98.3	81.3	98.3	81.3	99.4	82.1	8614	98.3
2002	6323.0	846.0	83.7	81.5	83.7	81.5	85.3	82.3	7333	83.7
2003	6282.1	846.0	83.1	81.5	83.1	81.6	84.8	82.5	7278	83.1



## JP-28 SENDAI-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
19 Apr	1481.0	1253.2	PF	C	PERIODICAL INSPECTION AND REFUELLING.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure C. Inspection, maintenance or repair combined with refuelling	1481			1454	63	
Subtotal	1481	0	0	1454	63	0
Total	1481			1517		

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		14
16. Steam generation systems		35
31. Turbine and auxiliaries		11
Total	0	62

# JP-37 SENDAI-2

**Operator:** KYUSHU (KYUSHU ELECTRIC POWER CO.)  
**Contractor:** M (MITSUBISHI HEAVY INDUSTRY LTD)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 846.0 MW(e)  
**Design Net Capacity:** 846.0 MW(e)  
**Design Discharge Burnup:** 31000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6348.8 GW(e).h  
**Energy Availability Factor:** 83.4%  
**Load Factor:** 85.7%  
**Operating Factor:** 83.5%  
**Energy Unavailability Factor:** 16.6%  
**Total Off-line Time:** 1445 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	647.0	584.3	646.9	625.9	645.4	622.4	643.8	60.2	1.5	593.3	628.5	649.5	6348.8
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	9.4	0.2	91.6	100.0	100.0	83.4
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	9.4	0.2	91.6	100.0	100.0	83.4
<b>LF (%)</b>	102.8	102.8	102.8	102.9	102.5	102.2	102.3	9.6	0.3	94.1	103.2	103.2	85.7
<b>OF (%)</b>	100.0	100.0	100.0	100.1	100.0	100.0	100.0	6.5	1.5	94.5	100.0	100.0	83.5
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.6	99.8	8.4	0.0	0.0	16.6
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.6	99.8	8.4	0.0	0.0	16.6
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 12 Oct 1981      **Lifetime Generation:** 114613.6 GW(e).h  
**Date of First Criticality:** 18 Mar 1985      **Cumulative Energy Availability Factor:** 82.8%  
**Date of Grid Connection:** 05 Apr 1985      **Cumulative Load Factor:** 83.8%  
**Date of Commercial Operation:** 28 Nov 1985      **Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1985	2816.1	846.0	0.0	0.0	38.4	100.0	38.4	0.0	4327	49.9
1986	5996.4	846.0	80.1	80.1	80.1	80.1	80.9	80.9	7112	81.2
1987	6080.6	846.0	81.2	80.7	81.2	80.7	82.0	81.5	7211	82.3
1988	7409.8	846.0	98.7	86.7	98.7	86.7	99.7	87.6	8665	98.6
1989	4999.4	846.0	66.8	81.7	66.8	81.7	67.5	82.5	5950	67.9
1990	6160.1	846.0	82.4	81.9	82.4	81.9	83.1	82.7	7309	83.4
1991	5665.3	846.0	75.7	80.8	75.7	80.8	76.4	81.6	6732	76.8
1992	7385.3	846.0	98.3	83.3	98.3	83.3	99.4	84.2	8639	98.3
1993	5822.0	846.0	77.7	82.6	77.7	82.6	78.6	83.5	6632	75.7
1994	5568.8	846.0	74.3	81.7	74.3	81.7	75.1	82.5	6557	74.9
1995	5658.4	846.0	75.5	81.1	75.5	81.1	76.4	81.9	6709	76.6
1996	7359.3	846.0	98.0	82.6	98.0	82.6	99.0	83.5	8617	98.1
1997	5950.3	846.0	79.4	82.4	79.4	82.4	80.3	83.2	7034	80.3
1998	5899.1	846.0	78.7	82.1	78.7	82.1	79.6	82.9	6973	79.6
1999	5658.3	846.0	75.5	81.6	75.5	81.6	76.4	82.5	6612	75.5
2000	7370.2	846.0	98.0	82.7	98.0	82.7	99.2	83.6	8614	98.1
2001	6210.2	846.0	82.9	82.7	82.9	82.7	83.8	83.6	7260	82.9
2002	6255.5	846.0	82.8	82.7	82.8	82.7	84.4	83.6	7257	82.8
2003	6348.8	846.0	83.4	82.8	83.4	82.8	85.7	83.8	7315	83.5

## JP-37 SENDAI-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
03 Aug	1444.0	1231.0	PF	C	PERIODICAL INSPECTION AND REFUELLING.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1986 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling	1444			1430		
Subtotal	1444	0	0	1430	0	0
Total	1444			1430		

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

System	2003 Hours Lost	1986 to 2003 Average Hours Lost Per Year

**JP-48 SHIKA-1**

Operator: HOKURIKU (HOKURIKU ELECTRIC POWER CO.)

Contractor: HITACHI (HITACHI LTD.)

**1. Station Details**

Type: BWR  
 Maximum Net Capacity  
 at the beginning of 2003: 505.0 MW(e)  
 Design Net Capacity: 513.0 MW(e)  
 Design Discharge Burnup: —

**2. Production Summary 2003**

Energy Production: 1523.8 GW(e).h  
 Energy Availability Factor: 34.6%  
 Load Factor: 34.4%  
 Operating Factor: 34.6%  
 Energy Unavailability Factor: 65.4%  
 Total Off-line Time: 5731 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	376.8	340.0	375.7	244.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	187.2	1523.8
EAF (%)	100.0	100.0	100.0	66.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.8	34.6
UCF (%)	100.0	100.0	100.0	66.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.8	34.6
LF (%)	100.3	100.2	100.0	67.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49.8	34.4
OF (%)	100.0	100.0	100.0	63.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	55.6	34.6
EUF (%)	0.0	0.0	0.0	34.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	47.2	65.4
PUF (%)	0.0	0.0	0.0	34.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	47.2	65.4
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. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Jul 1989      Lifetime Generation: 37638.1 GW(e).h  
 Date of First Criticality: 20 Nov 1992      Cumulative Energy Availability Factor: 78.7%  
 Date of Grid Connection: 12 Jan 1993      Cumulative Load Factor: 78.6%  
 Date of Commercial Operation: 30 Jul 1993      Cumulative Unit Capability Factor: 80.8%  
    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 (%)
1993	2834.3	505.0	0.0	0.0	99.9	100.0	64.1	0.0	6576	75.1
1994	3312.4	505.0	75.0	75.0	75.0	75.0	74.9	74.9	6584	75.2
1995	3497.2	505.0	79.0	77.0	79.0	77.0	79.1	77.0	6974	79.6
1996	3454.7	505.0	77.9	77.3	77.9	77.3	77.9	77.3	6848	78.0
1997	4431.8	505.0	100.0	83.0	100.0	83.0	100.2	83.0	8760	100.0
1998	3530.6	505.0	80.0	82.4	80.0	82.4	79.8	82.4	7047	80.4
1999	3325.7	505.0	75.4	81.2	75.4	81.2	75.2	81.2	6607	75.4
2000	3763.1	505.0	84.9	81.8	84.9	81.8	84.8	81.7	7462	84.9
2001	4427.4	505.0	100.0	84.0	100.0	84.0	100.1	84.0	8760	100.0
2002	3537.1	505.0	80.0	83.6	80.0	83.6	80.0	83.5	7010	80.0
2003	1523.8	505.0	34.6	78.7	34.6	78.7	34.4	78.6	3029	34.6

## JP-48 SHIKA-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
20 Apr	5731.0	2894.3	PF	C	PERIODICAL INSPECTION AND REFUELLING.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1994 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure C. Inspection, maintenance or repair combined with refuelling	5731			1143	141	
Subtotal	5731	0	0	1143	141	0
Total	5731			1284		

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

System	2003 Hours Lost	1994 to 2003 Average Hours Lost Per Year
15. Reactor Cooling Systems		95
31. Turbine and auxiliaries		15
42. Electrical Power Supply Systems		30
Total	0	140

# JP-7 SHIMANE-1

**Operator:** CHUGOKU (CHUGOKU ELECTRIC POWER CO.)  
**Contractor:** HITACHI (HITACHI LTD.)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 439.0 MW(e)  
**Design Net Capacity:** 439.0 MW(e)  
**Design Discharge Burnup:** 32000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 2749.0 GW(e).h  
**Energy Availability Factor:** 71.4%  
**Load Factor:** 71.5%  
**Operating Factor:** 71.4%  
**Energy Unavailability Factor:** 28.6%  
**Total Off-line Time:** 2507 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	327.9	296.2	327.9	317.3	327.7	315.7	326.0	325.9	167.5	0.0	0.0	16.9	2749.0
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	53.1	0.0	0.0	5.2	71.4
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	53.1	0.0	0.0	5.2	71.4
<b>LF (%)</b>	100.4	100.4	100.4	100.5	100.3	99.9	99.8	99.8	53.0	0.0	0.0	5.2	71.5
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	50.0	0.0	0.0	8.3	71.4
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.9	100.0	100.0	94.8	28.6
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.9	100.0	100.0	42.0	24.1
<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	52.8	4.5
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 02 Jul 1970      **Lifetime Generation:** 83739.3 GW(e).h  
**Date of First Criticality:** 01 Jun 1973      **Cumulative Energy Availability Factor:** 72.5%  
**Date of Grid Connection:** 02 Dec 1973      **Cumulative Load Factor:** 72.3%  
**Date of Commercial Operation:** 29 Mar 1974      **Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	2366.8	439.0	61.5	66.6	61.5	66.6	61.5	66.1	5499	62.8
1983	2696.1	439.0	70.1	67.0	70.1	67.0	70.1	66.5	6268	71.6
1984	2990.7	439.0	78.2	68.1	78.2	68.1	77.6	67.6	6912	78.7
1985	3790.4	439.0	100.0	71.0	99.1	70.9	98.6	70.5	8705	99.4
1986	2130.5	439.0	55.5	69.7	55.5	69.6	55.4	69.2	4903	56.0
1987	3011.2	439.0	79.4	70.5	78.6	70.3	78.3	69.9	6937	79.2
1988	2355.1	439.0	61.1	69.8	61.1	69.7	61.1	69.3	5398	61.5
1989	2616.3	439.0	68.1	69.7	68.1	69.6	68.0	69.2	5965	68.1
1990	3745.5	439.0	97.3	71.4	97.4	71.3	97.4	70.9	8565	97.8
1991	3111.3	439.0	80.9	72.0	80.9	71.9	80.9	71.5	7123	81.3
1992	2671.3	439.0	73.4	72.0	69.4	71.7	69.3	71.4	6134	69.8
1993	2549.1	439.0	66.5	71.7	66.5	71.4	66.3	71.1	5849	66.8
1994	2948.0	439.0	76.7	72.0	76.7	71.7	76.7	71.4	6733	76.9
1995	2984.6	439.0	78.0	72.3	78.1	72.0	77.6	71.7	6862	78.3
1996	2245.5	439.0	58.4	71.7	58.4	71.4	58.2	71.1	5154	58.7
1997	2923.6	439.0	76.2	71.8	76.2	71.6	76.0	71.3	6712	76.6
1998	3845.4	439.0	100.0	73.0	100.0	72.8	100.0	72.5	8760	100.0
1999	3359.3	439.0	87.4	73.6	87.4	73.4	87.4	73.1	7657	87.4
2000	1381.2	439.0	35.8	72.1	35.8	71.9	35.8	71.7	3149	35.8
2001	2844.6	439.0	74.0	72.2	74.1	72.0	74.0	71.7	6488	74.1
2002	3393.2	439.0	88.2	72.8	88.2	72.6	88.2	72.3	7730	88.2
2003	2749.0	439.0	71.4	72.7	71.4	72.5	71.5	72.3	6253	71.4

## JP-7 SHIMANE-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
16 Sep	2113.0	928.0	PF	C	PERIODICAL INSPECTION AND REFUELLING
14 Dec	393.0	172.5	UF3	Z	EXTENSION OF PERIODICAL INSPECTION

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					15	
C. Inspection, maintenance or repair combined with refuelling	2113			2083		
D. Inspection, maintenance or repair without refuelling				82		
J. Grid failure or grid unavailability						3
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					11	
Z. Others		393				
Subtotal	2113	393	0	2165	26	3
Total		2506			2194	

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

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
15. Reactor Cooling Systems		13
31. Turbine and auxiliaries		2
Total	0	15

# JP-41 SHIMANE-2

**Operator:** CHUGOKU (CHUGOKU ELECTRIC POWER CO.)  
**Contractor:** HITACHI (HITACHI LTD.)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 789.0 MW(e)  
**Design Net Capacity:** 789.0 MW(e)  
**Design Discharge Burnup:** 32000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4836.2 GW(e).h  
**Energy Availability Factor:** 70.0%  
**Load Factor:** 70.0%  
**Operating Factor:** 70.0%  
**Energy Unavailability Factor:** 30.0%  
**Total Off-line Time:** 2627 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	586.4	529.0	586.0	262.2	0.0	0.0	0.0	561.0	565.5	585.8	568.9	591.6	4836.2
<b>EAF (%)</b>	100.0	100.0	100.0	46.2	0.0	0.0	0.0	95.8	99.8	100.0	100.0	100.0	70.0
<b>UCF (%)</b>	100.0	100.0	100.0	46.2	0.0	0.0	0.0	96.2	100.0	100.0	100.0	100.0	70.1
<b>LF (%)</b>	99.9	99.8	99.8	46.2	0.0	0.0	0.0	95.6	99.5	99.7	100.1	100.8	70.0
<b>OF (%)</b>	100.0	100.0	100.0	43.4	0.0	0.0	0.0	98.5	100.0	99.9	100.0	100.0	70.0
<b>EUf (%)</b>	0.0	0.0	0.0	53.8	100.0	100.0	100.0	4.2	0.2	0.0	0.0	0.0	30.0
<b>PUf (%)</b>	0.0	0.0	0.0	53.8	100.0	100.0	22.6	0.9	0.0	0.0	0.0	0.0	23.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	77.4	2.8	0.0	0.0	0.0	0.0	6.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 02 Feb 1985  
**Date of First Criticality:** 25 May 1988  
**Date of Grid Connection:** 11 Jul 1988  
**Date of Commercial Operation:** 10 Feb 1989

**Lifetime Generation:** 89105.3 GW(e).h  
**Cumulative Energy Availability Factor:** 84.7%  
**Cumulative Load Factor:** 84.6%  
**Cumulative Unit Capability Factor:** 78.8%  
**Cumulative Energy Unavailability Factor:** 15.3%

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 (%)
1988	1317.1	890.0	0.0	0.0	17.3	100.0	17.3	0.0	2474	29.0
1989	5852.1	791.0	0.0	0.0	90.1	100.0	84.5	0.0	7485	85.4
1990	5123.5	790.0	74.0	74.0	74.0	74.0	74.0	74.0	6592	75.3
1991	5544.5	790.0	80.1	77.1	80.1	77.1	80.1	77.1	7121	81.3
1992	5516.1	790.0	79.7	78.0	79.7	77.9	79.5	77.9	7072	80.5
1993	6756.9	790.0	97.8	82.9	97.8	82.9	97.6	82.8	8592	98.1
1994	5547.3	790.0	80.6	82.5	80.6	82.4	80.2	82.3	7071	80.7
1995	5363.6	790.0	77.9	81.7	77.9	81.7	77.5	81.5	6888	78.6
1996	5583.7	790.0	80.8	81.6	80.8	81.6	80.5	81.3	7166	81.6
1997	6903.2	789.0	100.0	83.9	100.0	83.8	99.9	83.7	8760	100.0
1998	5962.5	789.0	86.5	84.2	86.5	84.1	86.3	83.9	7600	86.8
1999	5758.7	789.0	83.5	84.1	83.5	84.1	83.3	83.9	7319	83.6
2000	6084.0	789.0	88.2	84.5	88.1	84.4	87.8	84.2	7747	88.2
2001	6901.0	789.0	100.0	85.8	100.0	85.7	99.8	85.5	8760	100.0
2002	6055.1	789.0	87.6	85.9	87.6	85.9	87.6	85.7	7678	87.6
2003	4836.2	789.0	70.1	84.8	70.0	84.7	70.0	84.6	6133	70.0



## JP-41 SHIMANE-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
14 Apr	2026.0	1598.4	PF	C	PERIODICAL INSPECTION AND REFUELLING
08 Jul	597.0	471.0	UF3	Z	EXTENSION OF PERIODICAL INSPECTION
04 Aug	1152.0	3.7	XP	N	RISE OF SEAWATER TEMPARATURE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1989 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					97	
B. Refuelling without a maintenance					7	
C. Inspection, maintenance or repair combined with refuelling	2026			983		
D. Inspection, maintenance or repair without refuelling				7		
Z. Others		597				
Subtotal	2026	597	0	990	104	0
Total	2623			1094		

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

System	2003 Hours Lost	1989 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		24
15. Reactor Cooling Systems		11
Total	0	41

# JP-8 TAKAHAMA-1

**Operator:** KEPCO (KANSAI ELECTRIC POWER CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 780.0 MW(e)  
**Design Net Capacity:** 780.0 MW(e)  
**Design Discharge Burnup:** 43000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6247.2 GW(e).h  
**Energy Availability Factor:** 87.2%  
**Load Factor:** 91.4%  
**Operating Factor:** 87.2%  
**Energy Unavailability Factor:** 12.8%  
**Total Off-line Time:** 1123 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	0.0	237.0	611.8	592.3	611.4	590.4	607.7	603.5	584.0	608.0	590.1	610.9	6247.2
EAF (%)	0.0	43.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	87.2
UCF (%)	0.0	43.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	87.2
LF (%)	0.0	45.2	105.4	105.6	105.4	105.1	104.7	104.0	104.0	104.6	105.1	105.3	91.4
OF (%)	0.0	43.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	87.2
EUf (%)	100.0	56.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.8
PUf (%)	100.0	56.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.8
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. 2003 Summary of Operation

## 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:** 133749.9 GW(e).h  
**Cumulative Energy Availability Factor:** 65.8%  
**Cumulative Load Factor:** 66.1%  
**Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	3872.1	780.0	56.5	42.9	56.5	42.9	56.7	43.0	5085	58.0
1983	5716.2	780.0	83.7	47.5	83.8	47.5	83.7	47.5	7403	84.5
1984	3537.4	780.0	51.4	47.9	51.4	47.9	51.6	47.9	4586	52.2
1985	5000.8	780.0	72.8	50.1	72.8	50.1	73.2	50.2	6473	73.9
1986	5070.3	780.0	73.9	52.1	73.9	52.1	74.2	52.2	6507	74.3
1987	4701.4	780.0	70.2	53.5	70.2	53.5	68.8	53.5	6148	70.2
1988	4147.1	780.0	60.9	54.0	60.9	54.0	60.5	54.0	5351	60.9
1989	4877.3	780.0	72.0	55.2	72.0	55.2	71.4	55.1	6311	72.0
1990	6265.5	780.0	90.8	57.4	90.8	57.4	91.7	57.4	8002	91.3
1991	4795.0	780.0	68.3	58.1	68.2	58.1	70.2	58.2	6202	70.8
1992	4645.0	780.0	67.6	58.6	67.6	58.6	67.8	58.7	6051	68.9
1993	3299.7	780.0	48.4	58.1	48.4	58.1	48.3	58.2	4458	50.9
1994	4024.0	780.0	58.8	58.1	58.8	58.1	58.9	58.2	5146	58.7
1995	6585.1	780.0	96.0	59.9	96.0	59.9	96.4	60.0	8485	96.9
1996	3358.8	780.0	48.8	59.4	48.8	59.4	49.0	59.5	4331	49.3
1997	4674.4	780.0	68.1	59.8	68.1	59.8	68.4	59.9	6000	68.5
1998	6856.8	780.0	100.0	61.5	100.0	61.5	100.4	61.6	8760	100.0
1999	5704.2	780.0	84.3	62.4	83.2	62.3	83.5	62.5	7291	83.2
2000	6008.1	780.0	87.4	63.3	87.4	63.3	87.7	63.4	7716	87.8
2001	6005.8	780.0	87.6	64.2	87.6	64.2	87.9	64.3	7731	88.3
2002	6056.3	780.0	88.4	65.1	88.4	65.1	88.6	65.2	7749	88.5
2003	6247.2	780.0	87.2	65.9	87.2	65.8	91.4	66.1	7637	87.2

# JP-8 TAKAHAMA-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	1123.0	876.3	PF	C	PERIODICAL INSPECTION AND REFUELLING.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					441	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1123			2067		
D. Inspection, maintenance or repair without refuelling				237		
E. Testing of plant systems or components				0		
J. Grid failure or grid unavailability						3
Subtotal	1123	0	0	2304	442	3
Total		1123			2749	

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

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		8
15. Reactor Cooling Systems		109
16. Steam generation systems		273
31. Turbine and auxiliaries		19
32. Feedwater and Main Steam System		29
42. Electrical Power Supply Systems		0
Total	0	438

# JP-13 TAKAHAMA-2

**Operator:** KEPCO (KANSAI ELECTRIC POWER CO.)

**Contractor:** M (MITSUBISHI HEAVY INDUSTRY LTD)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 780.0 MW(e)  
**Design Net Capacity:** 780.0 MW(e)  
**Design Discharge Burnup:** 43000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5470.8 GW(e).h  
**Energy Availability Factor:** 76.4%  
**Load Factor:** 80.1%  
**Operating Factor:** 76.7%  
**Energy Unavailability Factor:** 23.6%  
**Total Off-line Time:** 2043 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	612.0	553.0	611.9	591.3	608.2	584.8	597.2	14.9	0.0	99.7	588.9	608.9	5470.8
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	2.5	0.0	16.6	100.0	100.0	76.4
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	2.5	0.0	16.6	100.0	100.0	76.4
<b>LF (%)</b>	105.5	105.5	105.4	105.4	104.8	104.1	102.9	2.6	0.0	17.2	104.9	104.9	80.1
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	3.1	0.0	19.2	100.0	100.0	76.7
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	97.5	100.0	83.4	0.0	0.0	23.6
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	97.5	100.0	67.8	0.0	0.0	22.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.7	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 09 Mar 1971      **Lifetime Generation:** 130853.9 GW(e).h  
**Date of First Criticality:** 20 Dec 1974      **Cumulative Energy Availability Factor:** 66.2%  
**Date of Grid Connection:** 17 Jan 1975      **Cumulative Load Factor:** 66.7%  
**Date of Commercial Operation:** 14 Nov 1975      **Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 33.8%

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	4133.9	780.0	60.3	59.6	60.2	59.6	60.5	59.7	5407	61.7
1983	3549.4	780.0	51.7	58.6	51.8	58.6	51.9	58.7	4645	53.0
1984	4503.1	780.0	65.4	59.3	65.4	59.3	65.7	59.5	5746	65.4
1985	4967.4	780.0	72.4	60.6	72.4	60.6	72.7	60.8	6466	73.8
1986	3997.8	780.0	58.4	60.4	58.4	60.4	58.5	60.6	5183	59.2
1987	4621.8	780.0	70.3	61.3	67.3	61.0	67.6	61.2	6154	70.3
1988	3071.3	780.0	45.5	60.0	45.5	59.8	44.8	59.9	4001	45.5
1989	3991.5	780.0	59.5	60.0	59.5	59.8	58.4	59.8	5213	59.5
1990	1727.9	780.0	20.9	57.4	20.8	57.2	25.3	57.5	2218	25.3
1991	2265.8	780.0	32.3	55.8	32.2	55.6	33.2	56.0	3054	34.9
1992	4873.8	780.0	70.8	56.7	70.8	56.5	71.1	56.9	6226	70.9
1993	5757.0	780.0	84.0	58.2	84.0	58.1	84.3	58.4	7426	84.8
1994	3357.3	780.0	49.3	57.8	49.3	57.6	49.1	57.9	4299	49.1
1995	4458.7	780.0	65.1	58.1	65.1	58.0	65.3	58.3	5906	67.4
1996	6709.1	780.0	97.7	60.0	97.3	59.9	97.9	60.2	8629	98.2
1997	4981.2	780.0	72.5	60.6	72.5	60.4	72.9	60.8	6306	72.0
1998	5972.9	780.0	87.0	61.7	87.0	61.6	87.4	61.9	7657	87.4
1999	5989.8	780.0	87.2	62.8	87.2	62.6	87.7	63.0	7717	88.1
2000	6849.9	780.0	99.5	64.3	99.5	64.1	100.0	64.5	8784	100.0
2001	5901.0	780.0	86.0	65.1	86.0	65.0	86.4	65.3	7572	86.4
2002	6097.7	780.0	87.0	65.9	87.0	65.8	89.2	66.2	7626	87.1
2003	5470.8	780.0	76.4	66.3	76.4	66.2	80.1	66.7	6717	76.7

## JP-13 TAKAHAMA-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Aug	1926.0	1521.1	PF	C	PERIODICAL INSPECTION AND REFUELLING
21 Oct	22.0	17.2	UF3	A42	EXTENSION OF PERIODICAL INSPECTION BY FAILURE OF EMERGENCY DIESEL GENERATOR FUNCTIONAL INSPECTION.
22 Oct	94.0	73.7	UF2	A31	MANUAL TRIP CAUSED BY SLIGHT STEAM LEAK FROM INLET FLANGE OF LOW-PRESSURE TURBINE.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1976 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		116			149	
B. Refuelling without a maintenance					7	
C. Inspection, maintenance or repair combined with refuelling	1926			2552		
D. Inspection, maintenance or repair without refuelling				11		
Subtotal	1926	116	0	2563	156	0
Total		2042			2719	

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

System	2003 Hours Lost	1976 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		45
16. Steam generation systems		95
31. Turbine and auxiliaries	94	
32. Feedwater and Main Steam System		9
42. Electrical Power Supply Systems	22	
Total	116	149

**JP-29 TAKAHAMA-3**

Operator: KEPCO (KANSAI ELECTRIC POWER CO.)

Contractor: M (MITSUBISHI HEAVY INDUSTRY LTD)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 830.0 MW(e)  
 Design Net Capacity: 830.0 MW(e)  
 Design Discharge Burnup: 40000 MW.d/t

**2. Production Summary 2003**

Energy Production: 7355.7 GW(e).h  
 Energy Availability Factor: 96.1%  
 Load Factor: 101.2%  
 Operating Factor: 96.1%  
 Energy Unavailability Factor: 3.9%  
 Total Off-line Time: 339 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	651.4	588.9	652.2	630.5	650.1	626.7	648.2	646.1	625.9	649.1	630.8	355.6	7355.7
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	54.5	96.1
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	54.5	96.1
LF (%)	105.5	105.6	105.6	105.7	105.3	104.9	105.0	104.6	104.7	105.0	105.6	57.6	101.2
OF (%)	100.0	100.0	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	54.4	96.1
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.5	3.9
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.5	3.9
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. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 12 Dec 1980      Lifetime Generation: 120508.4 GW(e).h  
 Date of First Criticality: 17 Apr 1984      Cumulative Energy Availability Factor: 84.9%  
 Date of Grid Connection: 09 May 1984      Cumulative Load Factor: 86.1%  
 Date of Commercial Operation: 17 Jan 1985      Cumulative Unit Capability Factor: 77.8%  
    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 (%)
1984	1456.8	830.0	0.0	0.0	54.3	100.0	20.5	0.0	2959	34.5
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	93.8	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	85.0	96.1	84.9	101.2	86.1	8421	96.1

## JP-29 TAKAHAMA-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
17 Dec	339.0	281.0	PF	C	PERIODICAL INSPECTION AND REFUELLING

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					1	
C. Inspection, maintenance or repair combined with refuelling	339			1282		
J. Grid failure or grid unavailability						4
Subtotal	339	0	0	1282	1	4
Total	339			1287		

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		1
Total	0	1

# JP-30 TAKAHAMA-4

**Operator:** KEPCO (KANSAI ELECTRIC POWER CO.)

**Contractor:** M (MITSUBISHI HEAVY INDUSTRY LTD)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 830.0 MW(e)  
**Design Net Capacity:** 830.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6490.2 GW(e).h  
**Energy Availability Factor:** 86.0%  
**Load Factor:** 89.3%  
**Operating Factor:** 86.0%  
**Energy Unavailability Factor:** 14.0%  
**Total Off-line Time:** 1229 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	626.0	565.4	626.0	543.1	0.0	269.6	651.3	648.7	627.7	650.9	630.1	651.4	6490.2
<b>EAF (%)</b>	100.0	100.0	100.0	89.6	0.0	43.2	100.0	100.0	100.0	100.0	100.0	100.0	86.0
<b>UCF (%)</b>	100.0	100.0	100.0	89.6	0.0	43.2	100.0	100.0	100.0	100.0	100.0	100.0	86.0
<b>LF (%)</b>	101.4	101.4	101.4	91.0	0.0	45.1	105.5	105.1	105.0	105.3	105.4	105.5	89.3
<b>OF (%)</b>	100.0	100.0	100.0	86.6	0.0	46.1	100.0	100.0	100.0	99.9	100.0	100.0	86.0
<b>EUf (%)</b>	0.0	0.0	0.0	10.4	100.0	56.8	0.0	0.0	0.0	0.0	0.0	0.0	14.0
<b>PUf (%)</b>	0.0	0.0	0.0	10.4	100.0	56.8	0.0	0.0	0.0	0.0	0.0	0.0	14.0
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 19 Mar 1981      **Lifetime Generation:** 117581.5 GW(e).h  
**Date of First Criticality:** 11 Oct 1984      **Cumulative Energy Availability Factor:** 84.2%  
**Date of Grid Connection:** 01 Nov 1984      **Cumulative Load Factor:** 85.4%  
**Date of Commercial Operation:** 05 Jun 1985      **Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1984	282.6	830.0	0.0	0.0	87.4	100.0	3.9	0.0	988	11.3
1985	5479.3	830.0	0.0	0.0	74.7	100.0	75.4	0.0	6887	78.6
1986	5864.0	830.0	79.6	79.6	79.6	79.6	80.7	80.7	7073	80.7
1987	5588.5	830.0	77.0	78.3	77.0	78.3	76.9	78.8	6743	77.0
1988	6437.9	830.0	87.3	81.3	87.3	81.3	88.3	81.9	7666	87.3
1989	6802.7	830.0	93.2	84.3	93.2	84.3	93.6	84.8	8167	93.2
1990	5174.6	830.0	69.0	81.2	69.0	81.2	71.2	82.1	6233	71.2
1991	6170.1	830.0	83.0	81.5	83.1	81.5	84.9	82.6	7409	84.6
1992	6048.4	830.0	81.9	81.6	81.9	81.6	83.0	82.6	7265	82.7
1993	7210.9	830.0	97.9	83.6	97.9	83.6	99.2	84.7	8578	97.9
1994	5767.2	830.0	78.5	83.0	78.5	83.0	79.3	84.1	6861	78.3
1995	5651.8	830.0	76.7	82.4	76.7	82.4	77.7	83.5	6785	77.5
1996	5666.5	830.0	76.7	81.9	76.7	81.9	77.7	82.9	6785	77.2
1997	7367.3	830.0	100.0	83.4	100.0	83.4	101.3	84.5	8760	100.0
1998	6470.2	830.0	87.8	83.7	87.8	83.7	89.0	84.8	7727	88.2
1999	5500.3	830.0	75.8	83.2	74.6	83.1	75.6	84.2	6542	74.7
2000	6099.0	830.0	82.6	83.1	82.6	83.1	83.7	84.1	7254	82.6
2001	7364.6	830.0	100.0	84.2	100.0	84.1	101.3	85.2	8760	100.0
2002	6145.5	830.0	83.5	84.1	83.5	84.1	84.5	85.2	7316	83.5
2003	6490.2	830.0	86.0	84.3	86.0	84.2	89.3	85.4	7531	86.0



## JP-30 TAKAHAMA-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
27 Apr	1228.0	1018.9	PF	C	PERIODICAL INSPECTION AND REFUELLING

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					13	
C. Inspection, maintenance or repair combined with refuelling	1228			1225		
J. Grid failure or grid unavailability						5
Subtotal	1228	0	0	1225	13	5
Total	1228			1243		

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		13
Total	0	13

# JP-21 TOKAI-2

**Operator:** JAPCO (JAPAN ATOMIC POWER CO.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1056.0 MW(e)  
**Design Net Capacity:** 1056.0 MW(e)  
**Design Discharge Burnup:** 21000 IN MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9176.5 GW(e).h  
**Energy Availability Factor:** 98.5%  
**Load Factor:** 99.2%  
**Operating Factor:** 98.6%  
**Energy Unavailability Factor:** 1.5%  
**Total Off-line Time:** 125 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	792.3	716.1	659.9	766.9	791.7	766.2	788.6	788.4	760.9	789.8	764.2	791.4	9176.5
<b>EAF (%)</b>	100.0	100.0	83.2	100.0	100.0	100.0	99.9	99.9	99.6	100.0	99.9	100.0	98.5
<b>UCF (%)</b>	100.0	100.0	83.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	100.0	98.6
<b>LF (%)</b>	100.8	100.9	84.0	101.0	100.8	100.8	100.4	100.4	100.1	100.4	100.5	100.7	99.2
<b>OF (%)</b>	100.0	100.0	83.2	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	98.6
<b>EUf (%)</b>	0.0	0.0	16.8	0.0	0.0	0.0	0.1	0.1	0.4	0.0	0.1	0.0	1.5
<b>PUf (%)</b>	0.0	0.0	16.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.4	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 03 Oct 1973      **Lifetime Generation:** 174480.2 GW(e).h  
**Date of First Criticality:** 18 Jan 1978      **Cumulative Energy Availability Factor:** 73.6%  
**Date of Grid Connection:** 13 Mar 1978      **Cumulative Load Factor:** 73.7%  
**Date of Commercial Operation:** 28 Nov 1978      **Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1982	5571.6	1056.0	59.6	63.5	59.6	63.5	60.2	63.7	5338	60.9
1983	6556.6	1056.0	70.5	64.9	70.5	64.9	70.9	65.1	6327	72.2
1984	8695.2	1056.0	93.5	69.6	93.5	69.6	93.7	69.9	8240	93.8
1985	6957.5	1056.0	75.0	70.4	75.0	70.4	75.2	70.7	6625	75.6
1986	5797.6	1056.0	62.5	69.4	62.5	69.4	62.7	69.7	5508	62.9
1987	7040.5	1056.0	76.5	70.2	76.5	70.2	76.1	70.4	6776	77.4
1988	6088.4	1056.0	66.0	69.8	66.0	69.8	65.6	69.9	5872	66.8
1989	8435.0	1056.0	91.2	71.7	91.2	71.7	91.2	71.8	8006	91.4
1990	7291.6	1056.0	78.9	72.3	78.9	72.3	78.8	72.4	6948	79.3
1991	7025.3	1056.0	76.1	72.6	76.1	72.6	75.9	72.7	6716	76.7
1992	6307.7	1080.0	68.6	72.3	68.5	72.3	66.5	72.2	5990	68.2
1993	8707.2	1080.0	93.8	73.8	93.8	73.8	92.0	73.6	8252	94.2
1994	7325.8	1056.0	78.9	74.1	78.9	74.1	79.2	73.9	6938	79.2
1995	6845.0	1056.0	73.7	74.1	73.7	74.1	74.0	73.9	6488	74.1
1996	7562.1	1056.0	80.8	74.5	80.7	74.4	81.5	74.4	7169	81.6
1997	8884.5	1056.0	95.7	75.6	95.6	75.5	96.0	75.5	8404	95.9
1998	6999.4	1056.0	75.1	75.5	75.0	75.5	75.7	75.5	6642	75.8
1999	2316.1	1056.0	25.4	73.2	24.9	73.1	25.0	73.1	2228	25.4
2000	7031.6	1056.0	76.3	73.3	75.4	73.2	75.8	73.2	6626	75.4
2001	5833.2	1056.0	62.7	72.8	62.7	72.8	63.1	72.8	5641	64.4
2002	6420.1	1056.0	70.0	72.7	68.9	72.6	69.4	72.6	6061	69.2
2003	9176.5	1056.0	98.6	73.8	98.5	73.6	99.2	73.7	8635	98.6

## JP-21 TOKAI-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
15 Mar	125.0	132.0	PF	D12	PLANT SCHEDULED SHUTDOWN FOR PLR FCV POSITIONING INDICATOR REPLACEMENT

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1979 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					347	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling				1810		
D. Inspection, maintenance or repair without refuelling	125			33		
J. Grid failure or grid unavailability						5
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					25	
Subtotal	125	0	0	1843	372	5
Total		125			2220	

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

System	2003 Hours Lost	1979 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		238
13. Reactor Auxiliary Systems		6
15. Reactor Cooling Systems		48
31. Turbine and auxiliaries		16
32. Feedwater and Main Steam System		24
42. Electrical Power Supply Systems		14
Total	0	346

# JP-43 TOMARI-1

**Operator:** HEPCO (HOKKAIDO ELECTRIC POWER CO.)  
**Contractor:** M (MITSUBISHI HEAVY INDUSTRY LTD)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 550.0 MW(e)  
**Design Net Capacity:** 550.0 MW(e)  
**Design Discharge Burnup:** 31500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3821.7 GW(e).h  
**Energy Availability Factor:** 78.7%  
**Load Factor:** 79.3%  
**Operating Factor:** 78.7%  
**Energy Unavailability Factor:** 21.3%  
**Total Off-line Time:** 1867 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	407.4	368.1	407.7	326.4	0.0	147.8	417.4	415.4	399.3	131.4	383.9	416.8	3821.7
<b>EAF (%)</b>	100.0	100.0	100.0	82.6	0.0	37.0	100.0	100.0	100.0	31.8	95.1	100.0	78.7
<b>UCF (%)</b>	100.0	100.0	100.0	82.6	0.0	37.0	100.0	100.0	100.0	31.8	95.1	100.0	78.7
<b>LF (%)</b>	99.6	99.6	99.6	82.5	0.0	37.3	102.0	101.5	100.8	32.1	96.9	101.8	79.3
<b>OF (%)</b>	100.0	100.0	100.0	80.1	0.0	39.4	100.0	100.0	100.0	29.0	97.9	100.0	78.7
<b>EUf (%)</b>	0.0	0.0	0.0	17.4	100.0	63.0	0.0	0.0	0.0	68.2	4.9	0.0	21.3
<b>PUf (%)</b>	0.0	0.0	0.0	17.4	100.0	63.0	0.0	0.0	0.0	0.0	0.0	0.0	15.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	68.2	4.9	0.0	6.2
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 12 Jul 1985  
**Date of First Criticality:** 16 Nov 1988  
**Date of Grid Connection:** 06 Dec 1988  
**Date of Commercial Operation:** 22 Jun 1989

**Lifetime Generation:** 61156.0 GW(e).h  
**Cumulative Energy Availability Factor:** 84.6%  
**Cumulative Load Factor:** 85.2%  
**Cumulative Unit Capability Factor:** 78.8%  
**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 (%)
1988	55.0	550.0	0.0	0.0	1.2	100.0	1.2	0.0	375	4.4
1989	3607.0	550.0	0.0	0.0	99.8	100.0	74.9	0.0	7095	81.0
1990	3830.7	550.0	79.5	79.5	79.5	79.5	79.5	79.5	7092	81.0
1991	3540.4	550.0	73.5	76.5	73.5	76.5	73.5	76.5	6588	75.2
1992	3646.4	550.0	75.9	76.3	75.9	76.3	75.5	76.2	6780	77.2
1993	4795.2	550.0	100.0	82.2	100.0	82.2	99.5	82.0	8760	100.0
1994	3903.9	550.0	81.4	82.0	81.4	82.0	81.0	81.8	7208	82.3
1995	3946.3	550.0	81.8	82.0	81.9	82.0	81.9	81.8	7175	81.9
1996	3750.4	550.0	78.1	81.4	78.1	81.4	77.6	81.2	6920	78.8
1997	4795.6	550.0	100.0	83.8	100.0	83.8	99.5	83.5	8760	100.0
1998	4239.1	550.0	83.1	83.7	82.7	83.6	88.0	84.0	7373	84.2
1999	4074.6	550.0	79.7	83.3	79.7	83.3	84.6	84.1	6986	79.7
2000	4168.5	550.0	86.5	83.6	86.5	83.5	86.3	84.3	7598	86.5
2001	4804.0	550.0	100.0	85.0	100.0	84.9	99.7	85.5	8760	100.0
2002	4177.3	550.0	86.9	85.1	86.9	85.1	86.7	85.6	7614	86.9
2003	3821.7	550.0	78.7	84.6	78.7	84.6	79.3	85.2	6893	78.7

# JP-43 TOMARI-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
25 Apr	1323.0	727.5	PF	C	PERIODICAL INSPECTION AND REFUELLING.
10 Oct	543.0	298.8	UF1	Z	UNPLANNED INSPECTION.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1990 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					35	
C. Inspection, maintenance or repair combined with refuelling	1323			1131		
Z. Others		543				
Subtotal	1323	543	0	1131	35	0
Total	1866			1166		

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

System	2003 Hours Lost	1990 to 2003 Average Hours Lost Per Year
32. Feedwater and Main Steam System		35
Total	0	35

# JP-44 TOMARI-2

**Operator:** HEPCO (HOKKAIDO ELECTRIC POWER CO.)  
**Contractor:** M (MITSUBISHI HEAVY INDUSTRY LTD)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 550.0 MW(e)  
**Design Net Capacity:** 550.0 MW(e)  
**Design Discharge Burnup:** 31500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3542.0 GW(e).h  
**Energy Availability Factor:** 71.9%  
**Load Factor:** 73.5%  
**Operating Factor:** 71.9%  
**Energy Unavailability Factor:** 28.1%  
**Total Off-line Time:** 2460 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	7.8	365.3	419.4	405.5	419.2	406.0	419.5	417.2	131.8	0.0	129.8	420.5	3542.0
<b>EAF (%)</b>	1.9	98.2	100.0	100.0	100.0	100.0	100.0	100.0	32.8	0.0	32.0	100.0	71.9
<b>UCF (%)</b>	1.9	98.2	100.0	100.0	100.0	100.0	100.0	100.0	32.8	0.0	32.0	100.0	71.9
<b>LF (%)</b>	1.9	98.8	102.5	102.6	102.4	102.5	102.5	102.0	33.3	0.0	32.8	102.8	73.5
<b>OF (%)</b>	0.3	100.0	100.0	100.1	100.0	100.0	100.0	100.0	30.0	0.0	34.7	100.0	71.9
<b>EUf (%)</b>	98.1	1.8	0.0	0.0	0.0	0.0	0.0	0.0	67.2	100.0	68.0	0.0	28.1
<b>PUF (%)</b>	98.1	1.8	0.0	0.0	0.0	0.0	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	0.0	0.0	67.2	100.0	68.0	0.0	19.6
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 08 May 1986  
**Date of First Criticality:** 25 Jul 1990  
**Date of Grid Connection:** 27 Aug 1990  
**Date of Commercial Operation:** 12 Apr 1991

**Lifetime Generation:** 53304.1 GW(e).h  
**Cumulative Energy Availability Factor:** 84.4%  
**Cumulative Load Factor:** 85.3%  
**Cumulative Unit Capability Factor:** 79.8%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1990	675.2	550.0	0.0	0.0	100.0	100.0	14.0	0.0	2001	22.8
1991	3277.8	550.0	0.0	0.0	81.9	100.0	68.0	0.0	6061	69.2
1992	3639.6	550.0	75.5	75.5	75.5	75.5	75.3	75.3	6756	76.9
1993	3847.5	550.0	80.0	77.8	80.0	77.8	79.9	77.6	7092	81.0
1994	4511.6	550.0	93.9	83.1	93.9	83.1	93.6	82.9	8232	94.0
1995	4161.9	550.0	85.5	83.7	85.5	83.7	86.4	83.8	7567	86.4
1996	3933.6	550.0	81.5	83.3	81.5	83.3	81.4	83.3	7232	82.3
1997	3775.2	550.0	78.5	82.5	78.5	82.5	78.4	82.5	6943	79.3
1998	5071.6	550.0	100.0	85.0	100.0	85.0	105.3	85.7	8760	100.0
1999	4273.2	550.0	83.8	84.8	83.8	84.8	88.7	86.1	7344	83.8
2000	4107.5	550.0	85.1	84.9	85.1	84.9	85.0	86.0	7477	85.1
2001	3971.3	550.0	82.6	84.7	82.6	84.6	82.4	85.6	7235	82.6
2002	4516.1	550.0	93.9	85.5	93.9	85.5	93.7	86.4	8228	93.9
2003	3542.0	550.0	71.9	84.4	71.9	84.4	73.5	85.3	6300	71.9

## JP-44 TOMARI-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	742.0	408.1	PF	C	PERIODICAL INSPECTION AND REFUELLING.
10 Sep	1718.0	944.7	UF1	A13	TOMARI UNIT2 WAS SHUT DOWN DUE TO LEAKAGE FROM OUTLET PIPE OF REGENERATIVE HEAT EXCHANGER. HIGH CYCLIC THERMAL FATIGUE IS PRESUMED TO BE THE CAUSE OF CRACK FORMATION, PROPAGATION AND PENETRATION.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1991 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		1718				
C. Inspection, maintenance or repair combined with refuelling	742			1043		
D. Inspection, maintenance or repair without refuelling				117		
Subtotal	742	1718	0	1160	0	0
Total		2460			1160	

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

System	2003 Hours Lost	1991 to 2003 Average Hours Lost Per Year
13. Reactor Auxiliary Systems	1718	
Total	1718	0

# JP-3 TSURUGA-1

**Operator:** JAPCO (JAPAN ATOMIC POWER CO.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 341.0 MW(e)  
**Design Net Capacity:** 341.0 MW(e)  
**Design Discharge Burnup:** 16500 IN MW.d/t

## 2. Production Summary 2003

**Energy Production:** 2426.3 GW(e).h  
**Energy Availability Factor:** 80.7%  
**Load Factor:** 81.2%  
**Operating Factor:** 81.4%  
**Energy Unavailability Factor:** 19.3%  
**Total Off-line Time:** 1625 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	253.7	224.8	195.1	248.5	253.1	98.9	0.0	184.5	246.5	256.1	248.3	216.9	2426.3
<b>EAF (%)</b>	100.0	98.1	76.4	100.0	99.1	40.3	0.0	72.1	100.0	100.0	100.0	84.6	80.7
<b>UCF (%)</b>	100.0	98.1	76.4	100.0	100.0	43.0	0.0	72.1	100.0	100.0	100.0	84.6	81.0
<b>LF (%)</b>	100.0	98.1	76.9	101.4	99.8	40.3	0.0	72.7	100.4	100.8	101.1	85.5	81.2
<b>OF (%)</b>	100.0	98.5	78.0	100.0	100.0	43.3	0.0	74.5	100.0	99.9	100.0	85.5	81.4
<b>EUf (%)</b>	0.0	1.9	23.6	0.0	0.9	59.7	100.0	27.9	0.0	0.0	0.0	15.4	19.3
<b>PUF (%)</b>	0.0	0.1	0.0	0.0	0.0	57.0	71.0	0.0	0.0	0.0	0.0	0.0	10.7
<b>UCLF (%)</b>	0.0	1.8	23.6	0.0	0.0	0.0	29.0	27.9	0.0	0.0	0.0	15.4	8.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.9	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.3

UCLF replaces previously used UUF.

## 4. 2003 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:** 66831.2 GW(e).h  
**Cumulative Energy Availability Factor:** 67.0%  
**Cumulative Load Factor:** 66.3%  
**Cumulative Unit Capability Factor:** 77.3%  
**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 (%)
1982	1614.0	340.0	59.5	70.6	59.5	60.7	54.2	59.1	5245	59.9
1983	1972.1	340.0	71.3	70.7	69.8	61.4	66.2	59.7	6464	73.8
1984	2643.1	325.0	92.2	72.2	92.1	63.5	92.6	62.0	8129	92.5
1985	1703.6	340.0	57.3	71.2	57.3	63.1	57.2	61.6	5088	58.1
1986	2286.3	340.0	77.5	71.5	77.1	64.0	76.8	62.6	6863	78.3
1987	2349.2	340.0	80.2	72.1	80.2	64.9	78.9	63.6	7052	80.5
1988	2222.9	341.0	74.8	72.2	74.8	65.5	74.2	64.2	6611	75.3
1989	2457.7	341.0	82.8	72.8	82.8	66.4	82.3	65.1	7298	83.3
1990	1959.8	341.0	65.6	72.4	65.6	66.4	65.6	65.1	5822	66.5
1991	2255.9	341.0	76.6	72.6	76.1	66.8	75.5	65.6	6742	77.0
1992	1994.1	341.0	66.9	72.4	66.7	66.8	66.6	65.7	5914	67.3
1993	2623.7	341.0	87.5	73.0	87.5	67.7	87.8	66.7	7745	88.4
1994	1507.5	341.0	50.5	72.1	50.5	67.0	50.5	66.0	4477	51.1
1995	2328.7	341.0	79.8	72.4	77.3	67.4	78.0	66.5	7027	80.2
1996	2514.2	341.0	84.0	72.8	84.0	68.1	83.9	67.1	7411	84.4
1997	1936.1	341.0	64.8	72.5	64.8	68.0	64.8	67.1	5728	65.4
1998	1870.5	341.0	62.6	72.2	62.7	67.8	62.6	66.9	5528	63.1
1999	1845.0	341.0	63.2	71.9	62.5	67.6	61.8	66.7	5542	63.3
2000	0.0	341.0	0.0	69.5	0.0	65.3	0.0	64.5	0	0.0
2001	2584.5	341.0	86.6	70.0	86.6	66.0	86.5	65.2	7594	86.7
2002	2546.6	341.0	85.5	70.5	85.3	66.6	85.3	65.8	7495	85.6
2003	2426.3	341.0	81.0	70.8	80.7	67.0	81.2	66.3	7135	81.4



**JP-3 TSURUGA-1****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
28 Feb	187.0	64.1	UF2	A15	PLANT MANUAL SHUTDOWN DUE TO THE PREVENTIVE MAINTENANCE FOR THE MECHANICAL SEALS OF PRIMARY ROOP RECIRCULATION PUMP
17 May	668.0	8.9	XP	N	POWER REDUCTION DUE TO TEMPERATURE RISE OF SEA WATER
13 Jun	900.0	320.0	PF	C	ANNUAL INSPECTION AND REFUELLING
23 Jul	422.0	144.5	UF3	A12	OUTAGE EXTENSION DUE TO CLACK ON CONTROL ROD BLADE AND REPLACEMENT
19 Dec	30.0	10.1	XF	J	PLANT AUTOMATIC SHUTDOWN DUE TO THUNDERBOLT TO A POWER TRANSMISSION LINE
28 Dec	85.0	29.1	UF2	A15	PLANT MANUAL SHUTDOWN DUE TO THE PREVENTIVE MAINTENANCE FOR THE MECHANICAL SEALS OF PRIMARY ROOP RECIRCULATION PUMP

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

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		694			331	
B. Refuelling without a maintenanc					0	
C. Inspection, maintenance or repai combined with refuelling	900			2255		
D. Inspection, maintenance or repai without refuelling				109		
J. Grid failure or grid unavailabilit			30			2
K. Load-following (frequency contro reserve shutdown due to reduced energ demand)					11	
Subtotal	900	694	30	2364	342	2
Total		1624			2708	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		79
12. Reactor I&C Systems	422	102
14. Safety Systems		24
15. Reactor Cooling System:	272	93
31. Turbine and auxiliaries:		7
32. Feedwater and Main Steam Syster		6
42. Electrical Power Supply System:		11
Total	694	322

# JP-34 TSURUGA-2

**Operator:** JAPCO (JAPAN ATOMIC POWER CO.)  
**Contractor:** M (MITSUBISHI HEAVY INDUSTRY LTD)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1115.0 MW(e)  
**Design Net Capacity:** 1115.0 MW(e)  
**Design Discharge Burnup:** 24000 IN MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8460.9 GW(e).h  
**Energy Availability Factor:** 84.7%  
**Load Factor:** 86.6%  
**Operating Factor:** 84.7%  
**Energy Unavailability Factor:** 15.3%  
**Total Off-line Time:** 1342 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	849.5	768.1	849.7	823.6	852.6	824.5	850.3	847.4	102.6	35.8	814.7	842.0	8460.9
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	12.6	4.4	100.0	100.0	84.7
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	12.6	4.4	100.0	100.0	84.7
<b>LF (%)</b>	102.4	102.5	102.4	102.7	102.8	102.7	102.5	102.2	12.8	4.3	101.5	101.5	86.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	10.0	6.8	100.0	100.0	84.7
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	87.4	95.6	0.0	0.0	15.3
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	87.4	38.7	0.0	0.0	10.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	57.0	0.0	0.0	4.9
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 06 Nov 1982      **Lifetime Generation:** 137714.0 GW(e).h  
**Date of First Criticality:** 28 May 1986      **Cumulative Energy Availability Factor:** 81.6%  
**Date of Grid Connection:** 19 Jun 1986      **Cumulative Load Factor:** 81.5%  
**Date of Commercial Operation:** 17 Feb 1987      **Cumulative Unit Capability Factor:** 78.2%  
**Cumulative Energy Unavailability Factor:** 18.4%

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	1553.6	1115.0	0.0	0.0	16.7	100.0	16.7	0.0	2506	30.0
1987	8751.3	1115.0	0.0	0.0	95.8	100.0	89.6	0.0	8028	91.6
1988	7939.7	1115.0	81.3	81.3	81.3	81.3	81.1	81.1	7243	82.5
1989	7507.7	1115.0	77.0	79.2	77.0	79.1	76.9	79.0	6814	77.8
1990	7201.0	1115.0	72.9	77.1	72.9	77.1	73.7	77.2	6462	73.8
1991	9259.2	1115.0	95.1	81.6	95.1	81.6	94.8	81.6	8338	95.2
1992	8118.7	1115.0	82.5	81.8	82.5	81.7	82.9	81.9	7310	83.2
1993	7844.1	1115.0	80.2	81.5	80.2	81.5	80.3	81.6	7086	80.9
1994	7814.6	1115.0	80.2	81.3	80.2	81.3	80.0	81.4	7080	80.8
1995	9220.5	1115.0	94.5	83.0	94.5	83.0	94.4	83.0	8290	94.6
1996	8092.3	1115.0	83.0	83.0	83.0	83.0	82.6	83.0	7325	83.4
1997	6522.2	1115.0	67.0	81.4	67.0	81.4	66.8	81.3	5946	67.9
1998	8534.6	1115.0	92.0	82.3	92.0	82.3	87.4	81.9	7724	88.2
1999	5131.7	1115.0	52.7	79.9	52.7	79.9	52.5	79.4	4615	52.7
2000	8993.8	1115.0	92.1	80.8	92.1	80.8	91.8	80.4	8087	92.1
2001	8072.7	1115.0	83.0	81.0	82.9	81.0	82.6	80.6	7267	83.0
2002	8695.5	1115.0	88.4	81.4	88.4	81.4	89.0	81.1	7742	88.4
2003	8460.9	1115.0	84.7	81.7	84.7	81.6	86.6	81.5	7418	84.7

## JP-34 TSURUGA-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
04 Sep	917.0	1023.1	PF	C	ANNUAL INSPECTION AND REFUELLING
13 Oct	424.0	473.3	UF3	A15	OUTAGE EXTENSION DUE TO CLACK ON NOZZLE SAFE-END OF PRESSURIZER VESSEL

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		424			243	
B. Refuelling without a maintenance					7	
C. Inspection, maintenance or repair combined with refuelling	917			1175		
P. Fire					17	
Subtotal	917	424	0	1175	267	0
Total		1341			1442	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
13. Reactor Auxiliary Systems		243
15. Reactor Cooling Systems	424	
Total	424	243

# KR-1 KORI-1

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 556.0 MW(e)  
**Design Net Capacity:** 564.0 MW(e)  
**Design Discharge Burnup:** 31500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4550.2 GW(e).h  
**Energy Availability Factor:** 90.1%  
**Load Factor:** 93.4%  
**Operating Factor:** 91.1%  
**Energy Unavailability Factor:** 9.9%  
**Total Off-line Time:** 782 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	385.3	2.6	417.1	413.6	427.1	411.0	425.7	424.3	373.5	426.8	414.6	428.7	4550.2
<b>EAF (%)</b>	90.8	-6.3	97.8	100.0	100.0	100.0	100.0	100.0	91.1	100.0	100.0	100.0	90.1
<b>UCF (%)</b>	90.8	-6.3	97.8	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.0	90.9
<b>LF (%)</b>	93.1	0.7	100.8	103.5	103.2	102.7	102.9	102.6	93.3	103.0	103.6	103.6	93.4
<b>OF (%)</b>	91.7	0.6	100.0	100.1	100.0	100.0	100.0	100.0	92.8	99.9	100.0	100.0	91.1
<b>EUf (%)</b>	9.2	106.3	2.2	0.0	0.0	0.0	0.0	0.0	8.9	0.0	0.0	0.0	9.9
<b>PUF (%)</b>	9.2	106.3	2.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	9.1
<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	8.9	0.0	0.0	0.0	0.7

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1972      **Lifetime Generation:** 92842.8 GW(e).h  
**Date of First Criticality:** 19 Jun 1977      **Cumulative Energy Availability Factor:** 76.5%  
**Date of Grid Connection:** 26 Jun 1977      **Cumulative Load Factor:** 74.2%  
**Date of Commercial Operation:** 29 Apr 1978      **Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1982	3559.2	556.0	100.0	77.3	73.1	70.6	73.1	63.3	6904	78.8
1983	3065.6	556.0	70.2	75.8	70.1	70.5	62.9	63.2	6142	70.1
1984	3236.3	556.0	67.3	74.4	67.3	70.0	66.3	63.7	6321	72.0
1985	3158.9	556.0	66.0	73.2	64.6	69.2	64.9	63.9	6364	72.6
1986	3279.5	556.0	72.8	73.2	72.8	69.7	67.3	64.3	6404	73.1
1987	4557.0	556.0	99.8	76.1	98.9	72.9	93.6	67.6	8653	98.8
1988	2221.0	556.0	50.6	73.6	50.6	70.7	45.5	65.4	4449	50.6
1989	2735.9	556.0	59.2	72.3	59.2	69.6	56.2	64.5	5256	60.0
1990	3500.1	556.0	74.6	72.5	74.6	70.0	71.9	65.1	6536	74.6
1991	4365.5	556.0	93.6	74.1	93.3	71.8	89.6	67.0	8172	93.3
1992	3640.3	556.0	77.0	74.3	76.9	72.2	74.5	67.5	6759	76.9
1993	3824.9	556.0	81.6	74.8	81.4	72.8	78.5	68.3	7131	81.4
1994	3223.4	564.0	66.2	74.2	65.8	72.4	65.2	68.1	5973	68.2
1995	3969.1	556.0	99.1	75.7	81.2	72.9	81.5	68.9	8704	99.4
1996	3748.4	556.0	78.6	75.8	76.6	73.1	76.7	69.3	6936	79.0
1997	3844.2	556.0	79.0	76.0	78.9	73.4	78.9	69.8	7080	80.8
1998	3783.7	556.0	78.7	76.2	78.7	73.6	77.7	70.2	6698	76.5
1999	4153.2	556.0	83.3	76.5	83.3	74.1	85.3	70.9	7418	84.7
2000	4514.3	556.0	89.2	77.1	89.2	74.8	92.4	71.9	7932	90.3
2001	4636.5	556.0	92.5	77.7	92.5	75.6	95.2	72.9	8144	93.0
2002	4147.0	556.0	84.0	78.0	84.0	75.9	85.1	73.4	8000	91.3
2003	4550.2	556.0	90.9	78.5	90.1	76.5	93.4	74.2	7978	91.1

# KR-1 KORI-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
29 Jan	729.3	441.6	PF	C21	REFUELING & MAINTENANCE
13 Sep	51.0	35.4	XF	J42	TRANSMISSION LINE DEFECTED CAUSED BY TYPHOON

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1977 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure				2	370	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	729			1298		
D. Inspection, maintenance or repair without refuelling				159		
E. Testing of plant systems or components				20	1	
J. Grid failure or grid unavailability			51			6
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						4
Subtotal	729	0	51	1479	375	10
Total		780			1864	

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

System	2003 Hours Lost	1977 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		9
15. Reactor Cooling Systems		31
16. Steam generation systems		88
31. Turbine and auxiliaries		29
32. Feedwater and Main Steam System		47
35. All other I&C Systems		0
41. Main Generator Systems		121
42. Electrical Power Supply Systems		39
XX. Miscellaneous Systems		3
Total	0	367

# KR-2 KORI-2

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 605.0 MW(e)  
**Design Net Capacity:** 605.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4844.2 GW(e).h  
**Energy Availability Factor:** 85.4%  
**Load Factor:** 91.4%  
**Operating Factor:** 88.0%  
**Energy Unavailability Factor:** 14.6%  
**Total Off-line Time:** 1051 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	476.0	430.0	476.6	461.9	372.6	461.6	476.9	474.3	394.9	162.3	180.1	476.9	4844.2
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	78.8	100.0	100.0	100.0	86.7	34.1	39.4	87.2	85.4
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	78.8	100.0	100.0	100.0	86.7	34.1	39.4	100.0	86.5
<b>LF (%)</b>	105.8	105.8	105.9	106.2	82.8	106.0	105.9	105.4	90.7	36.0	41.3	106.0	91.4
<b>OF (%)</b>	100.0	100.0	100.0	100.1	85.2	100.0	100.0	100.0	91.4	36.8	43.2	100.0	88.0
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	21.2	0.0	0.0	0.0	13.3	65.9	60.6	12.8	14.6
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	21.2	0.0	0.0	0.0	0.1	65.9	60.6	0.0	12.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.2	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	12.8	1.1

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 23 Dec 1977  
**Date of First Criticality:** 09 Apr 1983  
**Date of Grid Connection:** 22 Apr 1983  
**Date of Commercial Operation:** 25 Jul 1983

**Lifetime Generation:** 93596.8 GW(e).h  
**Cumulative Energy Availability Factor:** 84.6%  
**Cumulative Load Factor:** 86.1%  
**Cumulative Unit Capability Factor:** 77.7%  
**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 (%)
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	83.8	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

## KR-2 KORI-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
17 May	109.5	95.4	PF	D	PLANNED REPAIR (INSPECTION OF GEN. SHAFT SEAL OIL SYSTEM)
13 Sep	61.7	57.6	XF	J42	TRANSMISSION LINE DEFECTED CAUSED BY TYPHOON
12 Oct	879.0	561.1	PF	C	REFUELLING AND MAINTENANCE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					138	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	879			944		
D. Inspection, maintenance or repair without refuelling	109			40		
E. Testing of plant systems or components					0	
J. Grid failure or grid unavailability			61			3
Subtotal	988	0	61	984	142	3
Total		1049			1129	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		28
15. Reactor Cooling Systems		7
16. Steam generation systems		4
31. Turbine and auxiliaries		33
32. Feedwater and Main Steam System		10
35. All other I&C Systems		0
41. Main Generator Systems		53
42. Electrical Power Supply Systems		0
Total	0	135

# KR-5 KORI-3

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 895.0 MW(e)  
**Design Net Capacity:** 890.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8387.4 GW(e).h  
**Energy Availability Factor:** 99.1%  
**Load Factor:** 107.0%  
**Operating Factor:** 99.2%  
**Energy Unavailability Factor:** 0.9%  
**Total Off-line Time:** 71 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	721.6	651.9	721.4	697.1	720.2	696.1	718.9	714.8	609.7	718.5	696.4	720.7	8387.4
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.5	100.0	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	100.0	100.0	100.0	100.0
<b>LF (%)</b>	108.4	108.4	108.3	108.3	108.2	108.0	108.0	107.3	94.6	107.8	108.1	108.2	107.0
<b>OF (%)</b>	100.0	100.0	100.0	100.1	100.0	100.0	100.0	100.0	90.1	99.9	100.0	100.0	99.2
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5	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	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	11.5	0.0	0.0	0.0	0.9

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1979      **Lifetime Generation:** 124919.1 GW(e).h  
**Date of First Criticality:** 01 Jan 1985      **Cumulative Energy Availability Factor:** 84.3%  
**Date of Grid Connection:** 22 Jan 1985      **Cumulative Load Factor:** 87.2%  
**Date of Commercial Operation:** 30 Sep 1985      **Cumulative Unit Capability Factor:** 77.8%  
**Cumulative Energy Unavailability Factor:** 15.7%

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	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	79.8	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	90.5	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	73.8	80.5	73.7	80.4	76.7	80.7	6863	78.3
1996	7939.7	895.0	95.4	81.8	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



## KR-5 KORI-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
12 Sep	70.1	74.2	XF	J42	TRANSMISSION LINE DEFECTED CAUSED BY TYPHOON

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					113	
B. Refuelling without a maintenance					9	
C. Inspection, maintenance or repair combined with refuelling				1109		
D. Inspection, maintenance or repair without refuelling				19		
J. Grid failure or grid unavailability			70			2
Subtotal	0	0	70	1128	122	2
Total		70			1252	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		21
15. Reactor Cooling Systems		3
31. Turbine and auxiliaries		20
32. Feedwater and Main Steam System		11
35. All other I&C Systems		9
41. Main Generator Systems		47
42. Electrical Power Supply Systems		1
Total	0	112

# KR-6 KORI-4

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 895.0 MW(e)  
**Design Net Capacity:** 890.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7597.0 GW(e).h  
**Energy Availability Factor:** 89.6%  
**Load Factor:** 96.9%  
**Operating Factor:** 90.3%  
**Energy Unavailability Factor:** 10.4%  
**Total Off-line Time:** 847 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	722.0	652.4	651.3	0.0	675.5	698.4	720.9	717.5	617.9	720.5	698.9	721.7	7597.0
<b>EAF (%)</b>	100.0	100.0	90.3	0.0	94.1	100.0	100.0	100.0	89.2	100.0	100.0	100.0	89.6
<b>UCF (%)</b>	100.0	100.0	90.3	0.0	94.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.5
<b>LF (%)</b>	108.4	108.5	97.8	0.0	101.4	108.4	108.3	107.8	95.9	108.1	108.5	108.4	96.9
<b>OF (%)</b>	100.0	100.0	91.7	0.0	100.0	100.0	100.0	100.0	91.0	99.9	100.0	100.0	90.3
<b>EUf (%)</b>	0.0	0.0	9.7	100.0	5.9	0.0	0.0	0.0	10.8	0.0	0.0	0.0	10.4
<b>PUF (%)</b>	0.0	0.0	9.7	100.0	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5
<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	10.8	0.0	0.0	0.0	0.9

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1980      **Lifetime Generation:** 123776.1 GW(e).h  
**Date of First Criticality:** 26 Oct 1985      **Cumulative Energy Availability Factor:** 85.8%  
**Date of Grid Connection:** 15 Nov 1985      **Cumulative Load Factor:** 89.1%  
**Date of Commercial Operation:** 29 Apr 1986      **Cumulative Unit Capability Factor:** 78.1%  
**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 (%)
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	80.8	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	85.7	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

## KR-6 KORI-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
29 Mar	733.7	761.6	PF	C	REFUELING AND MAINTENANCE
12 Sep	64.7	69.6	XF	J42	TRANSMISSION LINE DEFECTED CAUSED BY TYPHOON

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1986 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					35	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	733			1037		
D. Inspection, maintenance or repair without refuelling				32		
E. Testing of plant systems or components					0	
J. Grid failure or grid unavailability			64			1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						6
Subtotal	733	0	64	1069	37	7
Total		797			1113	

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

System	2003 Hours Lost	1986 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		0
15. Reactor Cooling Systems		1
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System		9
41. Main Generator Systems		0
42. Electrical Power Supply Systems		9
Total	0	32

# KR-9 ULCHIN-1

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 920.0 MW(e)  
**Design Net Capacity:** 890.0 MW(e)  
**Design Discharge Burnup:** 33906 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6371.6 GW(e).h  
**Energy Availability Factor:** 85.2%  
**Load Factor:** 79.1%  
**Operating Factor:** 85.0%  
**Energy Unavailability Factor:** 14.8%  
**Total Off-line Time:** 1314 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	711.8	643.5	712.5	335.4	0.0	445.6	712.5	708.4	685.8	709.7	0.0	706.5	6371.6
<b>EAF (%)</b>	100.0	100.0	100.0	53.9	0.0	73.1	100.0	100.0	100.0	100.0	96.9	99.4	85.2
<b>UCF (%)</b>	100.0	100.0	100.0	53.9	0.0	73.1	100.0	100.0	100.0	100.0	96.9	99.5	85.2
<b>LF (%)</b>	104.0	104.1	104.1	50.7	0.0	67.3	104.1	103.5	103.5	103.5	0.0	103.2	79.1
<b>OF (%)</b>	100.0	100.0	100.0	50.1	0.0	70.8	100.0	100.0	100.0	99.9	100.0	100.0	85.0
<b>EUf (%)</b>	0.0	0.0	0.0	46.1	100.0	26.9	0.0	0.0	0.0	0.0	3.1	0.6	14.8
<b>PUf (%)</b>	0.0	0.0	0.0	46.1	100.0	26.9	0.0	0.0	0.0	0.0	0.0	0.0	14.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.5	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	0.1	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 26 Jan 1983  
**Date of First Criticality:** 25 Feb 1988  
**Date of Grid Connection:** 07 Apr 1988  
**Date of Commercial Operation:** 10 Sep 1988

**Lifetime Generation:** 96993.3 GW(e).h  
**Cumulative Energy Availability Factor:** 84.5%  
**Cumulative Load Factor:** 85.2%  
**Cumulative Unit Capability Factor:** 78.4%  
**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 (%)
1989	5205.4	920.0	66.5	66.5	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	82.7	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
2003	6371.6	920.0	85.2	84.9	85.2	84.5	79.1	85.2	7446	85.0

# KR-9 ULCHIN-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
16 Apr	1314.0	1114.0	PF	C21	REFUELING AND MAINTENANCE

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					214	
B. Refuelling without a maintenance					13	
C. Inspection, maintenance or repair combined with refuelling	1314			894		
J. Grid failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						7
Subtotal	1314	0	0	894	227	8
Total		1314			1129	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
15. Reactor Cooling Systems		4
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		5
41. Main Generator Systems		188
42. Electrical Power Supply Systems		10
Total	0	211

# KR-10 ULCHIN-2

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)  
**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 920.0 MW(e)  
**Design Net Capacity:** 890.0 MW(e)  
**Design Discharge Burnup:** 33906 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7253.8 GW(e).h  
**Energy Availability Factor:** 87.1%  
**Load Factor:** 90.0%  
**Operating Factor:** 87.7%  
**Energy Unavailability Factor:** 12.9%  
**Total Off-line Time:** 1074 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	710.4	640.5	709.6	629.3	341.8	5.3	709.3	707.3	685.6	712.1	690.8	711.6	7253.8
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	45.8	-0.5	99.9	100.0	100.0	100.0	100.0	100.0	87.1
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	45.8	-0.5	99.9	100.0	100.0	100.0	100.0	100.0	87.1
<b>LF (%)</b>	103.8	103.6	103.7	95.1	49.9	0.8	103.6	103.3	103.5	103.9	104.3	104.0	90.0
<b>OF (%)</b>	100.0	100.0	100.0	100.1	48.7	3.9	100.0	100.0	100.0	99.9	100.0	100.0	87.7
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	54.2	100.5	0.1	0.0	0.0	0.0	0.0	0.0	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>	0.0	0.0	0.0	0.0	54.2	100.5	0.1	0.0	0.0	0.0	0.0	0.0	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 05 Jul 1983  
**Date of First Criticality:** 25 Feb 1989  
**Date of Grid Connection:** 14 Apr 1989  
**Date of Commercial Operation:** 30 Sep 1989

**Lifetime Generation:** 101099.6 GW(e).h  
**Cumulative Energy Availability Factor:** 86.1%  
**Cumulative Load Factor:** 87.9%  
**Cumulative Unit Capability Factor:** 78.8%  
**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 (%)
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	87.0	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

## KR-10 ULCHIN-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
16 May	1074.1	1037.8	UF4	A41	ACTUATION OF PROTECTION RELAY FOR GENERATOR STATOR EARTH SYSTEM

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1989 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		1074			86	
C. Inspection, maintenance or repair combined with refuelling				1002		
D. Inspection, maintenance or repair without refuelling				40		
E. Testing of plant systems or components					2	
J. Grid failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						10
Subtotal	0	1074	0	1042	88	10
Total		1074			1140	

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

System	2003 Hours Lost	1989 to 2003 Average Hours Lost Per Year
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		81
32. Feedwater and Main Steam System		1
41. Main Generator Systems	1074	
42. Electrical Power Supply Systems		3
Total	1074	86

# KR-13 ULCHIN-3

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** DHICKOPC (DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPAN

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 960.0 MW(e)  
**Design Net Capacity:** 960.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 7984.3 GW(e).h  
**Energy Availability Factor:** 99.6%  
**Load Factor:** 94.9%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.4%  
**Total Off-line Time:** 2 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	704.6	671.6	744.6	720.4	743.4	718.7	32.8	739.4	714.5	738.4	716.1	739.8	7984.3
<b>EAF (%)</b>	95.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6
<b>UCF (%)</b>	95.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6
<b>LF (%)</b>	98.7	104.1	104.3	104.4	104.1	104.0	4.6	103.5	103.4	103.2	103.6	103.6	94.9
<b>OF (%)</b>	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.0
<b>EUf (%)</b>	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
<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>	5.0	0.0	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 21 Jul 1993      **Lifetime Generation:** 42167.1 GW(e).h  
**Date of First Criticality:** 21 Dec 1997      **Cumulative Energy Availability Factor:** 89.3%  
**Date of Grid Connection:** 06 Jan 1998      **Cumulative Load Factor:** 88.8%  
**Date of Commercial Operation:** 11 Aug 1998      **Cumulative Unit Capability Factor:** 83.1%  
**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 (%)
1998	4822.2	960.0	0.0	0.0	100.0	100.0	57.3	0.0	5872	67.0
1999	6918.0	960.0	81.5	81.5	79.7	79.7	82.3	82.3	7149	81.6
2000	7489.1	960.0	87.0	84.2	87.0	83.3	88.8	85.5	7734	88.0
2001	7922.2	960.0	91.3	86.6	91.3	86.0	94.2	88.4	8025	91.6
2002	7031.3	960.0	89.0	87.2	89.0	86.7	83.6	87.2	7824	89.3
2003	7984.3	960.0	99.6	89.6	99.6	89.3	94.9	88.8	8758	100.0



## KR-13 ULCHIN-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1999 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					13	
C. Inspection, maintenance or repair combined with refuelling				852		
Subtotal	0	0	0	852	13	0
Total	0			865		

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

System	2003 Hours Lost	1999 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		6
32. Feedwater and Main Steam System		6
Total	0	12

# KR-14 ULCHIN-4

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** DHICKOPC (DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPAN

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 960.0 MW(e)  
**Design Net Capacity:** 960.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 7922.5 GW(e).h  
**Energy Availability Factor:** 91.6%  
**Load Factor:** 94.2%  
**Operating Factor:** 92.2%  
**Energy Unavailability Factor:** 8.4%  
**Total Off-line Time:** 679 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	722.7	665.8	730.0	713.9	738.1	713.9	737.6	696.7	61.2	683.9	718.5	740.1	7922.5
<b>EAF (%)</b>	98.1	100.0	99.0	100.0	100.0	100.0	100.0	96.8	12.5	92.4	100.0	99.9	91.6
<b>UCF (%)</b>	98.1	100.0	99.0	100.0	100.0	100.0	100.0	96.8	12.5	92.4	100.0	100.0	91.6
<b>LF (%)</b>	101.2	103.2	102.2	103.4	103.3	103.3	103.3	97.5	8.9	95.6	103.9	103.6	94.2
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.8	14.9	94.4	100.0	100.0	92.2
<b>EUF (%)</b>	1.9	0.0	1.0	0.0	0.0	0.0	0.0	3.2	87.5	7.6	0.0	0.1	8.4
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	87.5	0.0	0.0	0.0	7.5
<b>UCLF (%)</b>	1.9	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6	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	0.1	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1993      **Lifetime Generation:** 30012.9 GW(e).h  
**Date of First Criticality:** 14 Dec 1998      **Cumulative Energy Availability Factor:** 86.7%  
**Date of Grid Connection:** 28 Dec 1998      **Cumulative Load Factor:** 89.1%  
**Date of Commercial Operation:** 31 Dec 1999      **Cumulative Unit Capability Factor:** 83.4%  
**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 (%)
1998	4.4	80.0	0.0	0.0	100.0	100.0	7.4	0.0	81	10.9
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

## KR-14 ULCHIN-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
31 Aug	637.8	630.5	PF	C	REFUELING AND MAINTENANCE
10 Oct	41.4	55.0	UF5	A42	MAIN-TRANSFORMER GROUND FAULT

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			2000 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure C. Inspection, maintenance or repair combined with refuelling	637	41		913	23	
Subtotal	637	41	0	913	23	0
Total	678			936		

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

System	2003 Hours Lost	2000 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		14
42. Electrical Power Supply Systems	41	8
Total	41	22

# KR-3 WOLSONG-1

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)  
**Contractor:** AECL (ATOMIC ENERGY OF CANADA LTD.)

## 1. Station Details

**Type:** PHWR  
**Maximum Net Capacity at the beginning of 2003:** 629.0 MW(e)  
**Design Net Capacity:** 629.0 MW(e)  
**Design Discharge Burnup:** 6500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4980.0 GW(e).h  
**Energy Availability Factor:** 88.1%  
**Load Factor:** 90.4%  
**Operating Factor:** 88.1%  
**Energy Unavailability Factor:** 11.9%  
**Total Off-line Time:** 1045 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	469.9	0.0	240.8	466.3	482.9	466.9	482.1	478.4	462.3	481.0	466.9	482.4	4980.0
<b>EAF (%)</b>	97.6	0.0	52.9	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.0	88.1
<b>UCF (%)</b>	97.7	0.0	53.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.1
<b>LF (%)</b>	100.4	0.0	51.5	103.1	103.2	103.1	103.0	102.2	102.1	102.6	103.1	103.1	90.4
<b>OF (%)</b>	96.8	0.0	53.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.1
<b>EUf (%)</b>	2.4	100.0	47.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	11.9
<b>PUF (%)</b>	2.3	100.0	47.0	0.0	0.0	0.0	0.0	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	0.0	0.0
<b>XUF (%)</b>	0.1	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 30 Oct 1977  
**Date of First Criticality:** 21 Nov 1982  
**Date of Grid Connection:** 31 Dec 1982  
**Date of Commercial Operation:** 22 Apr 1983

**Lifetime Generation:** 99500.8 GW(e).h  
**Cumulative Energy Availability Factor:** 84.3%  
**Cumulative Load Factor:** 87.3%  
**Cumulative Unit Capability Factor:** 77.7%  
**Cumulative Energy Unavailability Factor:** 15.7%

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 (%)
1982	305.3	628.0	0.0	0.0	97.1	100.0	5.5	0.0	744	8.5
1983	2893.2	628.0	0.0	0.0	52.5	100.0	52.5	0.0	6255	71.4
1984	3693.2	629.0	66.8	66.8	66.8	66.8	66.8	66.8	6202	70.6
1985	5246.5	629.0	95.7	81.3	94.0	80.4	95.2	81.0	8277	94.5
1986	4420.4	629.0	80.9	81.1	80.8	80.5	80.2	80.7	7079	80.8
1987	5155.8	629.0	94.4	84.5	93.9	83.9	93.6	84.0	8185	93.4
1988	4415.3	629.0	80.1	83.6	80.1	83.1	79.9	83.1	7033	80.1
1989	5053.2	629.0	91.7	84.9	68.8	80.7	91.7	84.6	8036	91.7
1990	4770.3	629.0	86.0	85.1	86.0	81.5	86.6	84.9	7532	86.0
1991	5062.0	629.0	90.5	85.8	90.5	82.6	91.9	85.7	7927	90.5
1992	4843.3	629.0	85.5	85.7	85.5	82.9	87.7	85.9	7510	85.5
1993	5611.3	629.0	99.0	87.1	99.0	84.5	101.8	87.5	8671	99.0
1994	4583.1	629.0	80.5	86.5	80.4	84.1	83.2	87.1	7150	81.6
1995	4647.1	629.0	80.9	86.0	80.9	83.9	84.3	86.9	7266	82.9
1996	4508.2	629.0	78.5	85.4	78.0	83.4	81.6	86.5	7029	80.0
1997	5689.6	629.0	99.7	86.4	99.6	84.6	103.3	87.7	8732	99.7
1998	4360.4	629.0	76.5	85.8	76.5	84.0	79.1	87.1	6730	76.8
1999	4613.0	629.0	80.7	85.5	80.7	83.8	83.7	86.9	7087	80.9
2000	4511.6	629.0	79.0	85.1	79.0	83.5	81.7	86.6	6993	79.6
2001	4622.0	629.0	81.3	84.9	81.3	83.4	83.9	86.4	7153	81.7
2002	5516.2	629.0	97.2	85.5	97.1	84.1	100.1	87.2	8543	97.5
2003	4980.0	629.0	88.1	85.7	88.1	84.3	90.4	87.3	7715	88.1

## KR-3 WOLSONG-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
31 Jan	1045.0	657.3	PF	D	PERIODIC INSPECTION AND MAINTENANCE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					105	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling				761		
D. Inspection, maintenance or repair without refuelling	1045			272		
E. Testing of plant systems or components				4		
J. Grid failure or grid unavailability						2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						7
Subtotal	1045	0	0	1037	109	9
Total		1045			1155	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		47
13. Reactor Auxiliary Systems		6
14. Safety Systems		5
15. Reactor Cooling Systems		14
16. Steam generation systems		2
31. Turbine and auxiliaries		9
32. Feedwater and Main Steam System		11
41. Main Generator Systems		1
42. Electrical Power Supply Systems		4
Total	0	99

# 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  
**Maximum Net Capacity at the beginning of 2003:** 650.0 MW(e)  
**Design Net Capacity:** 650.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 5480.6 GW(e).h  
**Energy Availability Factor:** 91.2%  
**Load Factor:** 96.3%  
**Operating Factor:** 91.5%  
**Energy Unavailability Factor:** 8.8%  
**Total Off-line Time:** 745 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	514.1	464.0	513.8	497.1	33.5	490.9	509.8	503.9	438.7	508.6	494.5	511.9	5480.6
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	6.6	99.4	100.0	100.0	90.3	100.0	100.0	100.0	91.2
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	6.6	99.4	100.0	100.0	90.3	100.0	100.0	100.0	91.2
<b>LF (%)</b>	106.3	106.2	106.2	106.4	6.9	104.9	105.4	104.2	93.7	105.0	105.7	105.8	96.3
<b>OF (%)</b>	100.0	100.0	100.0	100.0	8.3	100.0	100.0	100.0	91.3	100.0	100.0	100.0	91.5
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	93.4	0.6	0.0	0.0	9.7	0.0	0.0	0.0	8.8
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	93.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0	8.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.7	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 25 Sep 1992      **Lifetime Generation:** 34974.2 GW(e).h  
**Date of First Criticality:** 29 Jan 1997      **Cumulative Energy Availability Factor:** 88.7%  
**Date of Grid Connection:** 01 Apr 1997      **Cumulative Load Factor:** 92.7%  
**Date of Commercial Operation:** 01 Jul 1997      **Cumulative Unit Capability Factor:** 82.5%  
**Cumulative Energy Unavailability Factor:** 11.3%

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 (%)
1997	3295.0	650.0	0.0	0.0	97.3	100.0	57.9	0.0	5296	60.5
1998	4788.7	650.0	81.0	81.0	81.0	81.0	84.1	84.1	7144	81.6
1999	5211.8	650.0	88.1	84.6	88.1	84.6	91.5	87.8	7754	88.5
2000	5346.8	650.0	91.5	86.9	91.5	86.9	93.6	89.8	7843	89.3
2001	5585.4	650.0	93.0	88.4	92.8	88.4	98.1	91.8	8188	93.5
2002	5266.0	650.0	87.7	88.3	87.7	88.2	92.5	92.0	7717	88.1
2003	5480.6	650.0	91.2	88.8	91.2	88.7	96.3	92.7	8015	91.5

## KR-4 WOLSONG-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
03 May	682.0	451.8	PF	D	PERIODIC INSPECTION AND MAINTENANCE
12 Sep	63.1	45.3	XF	J42	THE ACTUATION OF MAIN TRANSFORMER PROTECTION RELAY CAUSED BY TYPHOON

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1997 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					35	
C. Inspection, maintenance or repair combined with refuelling				492		
D. Inspection, maintenance or repair without refuelling	682			241		
J. Grid failure or grid unavailability			63			1
Subtotal	682	0	63	733	35	1
Total		745			769	

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

System	2003 Hours Lost	1997 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		9
31. Turbine and auxiliaries		6
32. Feedwater and Main Steam System		13
41. Main Generator Systems		4
42. Electrical Power Supply Systems		1
Total	0	33

# 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  
**Maximum Net Capacity at the beginning of 2003:** 650.0 MW(e)  
**Design Net Capacity:** 650.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 5579.5 GW(e).h  
**Energy Availability Factor:** 93.1%  
**Load Factor:** 98.0%  
**Operating Factor:** 93.3%  
**Energy Unavailability Factor:** 6.9%  
**Total Off-line Time:** 584 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	510.3	461.4	510.7	494.0	509.9	491.9	507.5	419.0	164.7	507.3	493.0	509.7	5579.5
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	84.0	32.1	100.0	100.0	100.0	93.1
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	84.0	32.1	100.0	100.0	100.0	93.1
<b>LF (%)</b>	105.5	105.6	105.6	105.7	105.4	105.1	104.9	86.7	35.2	104.8	105.4	105.4	98.0
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	83.9	35.6	100.0	100.0	100.0	93.3
<b>EU (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	67.9	0.0	0.0	0.0	6.9
<b>PU (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.3	67.9	0.0	0.0	0.0	6.9
<b>UCLF (%)</b>	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
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 17 Mar 1994      **Lifetime Generation:** 29628.9 GW(e).h  
**Date of First Criticality:** 19 Feb 1998      **Cumulative Energy Availability Factor:** 90.1%  
**Date of Grid Connection:** 25 Mar 1998      **Cumulative Load Factor:** 91.9%  
**Date of Commercial Operation:** 01 Jul 1998      **Cumulative Unit Capability Factor:** 83.1%  
**Cumulative Energy Unavailability Factor:** 9.9%

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	3460.3	650.0	0.0	0.0	97.4	100.0	80.7	0.0	5326	80.7
1999	4696.7	650.0	80.2	80.2	80.2	80.2	82.5	82.5	7008	80.0
2000	5925.2	650.0	99.9	90.1	99.9	90.1	103.8	93.1	8784	100.0
2001	4923.9	650.0	85.3	88.5	85.3	88.5	86.5	90.9	7409	84.6
2002	5043.3	650.0	91.8	89.3	91.8	89.3	88.6	90.3	8083	92.3
2003	5579.5	650.0	93.1	90.1	93.1	90.1	98.0	91.9	8176	93.3



## KR-15 WOLSONG-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
26 Aug	0.0	0.0	UF4	A16	S/G LEVEL CONTROL FAILURE
26 Aug	584.0	391.6	PF	D	PERIODIC INSPECTION AND MAINTENANCE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1999 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		0			48	
C. Inspection, maintenance or repair combined with refuelling				558		
D. Inspection, maintenance or repair without refuelling	584			135		
Subtotal	584	0	0	693	48	0
Total	584			741		

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

System	2003 Hours Lost	1999 to 2003 Average Hours Lost Per Year
16. Steam generation systems	0	
35. All other I&C Systems		48
Total	0	48

# 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  
**Maximum Net Capacity at the beginning of 2003:** 650.0 MW(e)  
**Design Net Capacity:** 650.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 5601.9 GW(e).h  
**Energy Availability Factor:** 93.5%  
**Load Factor:** 98.4%  
**Operating Factor:** 93.9%  
**Energy Unavailability Factor:** 6.5%  
**Total Off-line Time:** 535 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	512.9	457.4	512.5	459.6	511.8	198.0	460.2	485.5	487.8	509.1	494.9	512.2	5601.9
<b>EAF (%)</b>	100.0	98.8	100.0	89.5	100.0	37.6	95.2	100.0	99.8	100.0	100.0	100.0	93.5
<b>UCF (%)</b>	100.0	98.8	100.0	89.5	100.0	37.6	95.2	100.0	99.8	100.0	100.0	100.0	93.5
<b>LF (%)</b>	106.1	104.7	106.0	98.3	105.8	42.3	95.2	100.4	104.2	105.1	105.7	105.9	98.4
<b>OF (%)</b>	100.0	99.1	100.0	93.9	100.0	41.0	95.2	96.9	100.0	99.9	100.0	100.0	93.9
<b>EUf (%)</b>	0.0	1.2	0.0	10.5	0.0	62.4	4.8	0.0	0.2	0.0	0.0	0.0	6.5
<b>PUF (%)</b>	0.0	0.0	0.0	10.5	0.0	62.4	4.8	0.0	0.0	0.0	0.0	0.0	6.4
<b>UCLF (%)</b>	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 22 Jul 1994  
**Date of First Criticality:** 10 Apr 1999  
**Date of Grid Connection:** 21 May 1999  
**Date of Commercial Operation:** 01 Oct 1999

**Lifetime Generation:** 23455.7 GW(e).h  
**Cumulative Energy Availability Factor:** 92.1%  
**Cumulative Load Factor:** 96.4%  
**Cumulative Unit Capability Factor:** 83.4%  
**Cumulative Energy Unavailability Factor:** 7.9%

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 (%)
1999	1489.2	650.0	0.0	0.0	99.9	100.0	103.8	0.0	2208	100.0
2000	5423.3	650.0	91.4	91.4	91.4	91.4	95.0	95.0	8033	91.5
2001	5493.2	650.0	92.6	92.0	92.6	92.0	96.5	95.7	8110	92.6
2002	5448.1	650.0	90.8	91.6	90.8	91.6	95.7	95.7	7971	91.0
2003	5601.9	650.0	93.5	92.0	93.5	92.1	98.4	96.4	8225	93.9

## KR-16 WOLSONG-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
06 Feb	5.2	5.8	UF	A31	MALFUCTION OF TEST SOLENOID VALVE FOR TURBINE PROTECTION CIRCUIT
19 Apr	45.0	49.2	PF	D11	PLANNED REPAIR (REPLACEMENT OF FUEL CHANNEL CLOSURE)
13 Jun	448.5	315.0	PF	D	PERIODIC INSPECTION AND MAINTENANCE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			2000 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		5				
C. Inspection, maintenance or repair combined with refuelling				348		
D. Inspection, maintenance or repair without refuelling	493			197		
Subtotal	493	5	0	545	0	0
Total		498			545	

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

System	2003 Hours Lost	2000 to 2003 Average Hours Lost Per Year
31. Turbine and auxiliaries	5	
Total	5	0

# KR-7 YONGGWANG-1

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 900.0 MW(e)  
**Design Net Capacity:** 890.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7074.4 GW(e).h  
**Energy Availability Factor:** 86.3%  
**Load Factor:** 89.7%  
**Operating Factor:** 86.7%  
**Energy Unavailability Factor:** 13.7%  
**Total Off-line Time:** 1167 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	708.2	458.8	706.6	582.1	189.5	272.5	699.3	691.6	671.3	703.6	683.0	708.0	7074.4
<b>EAF (%)</b>	74.2	100.0	100.0	100.0	24.9	38.7	100.0	99.7	99.8	100.0	99.8	99.9	86.3
<b>UCF (%)</b>	74.2	100.0	100.0	100.0	24.9	38.8	100.0	99.7	99.8	100.0	100.0	99.9	86.3
<b>LF (%)</b>	105.8	75.9	105.5	90.0	28.3	42.0	104.4	103.3	103.6	104.9	105.4	105.7	89.7
<b>OF (%)</b>	100.0	74.9	100.0	88.5	28.9	46.5	100.0	100.0	100.0	99.9	100.0	100.0	86.7
<b>EUf (%)</b>	25.8	0.0	0.0	0.0	75.1	61.3	0.0	0.3	0.2	0.0	0.2	0.1	13.7
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	73.0	61.3	0.0	0.3	0.2	0.0	0.0	0.1	11.3
<b>UCLF (%)</b>	25.8	0.0	0.0	0.0	2.1	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	0.2	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 04 Jun 1981      **Lifetime Generation:** 121563.3 GW(e).h  
**Date of First Criticality:** 31 Jan 1986      **Cumulative Energy Availability Factor:** 86.2%  
**Date of Grid Connection:** 05 Mar 1986      **Cumulative Load Factor:** 88.9%  
**Date of Commercial Operation:** 25 Aug 1986      **Cumulative Unit Capability Factor:** 78.1%  
**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 (%)
1986	2467.9	900.0	0.0	0.0	98.1	100.0	31.6	0.0	2928	33.8
1987	5973.9	900.0	78.8	78.8	78.8	78.8	75.8	75.8	6870	78.4
1988	6199.6	900.0	77.9	78.3	77.9	78.3	78.4	77.1	6844	77.9
1989	6451.8	900.0	81.5	79.4	81.5	79.4	81.8	78.7	7136	81.5
1990	6897.5	900.0	85.7	81.0	85.7	81.0	87.5	80.9	7507	85.7
1991	6695.6	900.0	84.3	81.6	84.3	81.6	84.9	81.7	7383	84.3
1992	6947.3	900.0	86.5	82.4	86.5	82.4	87.9	82.7	7600	86.5
1993	6724.0	900.0	86.8	83.1	86.8	83.1	85.3	83.1	7603	86.8
1994	8230.1	890.0	99.5	85.1	99.4	85.1	105.6	85.9	8751	99.9
1995	6094.6	900.0	74.9	84.0	74.9	84.0	77.3	84.9	6781	77.4
1996	6755.5	900.0	81.4	83.7	81.3	83.7	85.5	85.0	7255	82.6
1997	8236.1	900.0	99.4	85.1	99.4	85.1	104.5	86.7	8741	99.8
1998	7104.5	900.0	85.5	85.2	85.5	85.2	90.1	87.0	7599	86.7
1999	6730.0	900.0	81.1	84.8	81.1	84.8	85.4	86.9	7242	82.7
2000	7215.1	900.0	87.5	85.0	87.5	85.0	91.3	87.2	7696	87.6
2001	8346.4	900.0	99.9	86.0	99.9	86.0	105.9	88.5	8760	100.0
2002	7419.0	900.0	88.8	86.2	88.8	86.2	94.1	88.8	7867	89.8
2003	7074.4	900.0	86.3	86.2	86.3	86.2	89.7	88.9	7593	86.7

# KR-7 YONGGWANG-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
06 Feb	169.9	173.0	UF5	H41	MANUAL TRIP BY INCREASE OF HYDROGEN LEAKAGE AT THE GENERATOR
24 Apr	83.8	90.8	UF4	A17	RCP 'B' STOP CAUSED BY CONTROL CARD MALFUNCTION
10 May	915.9	885.6	PF	C	REFUELING AND MAINTENANCE

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1986 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		83			27	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	915			1001		
D. Inspection, maintenance or repair without refuelling				9		
H. Nuclear regulatory requirements		169				
J. Grid failure or grid unavailability					0	
Subtotal	915	252	0	1010	27	0
Total		1167			1037	

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

System	2003 Hours Lost	1986 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		10
15. Reactor Cooling Systems		2
16. Steam generation systems		0
17. Safety I&C Systems (excluding reactor I&C)	83	0
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		4
41. Main Generator Systems		0
42. Electrical Power Supply Systems		2
XX. Miscellaneous Systems		0
Total	83	22

# KR-8 YONGGWANG-2

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 900.0 MW(e)  
**Design Net Capacity:** 890.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7413.3 GW(e).h  
**Energy Availability Factor:** 89.6%  
**Load Factor:** 94.0%  
**Operating Factor:** 90.5%  
**Energy Unavailability Factor:** 10.4%  
**Total Off-line Time:** 829 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	348.5	160.2	704.5	680.6	701.4	675.1	696.0	690.6	671.9	701.5	678.4	704.6	7413.3
<b>EAF (%)</b>	48.3	22.7	100.0	100.0	99.9	100.0	100.0	100.0	100.0	100.0	99.5	100.0	89.6
<b>UCF (%)</b>	48.3	22.7	100.0	100.0	99.9	100.0	100.0	100.0	100.0	100.0	99.9	100.0	89.7
<b>LF (%)</b>	52.0	26.5	105.2	105.2	104.7	104.2	103.9	103.1	103.7	104.6	104.7	105.2	94.0
<b>OF (%)</b>	51.7	30.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.5
<b>EUf (%)</b>	51.7	77.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.5	0.0	10.4
<b>PUf (%)</b>	51.7	77.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	10.3
<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	0.4	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Dec 1981      **Lifetime Generation:** 112459.0 GW(e).h  
**Date of First Criticality:** 15 Oct 1986      **Cumulative Energy Availability Factor:** 83.6%  
**Date of Grid Connection:** 11 Nov 1986      **Cumulative Load Factor:** 85.7%  
**Date of Commercial Operation:** 10 Jun 1987      **Cumulative Unit Capability Factor:** 78.2%  
**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 (%)
1987	4297.0	900.0	0.0	0.0	98.9	100.0	55.9	0.0	4826	56.5
1988	6280.9	900.0	80.7	80.7	80.6	80.6	79.4	79.4	7085	80.7
1989	5703.2	900.0	73.6	77.1	73.6	77.1	72.3	75.9	6446	73.6
1990	5964.5	900.0	77.1	77.1	77.1	77.1	75.7	75.8	6757	77.1
1991	6715.0	900.0	84.8	79.1	84.9	79.1	85.2	78.2	7433	84.9
1992	6434.6	900.0	82.6	79.8	82.6	79.8	81.4	78.8	7259	82.6
1993	6930.5	900.0	85.8	80.8	85.7	80.8	87.9	80.3	7506	85.7
1994	7132.9	890.0	85.5	81.5	85.5	81.4	91.5	81.9	7687	87.8
1995	6036.5	900.0	74.2	80.5	74.2	80.5	76.6	81.2	6696	76.4
1996	7656.1	900.0	91.7	81.8	91.6	81.8	96.8	83.0	8189	93.2
1997	6657.3	900.0	81.2	81.7	81.2	81.7	84.4	83.1	7453	85.1
1998	6010.4	900.0	74.5	81.1	74.4	81.0	76.2	82.5	6583	75.1
1999	6718.9	900.0	82.1	81.2	82.1	81.1	85.2	82.7	7301	83.3
2000	7144.1	900.0	87.1	81.6	87.1	81.6	90.4	83.3	7753	88.3
2001	7169.7	900.0	87.1	82.0	87.1	82.0	90.9	83.9	7726	88.2
2002	8194.2	900.0	99.9	83.2	99.6	83.2	103.9	85.2	8744	99.8
2003	7413.3	900.0	89.7	83.6	89.6	83.6	94.0	85.7	7931	90.5

## KR-8 YONGGWANG-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
17 Jan	829.7	813.5	PF	C	REFUELING AND MAINTENANCE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					45	
B. Refuelling without a maintenance					5	
C. Inspection, maintenance or repair combined with refuelling	829			1057		
D. Inspection, maintenance or repair without refuelling				121		
J. Grid failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						0
Subtotal	829	0	0	1178	50	1
Total		829			1229	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		1
15. Reactor Cooling Systems		2
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		6
35. All other I&C Systems		1
41. Main Generator Systems		21
42. Electrical Power Supply Systems		10
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  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 1049.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 7818.1 GW(e).h  
**Energy Availability Factor:** 90.1%  
**Load Factor:** 93.9%  
**Operating Factor:** 91.0%  
**Energy Unavailability Factor:** 9.9%  
**Total Off-line Time:** 789 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	738.3	666.5	738.7	713.7	581.3	58.4	734.6	731.0	709.0	737.2	668.9	740.5	7818.1
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	79.5	6.1	100.0	100.0	100.0	100.0	94.4	100.0	90.1
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	79.5	6.1	100.0	100.0	100.0	100.0	94.4	100.0	90.1
<b>LF (%)</b>	104.5	104.4	104.5	104.5	82.2	8.5	103.9	103.4	103.7	104.2	97.8	104.8	93.9
<b>OF (%)</b>	100.0	100.0	100.0	100.1	80.6	15.6	100.0	100.0	100.0	99.9	94.9	100.0	91.0
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	20.5	93.9	0.0	0.0	0.0	0.0	5.6	0.0	9.9
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	20.5	93.9	0.0	0.0	0.0	0.0	0.0	0.0	9.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	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. 2003 Summary of Operation

## 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:** 66189.6 GW(e).h  
**Cumulative Energy Availability Factor:** 86.9%  
**Cumulative Load Factor:** 89.7%  
**Cumulative Unit Capability Factor:** 81.6%  
**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 (%)
1995	6430.3	950.0	0.0	0.0	99.4	100.0	77.3	0.0	6573	75.0
1996	6366.2	950.0	74.0	74.0	74.0	74.0	76.3	76.3	6589	75.0
1997	7229.6	950.0	84.0	79.0	84.0	79.0	86.9	81.6	7443	85.0
1998	7400.8	950.0	85.5	81.2	85.5	81.1	88.9	84.0	7566	86.4
1999	7395.3	950.0	86.7	82.5	86.7	82.5	88.9	85.2	7678	87.6
2000	7262.0	950.0	85.6	83.2	85.6	83.2	87.0	85.6	7568	86.2
2001	8629.1	950.0	100.0	86.0	100.0	86.0	103.7	88.6	8760	100.0
2002	7658.2	950.0	89.1	86.4	89.1	86.4	92.0	89.1	7831	89.4
2003	7818.1	950.0	90.1	86.9	90.1	86.9	93.9	89.7	7971	91.0



## KR-11 YONGGWANG-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
26 May	753.0	787.1	PF	C	REFUELING AND MAINTENANCE
25 Nov	36.8	40.5	UF4	A42	ON-SITE ELECTRIC POWER FAILURE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1995 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		36			8	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	753			872		
E. Testing of plant systems or components					0	
Subtotal	753	36	0	872	8	0
Total		789			880	

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

System	2003 Hours Lost	1995 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		3
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		0
35. All other I&C Systems		2
41. Main Generator Systems		0
42. Electrical Power Supply Systems	36	
Total	36	6

# 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  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 1049.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 8576.8 GW(e).h  
**Energy Availability Factor:** 98.7%  
**Load Factor:** 103.1%  
**Operating Factor:** 98.8%  
**Energy Unavailability Factor:** 1.3%  
**Total Off-line Time:** 108 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	743.1	563.3	743.5	719.2	742.0	714.2	736.7	729.9	705.0	733.7	708.9	737.1	8576.8
<b>EAF (%)</b>	99.8	84.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.8	100.0	98.7
<b>UCF (%)</b>	99.8	84.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.8	100.0	98.7
<b>LF (%)</b>	105.1	88.2	105.2	105.3	105.0	104.4	104.2	103.3	103.1	103.7	103.6	104.3	103.1
<b>OF (%)</b>	97.2	87.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.8
<b>EUf (%)</b>	0.2	15.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	1.3
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.1
<b>UCLF (%)</b>	0.2	15.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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. 2003 Summary of Operation

## 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:** 60740.1 GW(e).h  
**Cumulative Energy Availability Factor:** 88.1%  
**Cumulative Load Factor:** 91.2%  
**Cumulative Unit Capability Factor:** 81.6%  
**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 (%)		
1996	7197.5	950.0	83.5	83.5	83.5	83.5	86.3	86.3	86.3	86.3	7565	86.1
1997	6767.7	950.0	78.8	81.2	78.8	81.1	81.3	83.8	81.3	83.8	7125	81.3
1998	8427.3	950.0	97.1	86.5	97.1	86.5	101.3	89.6	101.3	89.6	8591	98.1
1999	7627.9	950.0	89.0	87.1	89.0	87.1	91.7	90.1	91.7	90.1	7883	90.0
2000	7252.3	950.0	84.7	86.6	84.6	86.6	86.9	89.5	86.9	89.5	7441	84.7
2001	7237.2	950.0	84.8	86.3	84.8	86.3	87.0	89.1	87.0	89.1	7424	84.7
2002	7653.5	950.0	88.7	86.6	88.7	86.6	92.0	89.5	92.0	89.5	7808	89.1
2003	8576.8	950.0	98.7	88.2	98.7	88.1	103.1	91.2	103.1	91.2	8652	98.8

## KR-12 YONGGWANG-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
31 Jan	107.0	101.5	UF4	A42	PROTECTION RELAY ACTUATION BY FAILURE OF GIB ON THE MAIN TRANSFORMER PHASE A'

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1996 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		107			33	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling				906		
Subtotal	0	107	0	906	34	0
Total		107			940	

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

System	2003 Hours Lost	1996 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		10
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		4
41. Main Generator Systems		14
42. Electrical Power Supply Systems	107	
Total	107	32

# KR-17 YONGGWANG-5

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** DHICKOPC (DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPAN

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 0.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 6694.4 GW(e).h  
**Energy Availability Factor:** 77.1%  
**Load Factor:** 80.4%  
**Operating Factor:** 78.3%  
**Energy Unavailability Factor:** 22.9%  
**Total Off-line Time:** 1904 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	738.4	666.9	361.4	0.0	44.4	714.2	736.4	657.1	711.8	738.2	714.4	611.2	6694.4
<b>EAF (%)</b>	100.0	100.0	48.0	0.0	4.3	100.0	100.0	89.5	100.0	100.0	99.8	85.7	77.1
<b>UCF (%)</b>	100.0	100.0	48.0	0.0	4.3	100.0	100.0	89.5	100.0	100.0	99.8	85.8	77.1
<b>LF (%)</b>	104.5	104.5	51.1	0.0	6.3	104.4	104.2	93.0	104.1	104.3	104.5	86.5	80.4
<b>OF (%)</b>	100.0	100.0	51.6	0.0	11.4	100.0	100.0	91.7	100.0	99.9	100.0	86.2	78.3
<b>EUf (%)</b>	0.0	0.0	52.0	100.0	95.7	0.0	0.0	10.5	0.0	0.0	0.2	14.3	22.9
<b>PUF (%)</b>	0.0	0.0	52.0	100.0	95.7	0.0	0.0	0.0	0.0	0.0	0.2	14.3	22.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.5	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 29 Jun 1997      **Lifetime Generation:** 11701.1 GW(e).h  
**Date of First Criticality:** 24 Nov 2001      **Cumulative Energy Availability Factor:** 77.1%  
**Date of Grid Connection:** 19 Dec 2001      **Cumulative Load Factor:** 80.4%  
**Date of Commercial Operation:** 21 May 2002      **Cumulative Unit Capability Factor:** 81.5%  
**Cumulative Energy Unavailability Factor:** 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 (%)
2002	5006.8	950.0	0.0	0.0	98.7	100.0	102.6	0.0	5095	99.2
2003	6694.4	950.0	77.1	77.1	77.1	77.1	80.4	80.4	6856	78.3

## KR-17 YONGGWANG-5

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
17 Mar	1739.0	1754.7	PF	C	REFUELING AND MAINTENANCE
03 Aug	62.4	73.9	UF4	A12	CRDM CONTROL POWER SUPPLY FUSE FAILURE
21 Dec	48.3	47.4	PF	D11	PLANNED REPAIR (THERMAL SLEEVE MAINTENANCE)
29 Dec	30.3	29.8	PF	D34	PLANNED REPAIR (RADIATION LEAKAGE IN DEMI-WATER SYSTEM)
31 Dec	24.0	22.6	PF	C	REFUELING AND MAINTENANCE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			2002 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		62			20	
C. Inspection, maintenance or repair combined with refuelling	1763					
D. Inspection, maintenance or repair without refuelling	78					
Subtotal	1841	62	0	0	20	0
Total	1903			20		

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

System	2003 Hours Lost	2002 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	62	
Total	62	0

# KR-18 YONGGWANG-6

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** DHICKOPC (DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPAN

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 0.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 7652.2 GW(e).h  
**Energy Availability Factor:** 88.2%  
**Load Factor:** 92.0%  
**Operating Factor:** 88.2%  
**Energy Unavailability Factor:** 11.8%  
**Total Off-line Time:** 1032 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	734.1	670.2	742.0	718.3	740.7	714.5	737.4	734.9	711.6	737.9	410.8	0.0	7652.2
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	60.0	0.0	88.2
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	60.0	0.0	88.2
<b>LF (%)</b>	103.9	105.0	105.0	105.2	104.8	104.5	104.3	104.0	104.0	104.3	60.1	0.0	92.0
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	60.0	0.0	88.2
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.0	100.0	11.8
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.0	100.0	11.8
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 20 Nov 1997  
**Date of First Criticality:** 01 Sep 2002  
**Date of Grid Connection:** 16 Sep 2002  
**Date of Commercial Operation:** 24 Dec 2002

**Lifetime Generation:** 7652.2 GW(e).h  
**Cumulative Energy Availability Factor:** 88.2%  
**Cumulative Load Factor:** 92.0%  
**Cumulative Unit Capability Factor:** 81.5%  
**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 (%)
2003	7652.2	950.0	88.2	88.2	88.2	88.2	92.0	92.0	7728	88.2

## KR-18 YONGGWANG-6

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
19 Nov	1031.3	979.5	PF	C	REFUELING AND MAINTENANCE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			2003 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling	1031					
Subtotal	1031	0	0	0	0	0
Total	1031			0		

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

System	2003 Hours Lost	2003 to 2003 Average Hours Lost Per Year

**LT-46 IGNALINA-1**

Operator: INPP (IGNALINA NUCLEAR POWER PLANT)

Contractor: MAEP (MINATOMENERGOPROM, MINISTRY OF NUCLEAR POWER AND INDUSTRY)

**1. Station Details**

Type: LWGR  
 Maximum Net Capacity  
 at the beginning of 2003: 1185.0 MW(e)  
 Design Net Capacity: 1380.0 MW(e)  
 Design Discharge Burnup: 21600 MW.d/t

**2. Production Summary 2003**

Energy Production: 6787.6 GW(e).h  
 Energy Availability Factor: 65.4%  
 Load Factor: 65.4%  
 Operating Factor: 71.9%  
 Energy Unavailability Factor: 34.6%  
 Total Off-line Time: 2461 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	814.3	724.8	751.9	838.3	860.3	742.9	261.0	0.0	0.0	205.4	829.7	758.9	6787.6
EAF (%)	92.4	91.0	85.3	98.3	97.6	87.1	29.6	0.0	0.0	23.4	97.2	86.1	65.4
UCF (%)	100.0	100.0	97.7	100.0	100.0	100.0	35.3	0.0	0.0	27.0	100.0	100.0	71.4
LF (%)	92.4	91.0	85.3	98.4	97.6	87.1	29.6	0.0	0.0	23.3	97.2	86.1	65.4
OF (%)	100.0	100.0	100.0	100.1	100.0	100.0	35.2	0.0	0.0	30.7	100.0	100.0	71.9
EUUF (%)	7.6	9.0	14.7	1.7	2.4	12.9	70.4	100.0	100.0	76.6	2.8	13.9	34.6
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	64.7	100.0	100.0	73.0	0.0	0.0	28.4
UCLF (%)	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
XUF (%)	7.6	9.0	12.4	1.7	2.4	12.9	5.7	0.0	0.0	3.6	2.8	13.9	6.0

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation**

THE MAIN AND SOLE REASON OF OTHER ENERGY LOSSES 622311 MWH IS POWER LIMITATION INTRODUCED BY DISPATCHER.

**5. Historical Summary**

Date of Construction Start: 01 May 1977      Lifetime Generation: 77171.1 GW(e).h  
 Date of First Criticality: 04 Oct 1983      Cumulative Energy Availability Factor: 55.0%  
 Date of Grid Connection: 31 Dec 1983      Cumulative Load Factor: 52.2%  
 Date of Commercial Operation: 01 May 1984      Cumulative Unit Capability Factor: 77.8%  
    Cumulative Energy Unavailability Factor: 45.0%

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	4660.8	1380.0	0.0	0.0	38.4	100.0	38.4	0.0	6489	73.9
1985	8751.9	1380.0	83.8	83.8	83.8	83.8	72.4	72.4	7483	85.4
1986	9143.0	1380.0	75.2	79.5	75.2	79.5	75.6	74.0	7055	80.5
1987	6652.3	1500.0	70.3	76.2	61.4	73.1	50.6	65.8	5378	61.4
1988	4565.9	1380.0	67.3	74.0	67.2	71.7	37.7	58.9	4990	56.8
1989	8245.0	1380.0	82.5	75.7	67.4	70.8	68.2	60.7	7338	83.8
1990	7450.3	1380.0	61.6	73.4	61.6	69.3	61.6	60.9	6620	75.6
1991	6811.7	1380.0	56.9	71.0	56.8	67.5	56.3	60.2	5895	67.3
1993	5361.3	1185.0	55.1	69.3	35.2	64.0	51.6	59.3	6644	75.8
1994	3460.4	1185.0	59.1	68.3	33.3	61.0	33.3	56.8	4620	52.7
1995	5026.3	1185.0	62.0	67.8	48.4	59.9	48.4	56.0	5059	57.8
1996	5746.8	1185.0	61.9	67.3	55.2	59.5	55.2	56.0	5432	61.8
1997	4399.1	1185.0	49.6	65.9	49.6	58.8	42.4	54.9	4423	50.5
1998	4113.0	1185.0	54.5	65.1	39.5	57.4	39.6	53.9	4925	56.2
1999	3789.8	1185.0	77.8	66.0	36.5	56.1	36.5	52.7	5663	64.6
2000	3544.0	1185.0	59.9	65.6	34.0	54.7	34.0	51.6	4739	54.0
2001	5072.5	1185.0	80.5	66.5	51.4	54.5	48.9	51.4	6462	73.8
2002	5485.9	1185.0	62.2	66.2	52.8	54.4	52.8	51.5	6164	70.4
2003	6787.6	1185.0	71.4	66.5	65.4	55.0	65.4	52.2	6299	71.9



# LT-46 IGNALINA-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Mar	40.0	20.2	UP	A31	UNPLANNED TURBINE TRIP DUE TO CRACK ON THE COVER OF TURBINE STEAM INLET.
11 Jul	2461.0	2263.8	PF	D	SCHEDULED PREVENTIVE MAINTENANCE OF THE UNIT.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					236	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling				260	29	
D. Inspection, maintenance or repair without refuelling	2461			1258		
J. Grid failure or grid unavailability						24
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					98	113
Subtotal	2461	0	0	1518	366	137
Total		2461			2021	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		22
12. Reactor I&C Systems		11
13. Reactor Auxiliary Systems		18
14. Safety Systems		19
15. Reactor Cooling Systems		56
17. Safety I&C Systems (excluding reactor I&C)		5
31. Turbine and auxiliaries		3
32. Feedwater and Main Steam System		12
35. All other I&C Systems		5
41. Main Generator Systems		11
Total	0	162

# LT-47 IGNALINA-2

**Operator:** INPP (IGNALINA NUCLEAR POWER PLANT)

**Contractor:** MAEP (MINATOMENERGOPROM, MINISTRY OF NUCLEAR POWER AND INDUSTRY)

## 1. Station Details

**Type:** LWGR  
**Maximum Net Capacity at the beginning of 2003:** 1185.0 MW(e)  
**Design Net Capacity:** 1380.0 MW(e)  
**Design Discharge Burnup:** 21600 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7461.9 GW(e).h  
**Energy Availability Factor:** 71.5%  
**Load Factor:** 71.9%  
**Operating Factor:** 81.7%  
**Energy Unavailability Factor:** 28.5%  
**Total Off-line Time:** 1604 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	877.1	775.9	662.9	64.1	0.0	392.9	763.6	901.1	875.0	813.0	597.1	739.2	7461.9
<b>EAF (%)</b>	99.5	97.4	75.2	7.4	0.0	46.0	86.6	100.0	100.0	92.2	70.0	83.8	71.5
<b>UCF (%)</b>	100.0	98.9	76.8	7.5	0.0	52.9	96.0	100.0	100.0	100.0	71.4	92.1	74.6
<b>LF (%)</b>	99.5	97.4	75.2	7.5	0.0	46.0	86.6	102.2	102.6	92.1	70.0	83.8	71.9
<b>OF (%)</b>	100.0	100.0	100.0	13.6	0.0	91.7	100.0	100.0	100.0	99.9	75.3	100.0	81.7
<b>EUf (%)</b>	0.5	2.6	24.8	92.6	100.0	54.0	13.4	0.0	0.0	7.8	30.0	16.2	28.5
<b>PUF (%)</b>	0.0	0.0	23.2	92.5	100.0	47.1	4.0	0.0	0.0	0.0	0.0	0.0	22.3
<b>UCLF (%)</b>	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.6	8.0	3.1
<b>XUF (%)</b>	0.5	1.4	1.6	0.1	0.0	6.8	9.4	0.0	0.0	7.8	1.4	8.2	3.1

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

THE MAIN AND SOLE REASON OF OTHER ENERGY LOSSES 324317 MWH IS POWER LIMITATIONS INTRODUCED BY DISPATCHER.

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1978  
**Date of First Criticality:** 01 Dec 1986  
**Date of Grid Connection:** 20 Aug 1987  
**Date of Commercial Operation:** 20 Aug 1987

**Lifetime Generation:** 64541.4 GW(e).h  
**Cumulative Energy Availability Factor:** 59.6%  
**Cumulative Load Factor:** 58.9%  
**Cumulative Unit Capability Factor:** 78.2%  
**Cumulative Energy Unavailability Factor:** 40.4%

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	2520.3	1316.0	0.0	0.0	23.1	100.0	23.1	0.0	2949	35.5
1988	7141.5	1380.0	69.7	69.7	69.7	69.7	58.9	58.9	6213	70.7
1989	7125.8	1380.0	71.2	70.5	58.0	63.9	58.9	58.9	6259	71.4
1990	8250.7	1380.0	68.3	69.8	68.3	65.3	68.3	62.0	7296	83.3
1991	8802.1	1380.0	73.2	70.6	73.0	67.3	72.8	64.7	7602	86.8
1993	5675.9	1185.0	49.0	66.8	38.2	62.1	54.7	63.0	5801	66.2
1994	3167.4	1185.0	76.2	68.2	30.5	57.4	30.5	58.1	4556	52.0
1995	5610.9	1185.0	75.8	69.2	54.1	56.9	54.1	57.6	6431	73.4
1996	6918.9	1185.0	75.8	70.0	66.5	58.0	66.5	58.6	6778	77.2
1997	6453.5	1185.0	77.8	70.8	77.7	60.1	62.2	59.0	6941	79.2
1998	8174.8	1185.0	89.7	72.6	78.6	61.8	78.8	60.8	7967	90.9
1999	4926.5	1185.0	73.8	72.7	47.5	60.6	47.5	59.7	6777	77.4
2000	3873.0	1185.0	77.6	73.1	37.2	58.7	37.2	57.9	4890	55.7
2001	4867.4	1185.0	68.8	72.7	46.9	57.9	46.9	57.1	4971	56.7
2002	7411.3	1185.0	78.4	73.1	70.9	58.8	71.4	58.1	6980	79.7
2003	7461.9	1185.0	74.6	73.2	71.5	59.6	71.9	58.9	7156	81.7

## LT-47 IGNALINA-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
03 Feb	13.0	9.0	UP	A31	UNPLANNED TURBINE TRIP DUE TO REDUCTION OF OIL LEVEL.
15 Mar	272.0	204.5	PP	D31	POWER REDUCTION OF THE UNIT DUE TO SCHEDULED PREVENTIVE MAINTENANCE OF TURBINE.
05 Apr	1366.0	1670.0	PF	D	SCHEDULED PREVENTIVE MAINTENANCE OF THE UNIT.
01 Jun	62.0	402.2	PP	D31	SCHEDULED PREVENTIVE MAINTENANCE OF THE UNIT.
01 Jul	45.0	35.5	PP	D31	SCHEDULED PREVENTIVE MAINTENANCE OF THE TURBINE.
01 Nov	178.0	244.3	UF	A16	UNPLANNED UNIT SHUTDOWN TO REMOVE THE DEFECTIVE WELD.
08 Dec	140.0	70.1	UP	A31	UNPLANNED TURBINE TRIP DUE TO LEAKAGE IN THE SYSTEM OF MAIN CONDENSATE OF TURBINE.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		178			143	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling				142		
D. Inspection, maintenance or repair without refuelling	1366			1229		
E. Testing of plant systems or components				1		
J. Grid failure or grid unavailability						16
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					56	131
L. Human factor related						120
Subtotal	1366	178	0	1372	203	267
Total		1544			1842	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		10
12. Reactor I&C Systems		7
13. Reactor Auxiliary Systems		13
14. Safety Systems		18
15. Reactor Cooling Systems		73
16. Steam generation systems	178	
32. Feedwater and Main Steam System		3
41. Main Generator Systems		2
42. Electrical Power Supply Systems		5
XX. Miscellaneous Systems		2
Total	178	133

**MX-1 LAGUNA VERDE-1**

Operator: CFE (COMISION FEDERAL DE ELECTRICIDAD)

Contractor: GE (GENERAL ELECTRIC COMPANY (US))

**1. Station Details**

Type: BWR  
 Maximum Net Capacity  
 at the beginning of 2003: 680.0 MW(e)  
 Design Net Capacity: 654.0 MW(e)  
 Design Discharge Burnup: 10093 MW.d/t

**2. Production Summary 2003**

Energy Production: 5415.4 GW(e).h  
 Energy Availability Factor: 97.6%  
 Load Factor: 90.9%  
 Operating Factor: 98.7%  
 Energy Unavailability Factor: 2.4%  
 Total Off-line Time: 118 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	476.9	428.7	477.6	454.8	431.1	446.5	463.8	461.2	446.8	469.3	385.2	473.5	5415.4
EAF (%)	99.1	99.3	99.7	99.0	92.7	99.5	99.6	99.7	99.2	99.8	85.0	98.5	97.6
UCF (%)	99.3	99.3	99.7	99.1	92.7	99.7	99.6	99.8	99.6	99.8	86.7	99.8	97.9
LF (%)	94.3	93.8	94.4	93.0	85.2	91.2	91.7	91.2	91.3	92.6	78.7	93.6	90.9
OF (%)	100.0	100.0	100.0	100.0	94.8	100.0	100.0	100.0	100.0	100.0	89.0	100.0	98.7
EUf (%)	0.9	0.7	0.3	1.0	7.3	0.5	0.4	0.3	0.8	0.2	15.0	1.5	2.4
PUF (%)	0.5	0.4	0.3	0.9	0.5	0.3	0.4	0.2	0.4	0.1	0.3	0.2	0.4
UCLF (%)	0.2	0.3	0.0	0.0	6.8	0.0	0.0	0.0	0.0	0.1	13.0	0.0	1.7
XUF (%)	0.2	0.0	0.0	0.1	0.0	0.2	0.0	0.1	0.4	0.0	1.7	1.3	0.3

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Oct 1976      Lifetime Generation: 59694.1 GW(e).h  
 Date of First Criticality: 08 Nov 1988      Cumulative Energy Availability Factor: 80.0%  
 Date of Grid Connection: 13 Apr 1989      Cumulative Load Factor: 76.4%  
 Date of Commercial Operation: 29 Jul 1990      Cumulative Unit Capability Factor: 79.3%  
    Cumulative Energy Unavailability Factor: 20.0%

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	311.2	654.0	0.0	0.0	76.8	100.0	5.4	0.0	2182	24.9
1990	2775.8	640.0	0.0	0.0	54.5	100.0	49.5	0.0	5370	61.3
1991	4062.1	640.0	74.5	74.5	74.4	74.4	72.5	72.5	7022	80.2
1992	3746.4	654.0	70.4	72.4	70.4	72.4	65.2	68.8	7024	80.0
1993	4724.4	654.0	90.6	78.5	90.6	78.5	82.5	73.4	7851	89.6
1994	4062.0	628.0	77.8	78.3	73.8	77.4	73.8	73.5	7095	81.0
1995	4154.1	628.0	78.1	78.3	75.5	77.0	75.5	73.9	7128	81.4
1996	3442.3	655.0	68.8	76.7	68.8	75.6	59.8	71.5	6628	75.5
1997	5218.8	615.0	96.0	79.3	95.9	78.4	96.9	75.0	8577	97.9
1998	4412.5	655.0	82.2	79.7	81.7	78.8	76.9	75.2	7359	84.0
1999	4451.0	670.0	82.8	80.0	81.5	79.1	75.8	75.3	7466	85.2
2000	4577.6	645.0	80.6	80.1	80.3	79.2	80.8	75.8	7409	84.3
2001	4144.3	645.0	74.9	79.6	73.2	78.7	73.3	75.6	6808	77.7
2002	4196.3	680.0	76.4	79.3	75.8	78.4	70.4	75.2	6876	78.5
2003	5415.4	680.0	97.9	80.8	97.6	80.0	90.9	76.4	8642	98.7

# MX-1 LAGUNA VERDE-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
20 May	48.0	33.1	UF5	A31	MANUAL REACTOR SCRAM DUE TO A LOSS OF VACUUM IN MAIN CONDENSER.
20 Nov	70.0	63.6	UF5	A15	MANUAL REACTOR SCRAM DUE TO AN INCREASE IN THE LEAKAGE RATE FROM CONTAINMENT ISOLATION VALVE.
24 Nov	2.0	2.3	XP2	N33	POWER REDUCTION DUE TO LOW LEVEL IN THE HEAT SINK SYSTEM (LOW TIDE).
25 Dec	24.0	2.1	XP2	J42	POWER REDUCTION DUE TO ELECTRICAL FAILURE IN THE EXTERNAL POWER TRANSMISSION GRID.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1989 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		118		102	365	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling				771	36	
D. Inspection, maintenance or repair without refuelling				161		
E. Testing of plant systems or components				134	9	
J. Grid failure or grid unavailability					11	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					33	
Z. Others					36	
Subtotal	0	118	0	1168	504	0
Total		118			1672	

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

System	2003 Hours Lost	1989 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		9
12. Reactor I&C Systems		21
13. Reactor Auxiliary Systems		195
14. Safety Systems		10
15. Reactor Cooling Systems	70	40
17. Safety I&C Systems (excluding reactor I&C)		6
31. Turbine and auxiliaries	48	27
32. Feedwater and Main Steam System		94
35. All other I&C Systems		43
42. Electrical Power Supply Systems		18
Total	118	463

# MX-2 LAGUNA VERDE-2

**Operator:** CFE (COMISION FEDERAL DE ELECTRICIDAD)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 680.0 MW(e)  
**Design Net Capacity:** 654.0 MW(e)  
**Design Discharge Burnup:** 10093 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4604.8 GW(e).h  
**Energy Availability Factor:** 82.1%  
**Load Factor:** 77.3%  
**Operating Factor:** 84.0%  
**Energy Unavailability Factor:** 17.9%  
**Total Off-line Time:** 1401 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	479.6	432.0	475.0	373.5	0.0	159.6	461.3	468.3	449.5	476.6	352.1	477.3	4604.8
<b>EAF (%)</b>	98.9	99.6	99.6	82.1	0.0	35.4	98.1	99.5	98.2	99.6	76.6	98.7	82.1
<b>UCF (%)</b>	99.1	99.6	99.6	82.9	0.0	35.7	98.2	99.6	98.7	99.6	77.9	99.7	82.5
<b>LF (%)</b>	94.8	94.5	93.9	76.4	0.0	32.6	91.2	92.6	91.8	94.1	71.9	94.4	77.3
<b>OF (%)</b>	100.0	100.0	100.0	83.4	0.0	44.3	100.0	100.0	100.0	100.0	81.0	100.0	84.0
<b>EUf (%)</b>	1.1	0.4	0.4	17.9	100.0	64.6	1.9	0.5	1.8	0.4	23.4	1.3	17.9
<b>PUf (%)</b>	0.1	0.4	0.4	17.1	100.0	34.5	0.6	0.4	1.3	0.4	0.5	0.3	13.1
<b>UCLF (%)</b>	0.8	0.0	0.0	0.0	0.0	29.8	1.2	0.0	0.0	0.0	21.6	0.0	4.4
<b>XUF (%)</b>	0.2	0.0	0.0	0.8	0.0	0.2	0.0	0.1	0.5	0.0	1.3	1.0	0.3

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1977  
**Date of First Criticality:** 06 Sep 1994  
**Date of Grid Connection:** 11 Nov 1994  
**Date of Commercial Operation:** 10 Apr 1995

**Lifetime Generation:** 38708.8 GW(e).h  
**Cumulative Energy Availability Factor:** 80.2%  
**Cumulative Load Factor:** 77.2%  
**Cumulative Unit Capability Factor:** 81.6%  
**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 (%)
1995	3379.4	628.0	0.0	0.0	88.4	100.0	63.1	0.0	5687	66.7
1996	3668.4	619.0	71.7	71.7	71.0	71.0	67.5	67.5	6657	75.8
1997	4805.5	627.0	89.0	80.4	88.9	80.0	87.5	77.5	7897	90.1
1998	4411.9	655.0	85.6	82.2	83.0	81.0	76.9	77.3	7609	86.9
1999	5110.6	668.0	93.3	85.1	92.3	84.0	87.3	79.9	8459	96.6
2000	3339.1	645.0	58.6	79.7	56.6	78.5	58.9	75.7	5865	66.8
2001	4228.1	645.0	74.8	78.9	74.7	77.8	74.8	75.6	6952	79.4
2002	5161.0	680.0	91.5	80.8	91.5	79.9	86.6	77.2	8273	94.4
2003	4604.8	680.0	82.5	81.0	82.1	80.2	77.3	77.2	7359	84.0

**MX-2 LAGUNA VERDE-2****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
03 Jan	12.0	2.8	UP1	A14	UNPLANNED PARTIAL OUTAGE DUE TO IN ORDER TO FIX LEAKING VALVES OF THE REACTOR COOLING ISOLATED CORE SYSTEM IN THE MAIN STEAM TUNNEL.
26 Apr	1081.0	738.9	PF	C	PLANNED FULL OUTAGE DUE TO THE SIXTH FUEL RELOAD WITH INSPECTION, MAINTENANCE AND REFUELING.
10 Jun	89.0	60.3	UF3	Z	UNPLANNED FULL OUTAGE BECAUSE OF AN EXTENSION OF TIME TO CONTINUE WITH THE SIXTH FUEL RELOAD
15 Jun	96.0	85.7	UF5	A32	MANUAL REACTOR SCRAM IN ANTICIPATION TO REACTOR LOW LEVEL DUE TO FEEDWATER PUMPS TRIP.
10 Jul	54.0	6.2	UP	A31	PARTIAL OUTAGE DUE TO PROBLEMS IN THE MINIMUM FLOW VALVES OF THE MOISTURE SEPERATOR AND REHEATER SYSTEM.
12 Nov	132.0	105.7	UF1	A11	UNPLANNED REACTOR SHUTDOWN IN ORDER TO REPAIR LEAKS TO THE DRYWELL.

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

Outage Cause	2003 Hours Lost			1995 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		228			202	
B. Refuelling without a maintenanc					4	
C. Inspection, maintenance or repai combined with refuelling	1081			736		
D. Inspection, maintenance or repai without refuelling				22		
K. Load-following (frequency contro reserve shutdown due to reduced energ demand)					123	
Z. Others		89				
Subtotal	1081	317	0	758	329	0
Total		1398			1087	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1995 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	132	6
12. Reactor I&C Systems		32
13. Reactor Auxiliary System:		11
14. Safety Systems		5
15. Reactor Cooling System:		2
16. Steam generation system:		6
31. Turbine and auxiliarie:		9
32. Feedwater and Main Steam Syster	96	18
33. Circulating Water System		17
35. All other I&C Systems:		2
41. Main Generator System:		41
42. Electrical Power Supply System:		40
Total	228	189

# NL-2 BORSSELE

**Operator:** EPZ (N.V. ELEKTRICITEITS-PRODUKTIEMAATSCHAPPIJ ZUID-NEDERLAND)

**Contractor:** KWU/STOR (KRAFTWERK UNION AG / STORK)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 450.0 MW(e)  
**Design Net Capacity:** 450.0 MW(e)  
**Design Discharge Burnup:** 32000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3788.3 GW(e).h  
**Energy Availability Factor:** 95.3%  
**Load Factor:** 96.1%  
**Operating Factor:** 96.2%  
**Energy Unavailability Factor:** 4.7%  
**Total Off-line Time:** 329 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	338.2	305.7	337.9	326.4	336.0	323.2	332.2	330.0	195.4	334.0	325.7	303.4	3788.3
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	99.9	99.5	98.8	60.5	94.5	100.0	90.3	95.3
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	99.9	99.5	98.8	60.5	94.5	100.0	90.3	95.3
<b>LF (%)</b>	101.0	101.1	100.9	100.9	100.4	99.8	99.2	98.6	60.3	99.6	100.5	90.6	96.1
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	100.0	100.0	100.0	64.7	99.5	100.0	90.5	96.2
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.1	0.5	1.2	39.5	5.5	0.0	9.7	4.7
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	34.8	4.6	0.0	0.0	3.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.1	0.5	1.2	4.7	0.9	0.0	9.7	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jul 1969      **Lifetime Generation:** 88409.2 GW(e).h  
**Date of First Criticality:** 20 Jun 1973      **Cumulative Energy Availability Factor:** 83.4%  
**Date of Grid Connection:** 04 Jul 1973      **Cumulative Load Factor:** 82.1%  
**Date of Commercial Operation:** 26 Oct 1973      **Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1980	3593.0	447.0	100.0	95.9	92.9	81.4	91.5	79.8	8496	96.7
1981	3048.3	447.0	78.8	93.8	78.8	81.1	77.8	79.5	7094	81.0
1982	3315.9	452.0	83.9	92.7	83.9	81.4	83.7	80.0	7489	85.5
1983	3050.0	452.0	76.9	91.1	76.9	80.9	77.0	79.7	6959	79.4
1984	3062.0	452.0	76.7	89.8	76.6	80.5	77.1	79.5	6895	78.5
1985	3261.2	452.0	83.3	89.2	81.9	80.7	82.4	79.7	7299	83.3
1986	3574.0	452.0	91.6	89.4	89.9	81.4	90.3	80.5	8053	91.9
1987	2950.9	452.0	76.6	88.5	74.2	80.9	74.5	80.1	6756	77.1
1988	3032.6	452.0	76.2	87.7	76.2	80.5	76.4	79.8	6763	77.0
1989	3421.9	481.0	87.8	87.7	87.8	81.0	81.2	79.9	7711	88.0
1990	2885.9	481.0	75.7	86.9	75.6	80.7	68.5	79.2	6636	75.8
1991	2728.5	452.0	69.3	86.0	69.2	80.1	68.9	78.7	6221	71.0
1992	2830.3	452.0	82.9	85.8	80.6	80.1	71.3	78.3	6412	73.0
1993	3328.2	452.0	84.3	85.7	83.6	80.3	84.1	78.6	7376	84.2
1994	3322.0	452.0	84.8	85.7	84.8	80.5	83.9	78.8	7489	85.5
1995	3386.8	452.0	87.1	85.7	86.8	80.8	85.5	79.1	7654	87.4
1996	3520.3	452.0	88.3	85.8	88.2	81.1	88.7	79.5	7978	90.8
1999	3604.2	449.0	94.2	86.2	94.2	81.6	91.6	80.0	8363	95.5
2000	3699.0	449.0	93.9	86.5	93.1	82.1	93.8	80.6	8262	94.1
2001	3746.7	449.0	94.6	86.8	94.6	82.6	95.3	81.1	8404	95.9
2002	3686.9	450.0	93.8	87.1	93.4	83.0	93.5	81.6	8284	94.6
2003	3788.3	450.0	95.3	87.4	95.3	83.4	96.1	82.1	8431	96.2



## NL-2 BORSSELE

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
20 Sep	254.0	128.1	PF	C	REFUELLING
18 Oct	4.0	3.0	UF1	E14	CALIBRATIONS
29 Dec	71.0	32.3	UF1	A15	REPAIR YP-VALVE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1973 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		71			157	
B. Refuelling without a maintenance				14	1	
C. Inspection, maintenance or repair combined with refuelling	254			812	19	
D. Inspection, maintenance or repair without refuelling				56		
E. Testing of plant systems or components		4			14	
J. Grid failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				0	4	6
Subtotal	254	75	0	882	195	7
Total		329			1084	

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

System	2003 Hours Lost	1973 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		5
13. Reactor Auxiliary Systems		4
14. Safety Systems		16
15. Reactor Cooling Systems	71	16
16. Steam generation systems		44
31. Turbine and auxiliaries		20
32. Feedwater and Main Steam System		34
33. Circulating Water System		3
41. Main Generator Systems		0
42. Electrical Power Supply Systems		12
Total	71	154

# PK-2 CHASNUPP 1

**Operator:** PAEC (PAKISTAN ATOMIC ENERGY COMMISSION)  
**Contractor:** CNNC (CHINA NATIONAL NUCLEAR CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 300.0 MW(e)  
**Design Net Capacity:** 300.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 1809.8 GW(e).h  
**Energy Availability Factor:** 68.9%  
**Load Factor:** 68.9%  
**Operating Factor:** 78.5%  
**Energy Unavailability Factor:** 31.1%  
**Total Off-line Time:** 1881 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	55.3	144.6	177.6	180.1	223.7	167.4	5.4	187.9	115.1	193.9	140.5	218.4	1809.8
<b>EAF (%)</b>	24.8	71.7	79.6	83.4	100.0	77.6	2.4	84.2	53.3	86.9	65.0	97.9	68.9
<b>UCF (%)</b>	24.8	71.7	79.6	83.4	100.0	77.6	2.4	84.2	53.3	86.9	65.1	97.9	68.9
<b>LF (%)</b>	24.8	71.7	79.6	83.5	100.2	77.5	2.4	84.2	53.3	86.7	65.0	97.9	68.9
<b>OF (%)</b>	44.0	98.2	95.7	94.2	100.0	81.5	8.9	91.8	57.5	83.4	89.4	100.0	78.5
<b>EU (%)</b>	75.2	28.3	20.4	16.6	0.0	22.4	97.6	15.8	46.7	13.1	35.0	2.1	31.1
<b>PU (%)</b>	0.9	0.0	0.5	0.6	0.0	4.0	0.0	0.0	43.4	9.9	24.5	2.1	7.1
<b>UCLF (%)</b>	74.3	28.3	19.9	16.0	0.0	18.4	97.6	15.8	3.3	3.2	10.4	0.0	24.0
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1993  
**Date of First Criticality:** 03 May 2000  
**Date of Grid Connection:** 13 Jun 2000  
**Date of Commercial Operation:** 15 Sep 2000

**Lifetime Generation:** 5276.7 GW(e).h  
**Cumulative Energy Availability Factor:** 60.4%  
**Cumulative Load Factor:** 60.2%  
**Cumulative Unit Capability Factor:** 83.5%  
**Cumulative Energy Unavailability Factor:** 39.6%

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 (%)
2000	529.2	300.0	0.0	0.0	72.2	100.0	68.7	0.0	1860	72.4
2001	1581.8	300.0	62.4	62.4	60.1	60.1	60.2	60.2	5918	67.6
2002	1356.0	300.0	53.7	58.1	52.2	56.2	51.6	55.9	4790	54.7
2003	1809.8	300.0	68.8	61.7	68.9	60.4	68.9	60.2	6879	78.5

# PK-2 CHASNUPP 1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	425.9	127.7	UF3	Z11	DUE TO INAPPROPRIATE IMPLEMENTATION OF A DESIGN MODIFICATION, REACTOR UPPER INTERNALS GOT ENTANGLED IN ITS STORAGE RACK OUT SIDE THE CORE WHICH WAS THEREAFTER RELEASED.
18 Jan	74.0	22.4	XF4	J	FREQUENCY FLUCTUATIONS ON THE GRID RESULTED REACTOR TRIP.
23 Jan	9.9	2.0	PP	E	POWER COEFFICIENT MEASUREMENT TEST
23 Jan	144.4	17.5	UP2	H12	PARTIAL INCORE SCANNING WAS DONE DUE TO UNAVAILABILITY OF A DETECTOR.
01 Feb	31.0	9.5	XF4	J	GRID FLUCTUATIONS DUE TO THUNDER STORM ON TRANSMISSION LINES.
04 Feb	623.0	51.0	UP2	H12	PARTIAL INCORE SCANNING WAS DONE DUE TO UNAVAILABILITY OF A DETECTOR.
09 Mar	62.2	17.8	UF2	A32	REPAIR THE LEAKING VALVE OF STARTUP/SHUTDOWN SYSTEM
11 Mar	168.4	13.1	UP2	H12	PARTIAL IN-CORE SCANNING WAS DONE DUE TO UNAVAILABILITY OF A DETECTOR.
18 Apr	31.0	9.6	UF4	A32	PLANT TRIP DUE TO MAIN FEEDWATER CONTROLLER FAILURE.
22 Apr	80.0	24.2	UF4	A32	PLANT TRIPPED DUE TO FAILURE OF MAIN FEEDWATER PNEUMATIC CONTROLLER.
24 Apr	26.6	4.0	PP	E31	CONDUCT OF TURBINE IMPORTANT VALVES TEST
01 Jun	12.2	0.6	PP	E31	TURBINE IMPORTANT VALVES TESTING
16 Jun	89.7	0.8	PP	E12	EX-CORE/IN-CORE INSTRUMENTATION TEST
25 Jun	588.0	176.7	XF4	J	LARGE GRID FLUCTUATIONS CAUSING PLANT TRIP
29 Aug	60.9	18.3	UF4	A32	PLANT TRIPPED ON SUDDEN CLOSURE OF MAIN FEEDWATER CONTROL VALVE.
07 Sep	313.0	94.1	XF5	R	REDUCED GRID DEMAND
19 Sep	26.0	8.1	UF4	A32	PLANT TRIPPED DUE TO MAIN FEEDWATER CONTROLLER FAILURE
11 Oct	34.2	10.9	UF4	A12	REACTOR TRIPPED ON FALSE SIGNAL DUE TO FAILURE OF THE FLOW TRANSMITTER.
19 Oct	73.0	22.2	PF	E32	REPAIR LEAKY GASKETS OF ISOLATION VALVES OF MAIN FW BYPASS CONTROL VALVES.
04 Nov	130.2	10.4	XP2	R	REDUCED GRID DEMAND
09 Nov	34.0	10.5	XF4	J	GRID FREQUENCY DEPRECIATION CAUSE PLANT TRIPPING ON LOW FREQUENCY
11 Nov	182.3	14.6	XP2	R	REDUCED DEMAND ON THE GRID
19 Nov	49.0	14.7	UF4	A35	CIRCULATING WATER PUMPS DISCHARGE HYDRAULIC CHECK VALVES CLOSED DUE TO FAULT ON ITS POWER SUPPLY UPS

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			2000 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		343			972	
C. Inspection, maintenance or repair combined with refuelling				555		
D. Inspection, maintenance or repair without refuelling				144		
E. Testing of plant systems or components	73				7	
H. Nuclear regulatory requirements				135		
J. Grid failure or grid unavailability			727			56
L. Human factor related					8	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			313			
Z. Others		425				
Subtotal	73	768	1040	834	987	56
Total		1881			1877	

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

System	2003	2000 to 2003
	Hours Lost	Average Hours Lost Per Year
12. Reactor I&C Systems	34	18
14. Safety Systems		211
15. Reactor Cooling Systems		311
31. Turbine and auxiliaries		131
32. Feedwater and Main Steam System	260	36
33. Circulating Water System		26
35. All other I&C Systems	49	
41. Main Generator Systems		1
42. Electrical Power Supply Systems		236
Total	343	970

# PK-1 KANUPP

**Operator:** PAEC (PAKISTAN ATOMIC ENERGY COMMISSION)  
**Contractor:** CGE (CANADIAN GENERAL ELECTRIC)

## 1. Station Details

**Type:** PHWR  
**Maximum Net Capacity at the beginning of 2003:** 125.0 MW(e)  
**Design Net Capacity:** 125.0 MW(e)  
**Design Discharge Burnup:** 8650 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 0.0 GW(e).h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

## 3. 2003 Monthly Performance Data

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

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

KANUPP COMPLETED ITS NOMINAL DESIGN LIFE OF THIRTY YEARS AND WAS SHUTDOWN ON 5TH DECEMBER 2002 TO CARRY OUT REFURBISHMENT AND SAFETY UPGRADES SO THAT THE PLANT CAN BE OPERATED BEYOND THIRTY YEARS OF DESIGN LIFE. THE PLANT REMAINED IN SHUTDOWN STATE TILL THE END OF REPORTING PERIOD.

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1966  
**Date of First Criticality:** 01 Aug 1971  
**Date of Grid Connection:** 18 Oct 1971  
**Date of Commercial Operation:** 07 Dec 1972

**Lifetime Generation:** 9786.2 GW(e).h  
**Cumulative Energy Availability Factor:** 27.9%  
**Cumulative Load Factor:** 27.8%  
**Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 72.1%

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	262.0	137.0	22.7	64.2	21.8	24.9	21.8	24.9	3895	44.5
1986	476.2	125.0	44.0	62.8	43.5	26.2	43.5	26.2	7211	82.3
1987	274.8	125.0	25.6	60.4	25.1	26.2	25.1	26.1	4541	51.8
1988	171.4	125.0	16.2	57.7	15.6	25.5	15.6	25.5	2962	33.7
1989	60.9	125.0	5.6	54.7	5.6	24.4	5.6	24.3	1145	13.1
1990	375.9	125.0	34.3	53.6	34.3	24.9	34.3	24.9	5331	60.9
1991	370.3	125.0	34.8	52.6	33.8	25.4	33.8	25.3	6126	69.9
1992	499.7	125.0	45.5	52.3	45.5	26.4	45.5	26.3	6396	72.8
1993	369.6	125.0	35.8	51.5	33.8	26.7	33.8	26.7	4620	52.7
1994	523.6	125.0	53.6	51.6	47.8	27.7	47.8	27.6	7518	85.8
1995	461.0	125.0	44.0	51.2	42.1	28.3	42.1	28.3	7520	85.8
1996	310.9	125.0	32.6	50.5	28.3	28.3	28.3	28.3	5291	60.2
1997	386.1	125.0	36.8	49.9	35.3	28.6	35.3	28.5	6391	73.0
1998	353.4	125.0	31.3	49.2	29.7	28.6	32.3	28.7	4799	54.8
1999	69.0	125.0	11.9	47.9	11.9	28.0	6.3	27.9	1046	11.9
2000	368.3	125.0	34.6	47.4	33.5	28.2	33.5	28.1	5078	57.8
2001	399.5	125.0	45.1	47.3	36.5	28.5	36.5	28.3	6049	69.1
2002	444.0	125.0	41.3	47.1	40.5	28.9	40.5	28.7	6601	75.4
2003	0.0	125.0	0.0	45.6	0.0	27.9	0.0	27.8	0	0.0

# PK-1 KANUPP

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	8760.0	1095.0	PF	G12	KANUPP REMIANED IN SHUT DOWN STATE AS EXPLAINED IN HIGHLIGHTS OF OPERATION

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					1157	
B. Refuelling without a maintenance					71	
D. Inspection, maintenance or repair without refuelling				1769		
E. Testing of plant systems or components				0		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			32		
J. Grid failure or grid unavailability						98
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				4	116	13
Subtotal	8760	0	0	1805	1344	111
Total		8760			3260	

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		11
12. Reactor I&C Systems		129
13. Reactor Auxiliary Systems		107
14. Safety Systems		19
15. Reactor Cooling Systems		194
16. Steam generation systems		37
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		10
31. Turbine and auxiliaries		28
32. Feedwater and Main Steam System		216
33. Circulating Water System		35
41. Main Generator Systems		6
42. Electrical Power Supply Systems		148
XX. Miscellaneous Systems		5
Total	0	946

**RO-1 CERNAVODA-1**

Operator: SNN (SOCIETATEA NATIONALA NUCLEARELECTRICA S.A.)

Contractor: AECL (ATOMIC ENERGY OF CANADA LTD.)

**1. Station Details**

Type: PHWR  
 Maximum Net Capacity  
 at the beginning of 2003: 655.0 MW(e)  
 Design Net Capacity: 660.0 MW(e)  
 Design Discharge Burnup: —

**2. Production Summary 2003**

Energy Production: 4541.4 GW(e).h  
 Energy Availability Factor: 78.7%  
 Load Factor: 79.1%  
 Operating Factor: 80.2%  
 Energy Unavailability Factor: 21.3%  
 Total Off-line Time: 1736 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	491.5	445.2	486.7	472.9	249.5	0.0	432.9	344.9	167.1	484.8	475.9	489.9	4541.4
EAF (%)	99.8	100.0	99.2	99.3	51.2	0.0	88.8	70.8	35.5	99.1	100.0	100.0	78.7
UCF (%)	99.8	100.0	99.2	99.3	51.2	0.0	91.2	99.9	100.0	99.5	100.0	100.0	86.7
LF (%)	100.9	101.2	99.9	100.4	51.2	0.0	88.8	70.8	35.4	99.4	100.9	100.5	79.1
OF (%)	100.0	100.0	99.7	100.1	51.7	0.0	97.3	74.3	38.2	100.0	100.0	100.0	80.2
EUf (%)	0.2	0.0	0.8	0.7	48.8	100.0	11.2	29.2	64.5	0.9	0.0	0.0	21.3
PUF (%)	0.2	0.0	0.1	0.0	48.5	96.8	2.1	0.2	0.0	0.5	0.0	0.0	12.4
UCLF (%)	0.0	0.0	0.7	0.7	0.2	3.2	6.7	0.0	0.0	0.0	0.0	0.0	1.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	2.4	29.1	64.5	0.4	0.0	0.0	8.0

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation**

THE UNIT WAS OPERATED AT FULL POWER IN BASE LOAD MODE. THE UNIT HAS DELIVERED 35,386 GCAL THERMAL ENERGY TO DISTRICT HEATING, BUT THIS WAS DONE WITHOUT REDUCING THE UNIT POWER BELOW ITS REFERENCE POWER.

**5. Historical Summary**

Date of Construction Start: 01 Jul 1982      Lifetime Generation: 35612.3 GW(e).h  
 Date of First Criticality: 16 Apr 1996      Cumulative Energy Availability Factor: 85.4%  
 Date of Grid Connection: 11 Jul 1996      Cumulative Load Factor: 85.8%  
 Date of Commercial Operation: 02 Dec 1996      Cumulative Unit Capability Factor: 81.9%  
    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 (%)
1996	1186.4	647.0	0.0	0.0	99.5	100.0	23.6	0.0	2686	34.6
1997	4953.3	646.0	87.3	87.3	86.7	86.7	87.5	87.5	7753	88.5
1998	4908.7	655.0	85.8	86.6	85.2	86.0	85.5	86.5	7585	86.6
1999	4813.0	655.0	83.8	85.6	83.5	85.1	83.9	85.6	7389	84.3
2000	5053.4	655.0	87.9	86.2	87.6	85.8	87.8	86.2	7791	88.7
2001	5049.9	655.0	88.2	86.6	87.5	86.1	88.0	86.6	7717	88.1
2002	5106.2	655.0	89.1	87.0	88.7	86.5	89.0	87.0	7854	89.7
2003	4541.4	655.0	86.7	87.0	78.7	85.4	79.1	85.8	7024	80.2

# RO-1 CERNAVODA-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
18 Jan	11.0	0.8	PP	D32	LOAD REDUCTION TO ISOLATE THE FEEDWATER SIDE OF A LP HEATER FOR REPAIR OF THE PASSING RELIEF VALVE.
02 Mar	1800.0	7.6	UP	A32	POWER REDUCTION TO LIMIT THE VIBRATIONS THAT APPEARED TO THE FEEDWATER LINE
16 May	5.0	1.0	PP	D31	POWER DECREASE PRECEDING THE ANNUAL PLANNED OUTAGE
17 May	1056.0	691.7	PF	D41	ANNUAL PLANNED OUTAGE.THE MAIN ACTIVITIES DONE WERE: - INSPECTION/REPAIRS OF ELECTRICAL GENERATOR - INSPECTION OF 10 FUEL CHANNELS - DOUSING TANK NORMAC LINER REPAIR - REACTOR BUILDING LEAK TEST
30 Jun	40.0	26.2	UF3	A41	THE EXTENSION WAS DUE TO NEED TO REPAIR THE ELECTRICAL GENERATOR COUPLE D.
01 Jul	19.0	9.8	PP	D41	LOAD INCREASE FOLLOWING ANNUAL PLANNED OUTAGE
01 Jul	744.0	11.7	XP	N33	LOAD REDUCTION DUE TO SEASONAL INCREASE IN COOLING WATER TEMPERATURE
02 Jul	4.0	2.6	UF	A33	TURBINE TRIPED ON CONDENSER VACUUM LOW. THIS WAS DUE TO PLUGGING OF THE CONDENSER TUBES WITH A LARGE QUANTITY OF DEAD SHELLS THAT DROPPED FROM THE PIPES IN A CASCADING EFFECT. THE CCW CIRCUIT WAS COMPLETELY OUT OF SERVICE DURING THE PLANNED OUTAGE.
02 Jul	45.0	16.7	UP	A33	POWER INCREASE FOLLOWING UNPLANNED OUTAGE.
01 Aug	553.0	14.4	XP	N33	LOAD REDUCTION DUE TO SEASONAL INCREASE IN COOLING WATER TEMPERATURE
23 Aug	8.0	2.3	XP	N33	POWER DECREASE FOR THE CONTROLLED SHUTDOWN OF THE UNIT DUE TO VERY LOW DANUBE RIVER LEVEL.
24 Aug	191.0	125.1	XF	N33	CONTROLLED SHUTDOWN OF THE UNIT DUE TO VERY LOW DANUBE RIVER LEVEL.
01 Sep	445.0	291.5	XF	N33	CONTROLLED SHUTDOWN OF THE UNIT DUE TO VERY LOW DANUBE RIVER LEVEL
19 Sep	62.0	13.0	XP	N33	POWER INCREASE AFTER OUTAGE DUE TO VERY LOW DANUBE RIVER LEVEL

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1997 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		44			295	
B. Refuelling without a maintenanc					17	
D. Inspection, maintenance or repai without refuelling	1056			564		
K. Load-following (frequency contro reserve shutdown due to reduced energ demand)					35	6
L. Human factor relatec					0	
N. Environmental conditions (flood, storr lightning, lack of cooling water due t dry weather, cooling water temperatur limits etc.)			636			
Subtotal	1056	44	636	564	347	6
Total		1736			917	

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

System	2003 Hours Lost	1997 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		35
13. Reactor Auxiliary System:		26
14. Safety Systems		4
31. Turbine and auxiliarie:		102
32. Feedwater and Main Steam Syster		38
33. Circulating Water System	4	
41. Main Generator System:	40	
42. Electrical Power Supply System:		7
XX. Miscellaneous Systems:		51
Total	44	263

**RU-96 BALAKOVO-1**

Operator: REA (ROSENERGOATOM, CONSORTIUM)

Contractor: MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

**1. Station Details**

Type: WWER  
 Maximum Net Capacity  
 at the beginning of 2003: 950.0 MW(e)  
 Design Net Capacity: 950.0 MW(e)  
 Design Discharge Burnup: 40000 MW.d/t

**2. Production Summary 2003**

Energy Production: 7032.2 GW(e).h  
 Energy Availability Factor: 83.1%  
 Load Factor: 84.5%  
 Operating Factor: 85.2%  
 Energy Unavailability Factor: 16.9%  
 Total Off-line Time: 1300 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	690.2	124.6	0.0	661.1	680.9	685.2	668.2	709.4	695.2	722.9	698.6	695.8	7032.2
EAF (%)	96.0	20.3	0.0	94.3	94.3	99.2	94.1	100.0	99.5	99.3	99.3	97.0	83.1
UCF (%)	100.0	25.1	0.0	94.3	100.0	99.2	94.5	100.0	99.5	100.0	100.0	100.0	84.7
LF (%)	97.7	19.5	0.0	96.8	96.3	100.2	94.5	100.4	101.6	102.1	102.1	98.4	84.5
OF (%)	100.0	25.1	0.0	98.2	100.0	100.0	94.8	100.0	100.0	99.9	100.0	100.0	85.2
EUf (%)	4.0	79.7	100.0	5.7	5.7	0.8	5.9	0.0	0.5	0.7	0.7	3.0	16.9
PUF (%)	0.0	74.9	100.0	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.6
UCLF (%)	0.0	0.0	0.0	0.8	0.0	0.8	5.5	0.0	0.5	0.0	0.0	0.0	0.6
XUF (%)	4.0	4.8	0.0	0.0	5.7	0.0	0.4	0.0	0.0	0.7	0.7	3.0	1.6

UCLF replaces previously used UUF.

**4. 2003 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, APRIL, MAY, JUNE, JULY, AUGUST, SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 87749 MWH.

**5. Historical Summary**

Date of Construction Start: 01 Dec 1980      Lifetime Generation: 87264.0 GW(e).h  
 Date of First Criticality: 12 Dec 1985      Cumulative Energy Availability Factor: 62.0%  
 Date of Grid Connection: 28 Dec 1985      Cumulative Load Factor: 58.0%  
 Date of Commercial Operation: 23 May 1986      Cumulative Unit Capability Factor: 78.1%  
    Cumulative Energy Unavailability Factor: 38.0%

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	49.1	950.0	0.0	0.0	0.6	100.0	0.6	0.0	96	1.2
1986	4868.0	950.0	0.0	0.0	77.4	100.0	58.5	0.0	6082	69.4
1987	4703.7	1000.0	57.4	57.4	57.4	57.4	53.7	53.7	5302	60.5
1988	6476.9	950.0	80.9	68.9	80.9	68.9	77.6	65.4	7207	82.0
1989	4473.9	950.0	56.4	64.8	56.3	64.8	53.8	61.6	5141	58.7
1990	739.1	950.0	9.1	51.0	9.1	51.0	8.9	48.6	887	10.1
1991	4951.6	950.0	60.2	52.9	59.8	52.8	59.5	50.7	5780	66.0
1992	6352.3	950.0	76.4	56.8	76.3	56.7	76.1	54.9	7666	87.3
1993	3326.1	950.0	46.1	55.2	39.9	54.3	40.0	52.8	4230	48.3
1994	1759.5	950.0	77.3	58.0	77.3	57.2	21.1	48.9	2307	26.3
1995	2018.0	950.0	28.6	54.7	28.6	54.0	24.2	46.2	4810	54.9
1996	4872.5	950.0	86.5	57.9	59.0	54.5	58.4	47.4	5913	67.3
1997	4729.0	950.0	60.4	58.1	57.2	54.7	56.8	48.2	5818	66.4
1998	4329.8	950.0	55.8	57.9	52.2	54.5	52.0	48.6	5671	64.7
1999	5141.3	950.0	65.6	58.5	62.1	55.1	61.8	49.6	6337	72.3
2000	7247.4	950.0	87.5	60.6	86.5	57.3	86.8	52.2	7705	87.7
2001	7407.9	950.0	91.6	62.6	88.2	59.4	89.0	54.7	8041	91.8
2002	6785.7	950.0	86.5	64.1	80.5	60.7	81.5	56.3	7501	85.6
2003	7032.2	950.0	84.7	65.3	83.1	62.0	84.5	58.0	7460	85.2



# RU-96 BALAKOVO-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
10 Jan	697.0	58.7	XP	S	POWER REDUCTION WHILE UNIT OPERATING IN COASTDOWN
08 Feb	1240.0	1182.5	PF	C	MEDIUM-SCALE UNIT MAINTENANCE
01 Apr	96.0	33.8	PP	E	POST-MAINTENANCE TESTS
01 Apr	14.0	4.0	UF4	L13	UNIT SHUTDOWN WHEN EMERGENCY PROTECTION SYSTEM TRIGGERED OWING TO OPERATING PERSONNEL ERRORS DURING SWITCHING IN THE COOLING WATER CIRCUIT FOR THE REACTOR COOLANT PUMP OIL COOLERS
01 May	744.0	28.2	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION
03 May	144.0	12.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
07 Jun	29.0	5.6	UP2	A15	UNIT POWER REDUCTION OWING TO CUT-OUT OF REACTOR COOLANT PUMP (FOR FIVE HOURS) DUE TO SPURIOUS TRIGGERING OF PROTECTION SYSTEM
02 Jul	39.0	39.1	UF2	A41	UNIT SHUTDOWN CAUSED BY SHORTING OF THE GENERATOR CIRCUIT BREAKER DUE TO A FAULT IN THE CONTACT
20 Jul	24.0	2.6	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION
20 Sep	19.0	3.6	UP1	A31	UNIT POWER REDUCTION TO LOCATE CIRCULATING WATER LEAKS INTO THE TURBINE CONDENSER
17 Oct	24.0	2.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
25 Oct	24.0	3.0	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
07 Nov	144.0	4.9	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER (THREE TIMES IN NOVEMBER)
12 Dec	72.0	12.2	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION
12 Dec	72.0	8.6	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1986 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		39			545	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling	1240			1314	21	
D. Inspection, maintenance or repair without refuelling				508		
E. Testing of plant systems or components				2	1	
G. Major back-fitting, refurbishment or upgrading activities without refuelling						135
J. Grid failure or grid unavailability						267
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					43	1
L. Human factor related		14				
Subtotal	1240	53	0	1824	624	403
Total		1293			2851	

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

System	2003 Hours Lost	1986 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		3
15. Reactor Cooling Systems		14
16. Steam generation systems		154
17. Safety I&C Systems (excluding reactor I&C)		6
31. Turbine and auxiliaries		83
32. Feedwater and Main Steam System		18
33. Circulating Water System		1
35. All other I&C Systems		15
41. Main Generator Systems	39	157
42. Electrical Power Supply Systems		38
XX. Miscellaneous Systems		3
Total	39	494

## RU-97 BALAKOVO-2

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

### 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 6171.8 GW(e).h  
**Energy Availability Factor:** 72.7%  
**Load Factor:** 74.2%  
**Operating Factor:** 73.8%  
**Energy Unavailability Factor:** 27.3%  
**Total Off-line Time:** 2293 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	704.0	651.3	145.2	0.0	0.0	419.0	708.1	713.5	705.8	738.6	685.1	701.3	6171.8
<b>EAF (%)</b>	96.8	99.7	21.3	0.0	0.0	61.6	99.6	100.0	100.0	100.0	97.1	97.7	72.7
<b>UCF (%)</b>	99.8	100.0	22.6	0.0	0.0	66.9	100.0	100.0	100.0	100.0	100.0	100.0	74.0
<b>LF (%)</b>	99.6	102.0	20.5	0.0	0.0	61.3	100.2	100.9	103.2	104.4	100.2	99.2	74.2
<b>OF (%)</b>	100.0	100.0	22.6	0.0	0.0	64.9	100.0	100.0	100.0	99.9	100.0	100.0	73.8
<b>EU (%)</b>	3.2	0.3	78.7	100.0	100.0	38.4	0.4	0.0	0.0	0.0	2.9	2.3	27.3
<b>PU (%)</b>	0.0	0.0	77.4	100.0	100.0	33.1	0.0	0.0	0.0	0.0	0.0	0.0	26.0
<b>UCLF (%)</b>	0.3	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>	3.0	0.3	1.3	0.0	0.0	5.3	0.4	0.0	0.0	0.0	2.9	2.3	1.3

UCLF replaces previously used UUF.

### 4. 2003 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, FEBRUARY, JUNE, JULY, AUGUST, SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 111027 MWH.

### 5. Historical Summary

**Date of Construction Start:** 01 Aug 1981      **Lifetime Generation:** 77974.5 GW(e).h  
**Date of First Criticality:** 02 Oct 1987      **Cumulative Energy Availability Factor:** 59.8%  
**Date of Grid Connection:** 08 Oct 1987      **Cumulative Load Factor:** 57.8%  
**Date of Commercial Operation:** 18 Jan 1988      **Cumulative Unit Capability Factor:** 78.2%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1987	988.5	962.0	0.0	0.0	11.7	100.0	11.7	0.0	1601	18.3
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	80.8	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	70.0	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	63.6	72.7	59.8	74.2	57.8	6467	73.8

## RU-97 BALAKOVO-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	264.0	21.0	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
03 Jan	12.0	1.8	UP1	A31	UNIT POWER REDUCTION TO CLEAN TURBINE CONDENSER
01 Feb	672.0	1.9	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTION OF THE FEDERAL ENERGY COMMISSION
01 Mar	168.0	9.3	XP	S	POWER REDUCTION WHILE UNIT OPERATING IN COASTDOWN
08 Mar	2103.0	1999.8	PF	C	MAJOR UNIT OVERHAUL
04 Jun	72.0	36.3	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION
06 Jun	190.0	164.2	PF	D	ROUTINE UNIT MAINTENANCE
20 Jul	24.0	2.8	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION
07 Nov	72.0	12.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATIONS IMPOSED BY THE DISPATCHER
23 Nov	24.0	7.6	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
12 Dec	72.0	4.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
12 Dec	72.0	12.2	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					592	
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling	2103			1742	170	
D. Inspection, maintenance or repair without refuelling	190			174		
J. Grid failure or grid unavailability						13
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					27	
Subtotal	2293	0	0	1916	795	13
Total		2293			2724	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		10
15. Reactor Cooling Systems		13
16. Steam generation systems		497
17. Safety I&C Systems (excluding reactor I&C)		4
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		27
35. All other I&C Systems		5
41. Main Generator Systems		31
42. Electrical Power Supply Systems		1
Total	0	588

## RU-98 BALAKOVO-3

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

### 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 7016.1 GW(e).h  
**Energy Availability Factor:** 83.2%  
**Load Factor:** 84.3%  
**Operating Factor:** 85.3%  
**Energy Unavailability Factor:** 16.8%  
**Total Off-line Time:** 1289 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	688.2	640.3	720.6	696.2	686.2	691.1	701.6	640.0	0.0	146.7	687.6	717.7	7016.1
<b>EAF (%)</b>	95.8	98.6	100.0	100.0	95.3	99.7	98.7	90.6	0.0	21.9	98.3	99.8	83.2
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	99.0	100.0	0.0	21.9	100.0	100.0	85.1
<b>LF (%)</b>	97.4	100.3	102.0	101.9	97.1	101.0	99.3	90.6	0.0	20.7	100.5	101.5	84.3
<b>OF (%)</b>	100.0	100.0	100.0	100.1	100.0	100.0	100.0	100.0	0.0	23.5	100.0	100.0	85.3
<b>EUf (%)</b>	4.2	1.4	0.0	0.0	4.7	0.3	1.3	9.4	100.0	78.1	1.7	0.2	16.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	78.1	0.0	0.0	14.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.1
<b>XUF (%)</b>	4.2	1.4	0.0	0.0	4.7	0.3	0.3	9.4	0.0	0.0	1.7	0.2	1.9

UCLF replaces previously used UUF.

### 4. 2003 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, FEBRUARY, MARCH, APRIL, MAY, JUNE, JULY, OCTOBER, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 57645 MWH.

### 5. Historical Summary

**Date of Construction Start:** 01 Nov 1982  
**Date of First Criticality:** 16 Dec 1988  
**Date of Grid Connection:** 25 Dec 1988  
**Date of Commercial Operation:** 08 Apr 1989

**Lifetime Generation:** 78389.3 GW(e).h  
**Cumulative Energy Availability Factor:** 64.4%  
**Cumulative Load Factor:** 61.5%  
**Cumulative Unit Capability Factor:** 78.8%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1988	50.2	950.0	0.0	0.0	0.6	100.0	0.6	0.0	168	2.0
1989	6621.4	950.0	0.0	0.0	80.7	100.0	79.6	0.0	7792	88.9
1990	5718.7	950.0	68.0	68.0	67.8	67.8	68.7	68.7	6696	76.4
1991	5403.4	950.0	67.1	67.6	64.2	66.0	64.9	66.8	6124	69.9
1992	5545.4	950.0	66.4	67.2	64.8	65.6	66.4	66.7	6202	70.6
1993	4378.6	950.0	61.6	65.8	52.7	62.4	52.6	63.2	5461	62.3
1994	3340.1	950.0	70.7	66.8	70.7	64.0	40.1	58.6	5389	61.5
1995	2674.7	950.0	53.1	64.5	47.5	61.3	32.1	54.2	5511	62.9
1996	5315.4	950.0	75.9	66.1	64.3	61.7	63.7	55.5	7085	80.7
1997	2058.8	950.0	38.8	62.7	25.3	57.2	24.7	51.7	3395	38.8
1998	5348.5	950.0	73.0	63.9	64.4	58.0	64.3	53.1	7136	81.5
1999	5458.0	950.0	72.0	64.7	65.6	58.7	65.6	54.3	6552	74.8
2000	6482.9	950.0	82.0	66.3	77.2	60.4	77.7	56.5	7327	83.4
2001	6050.7	950.0	78.7	67.3	72.1	61.4	72.7	57.8	6927	79.1
2002	6926.3	950.0	85.3	68.7	82.0	63.0	83.2	59.8	7478	85.4
2003	7016.1	950.0	85.0	69.8	83.2	64.4	84.3	61.5	7471	85.3

## RU-98 BALAKOVO-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
17 Jan	360.0	29.4	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION
23 Feb	72.0	8.6	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION
01 May	168.0	12.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER (THREE TIMES IN MAY)
01 May	1464.0	23.1	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION
12 Jul	23.0	7.1	UP1	A32	UNIT POWER REDUCTION TO CLEAN THE TURBINE-DRIVEN FEEDWATER PUMP CONDENSERS
20 Jul	24.0	1.9	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION
01 Aug	744.0	66.4	XP	S	POWER REDUCTION WHILE UNIT OPERATING IN COASTDOWN
01 Sep	1288.0	1236.5	PF	C	MEDIUM-SCALE UNIT MAINTENANCE
07 Nov	72.0	11.6	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
01 Dec	744.0	1.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1989 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					135	
B. Refuelling without a maintenanc					11	
C. Inspection, maintenance or repai combined with refuelling	1288			1561	44	
D. Inspection, maintenance or repai without refuelling				355		
E. Testing of plant systems or component					2	
J. Grid failure or grid unavailabilit						97
K. Load-following (frequency contro reserve shutdown due to reduced energ demand)					4	
Subtotal	1288	0	0	1916	196	97
Total		1288			2209	

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

System	2003 Hours Lost	1989 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		43
13. Reactor Auxiliary System:		0
15. Reactor Cooling System:		2
31. Turbine and auxiliarie:		15
32. Feedwater and Main Steam Syster		10
33. Circulating Water System		13
35. All other I&C Systems:		8
41. Main Generator System:		8
42. Electrical Power Supply System:		19
Total	0	118

## RU-99 BALAKOVO-4

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

### 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** —

### 2. Production Summary 2003

**Energy Production:** 7223.8 GW(e).h  
**Energy Availability Factor:** 84.6%  
**Load Factor:** 86.8%  
**Operating Factor:** 86.1%  
**Energy Unavailability Factor:** 15.4%  
**Total Off-line Time:** 1219 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	705.0	646.9	735.3	707.7	655.6	0.0	226.7	717.6	691.2	734.2	697.4	706.3	7223.8
<b>EAF (%)</b>	96.9	98.9	100.0	100.0	91.2	0.0	33.2	100.0	97.9	100.0	99.1	98.6	84.6
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	0.0	33.2	100.0	97.9	100.0	100.0	98.9	85.8
<b>LF (%)</b>	99.7	101.3	104.0	103.6	92.8	0.0	32.1	101.5	101.0	103.7	102.0	99.9	86.8
<b>OF (%)</b>	100.0	100.0	100.0	100.1	100.0	0.0	35.6	100.0	98.2	99.9	100.0	99.1	86.1
<b>EUf (%)</b>	3.1	1.1	0.0	0.0	8.8	100.0	66.8	0.0	2.1	0.0	0.9	1.4	15.4
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	100.0	64.8	0.0	0.0	0.0	0.0	0.0	13.7
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	2.1	0.0	0.0	1.1	0.4
<b>XUF (%)</b>	3.1	1.1	0.0	0.0	8.8	0.0	0.0	0.0	0.0	0.0	0.9	0.3	1.2

UCLF replaces previously used UUF.

### 4. 2003 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, FEBRUARY, MARCH, APRIL, MAY, JULY, AUGUST, SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 137925 MWH.

### 5. Historical Summary

**Date of Construction Start:** 01 Apr 1984  
**Date of First Criticality:** 24 Mar 1993  
**Date of Grid Connection:** 11 Apr 1993  
**Date of Commercial Operation:** 22 Dec 1993

**Lifetime Generation:** 59905.2 GW(e).h  
**Cumulative Energy Availability Factor:** 69.5%  
**Cumulative Load Factor:** 67.5%  
**Cumulative Unit Capability Factor:** 80.8%  
**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 (%)
1993	3676.3	950.0	0.0	0.0	73.3	100.0	45.5	0.0	5206	61.2
1994	3828.5	950.0	69.5	69.5	48.5	48.5	46.0	46.0	4604	52.6
1995	5610.0	950.0	88.7	79.1	86.5	67.5	67.4	56.7	8760	100.0
1996	4545.5	950.0	59.9	72.7	55.5	63.5	54.5	56.0	6652	75.7
1997	4637.7	950.0	71.3	72.3	59.6	62.5	55.7	55.9	6637	75.8
1998	5042.5	950.0	71.3	72.1	60.9	62.2	60.6	56.8	6936	79.2
1999	5803.9	950.0	77.5	73.0	69.6	63.4	69.7	59.0	7268	83.0
2000	6665.9	950.0	81.0	74.2	78.9	65.6	79.9	62.0	7216	82.1
2001	6578.1	950.0	83.9	75.4	78.3	67.2	79.0	64.1	7354	83.9
2002	6292.9	950.0	77.3	75.6	72.8	67.8	75.6	65.4	6723	76.7
2003	7223.8	950.0	85.8	76.6	84.6	69.5	86.8	67.5	7541	86.1

## RU-99 BALAKOVO-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	96.0	11.1	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
17 Jan	120.0	11.1	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
23 Feb	72.0	7.3	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION
05 May	648.0	62.5	XP	S	POWER REDUCTION WHILE UNIT OPERATING IN COASTDOWN
01 Jun	1185.0	1140.8	PF	C	MEDIUM-SCALE UNIT MAINTENANCE
22 Jul	11.0	13.8	UP2	A41	UNIT SHUT DOWN OWING TO LOSS OF GENERATOR EXCITATION CAUSED BY A FAILURE IN THE OPERATION OF THE ROTOR CURRENT LIMITING UNIT
14 Sep	13.0	14.4	UF2	A41	UNIT SHUT DOWN BY GENERATOR PROTECTION SYSTEM OWING TO LOSS OF EXCITATION
16 Nov	96.0	6.0	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER (THREE TIMES IN NOVEMBER)
01 Dec	737.0	2.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
23 Dec	7.0	7.9	UF2	A42	UNIT SHUT DOWN WHEN THE 6 KV BUS CUT OUT OWING TO SPURIOUS TRIGGERING OF THE PROTECTION SYSTEM FOR A SHORT CIRCUIT TO EARTH

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1994 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		20			10	
C. Inspection, maintenance or repair combined with refuelling	1185			1436		
D. Inspection, maintenance or repair without refuelling				25		
J. Grid failure or grid unavailability						33
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						167
Subtotal	1185	20	0	1461	10	200
Total		1205			1671	

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

System	2003 Hours Lost	1994 to 2003 Average Hours Lost Per Year
31. Turbine and auxiliaries		3
32. Feedwater and Main Steam System		3
35. All other I&C Systems		3
41. Main Generator Systems	13	
42. Electrical Power Supply Systems	7	
Total	20	9

## RU-21 BELOYARSKY-3(BN-600)

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

### 1. Station Details

**Type:** FBR  
**Maximum Net Capacity at the beginning of 2003:** 560.0 MW(e)  
**Design Net Capacity:** 560.0 MW(e)  
**Design Discharge Burnup:** 100000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 3693.3 GW(e).h  
**Energy Availability Factor:** 75.7%  
**Load Factor:** 75.3%  
**Operating Factor:** 78.0%  
**Energy Unavailability Factor:** 24.3%  
**Total Off-line Time:** 1924 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	402.5	351.1	409.8	173.4	0.0	168.9	413.1	410.6	402.7	183.1	365.7	412.4	3693.3
<b>EAF (%)</b>	97.6	93.0	98.8	43.9	0.0	43.4	99.2	98.8	99.7	45.7	90.8	98.8	75.7
<b>UCF (%)</b>	100.0	95.5	100.0	44.1	0.0	43.7	100.0	100.0	100.0	46.2	93.2	100.0	76.8
<b>LF (%)</b>	96.6	93.3	98.4	43.1	0.0	41.9	99.1	98.6	99.9	43.9	90.7	99.0	75.3
<b>OF (%)</b>	100.0	100.0	99.9	45.3	0.0	45.8	100.0	100.0	100.0	47.2	99.6	100.0	78.0
<b>EUF (%)</b>	2.4	7.0	1.2	56.1	100.0	56.6	0.8	1.2	0.3	54.3	9.2	1.2	24.3
<b>PUF (%)</b>	0.0	0.0	0.0	55.9	100.0	56.3	0.0	0.0	0.0	53.8	2.4	0.0	22.5
<b>UCLF (%)</b>	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	0.0	0.7
<b>XUF (%)</b>	2.4	2.5	1.2	0.2	0.0	0.3	0.8	1.2	0.3	0.4	2.4	1.2	1.1

UCLF replaces previously used UUF.

### 4. 2003 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 SEPTEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 243 MWH.

### 5. Historical Summary

**Date of Construction Start:** 01 Jan 1969  
**Date of First Criticality:** 26 Feb 1980  
**Date of Grid Connection:** 08 Apr 1980  
**Date of Commercial Operation:** 01 Nov 1981

**Lifetime Generation:** 83363.5 GW(e).h  
**Cumulative Energy Availability Factor:** 73.5%  
**Cumulative Load Factor:** 73.3%  
**Cumulative Unit Capability Factor:** 77.4%  
**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 (%)
1987	3895.0	600.0	75.9	75.9	75.9	75.9	74.1	74.1	6714	76.6
1988	3762.2	560.0	77.0	76.4	77.0	76.4	76.5	75.3	6810	77.5
1989	3694.4	560.0	77.0	76.6	77.0	76.6	75.3	75.3	6800	77.6
1990	3198.0	560.0	66.7	74.2	65.9	74.0	65.2	72.8	6627	75.7
1991	3394.0	560.0	63.6	72.1	63.6	71.9	69.2	72.1	6631	75.7
1992	4095.0	560.0	83.1	73.9	82.8	73.7	83.3	73.9	7449	84.8
1993	3914.9	560.0	79.6	74.7	79.5	74.5	79.8	74.8	7065	80.7
1994	3810.7	560.0	78.9	75.2	78.8	75.1	77.7	75.1	6977	79.6
1995	3413.3	560.0	72.3	74.9	70.7	74.6	69.6	74.5	6953	79.4
1996	3722.3	560.0	78.1	75.2	76.3	74.7	75.7	74.6	7010	79.8
1997	3545.8	560.0	74.6	75.2	73.0	74.6	72.3	74.4	6596	75.3
1998	2335.3	560.0	49.2	73.0	47.7	72.4	47.6	72.2	4385	50.1
1999	3721.0	560.0	78.0	73.4	76.2	72.7	75.9	72.5	6972	79.6
2000	3565.8	560.0	75.5	73.5	72.5	72.6	72.5	72.5	6820	77.6
2001	3891.1	560.0	80.7	74.0	79.9	73.1	79.3	72.9	7214	82.4
2002	3774.4	560.0	79.3	74.3	77.3	73.4	76.9	73.2	7069	80.7
2003	3693.3	560.0	76.8	74.5	75.7	73.5	75.3	73.3	6836	78.0



## RU-21 BELOYARSKY-3(BN-600)

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	2485.0	25.1	XP	Z	UNIT POWER REDUCTION OWING TO HEAT EXTRACTION FOR HEATING ABOVE THE LEVEL PERMITTED IN THE TECHNICAL SPECIFICATIONS FOR THE TURBINE
03 Feb	42.0	17.0	UP1	A32	UNIT POWER REDUCTION OWING TO SHUTDOWN OF LOOP 5 TO ELIMINATE A LEAK IN THE FEEDWATER LINE DRAIN
14 Apr	1528.0	868.5	PF	D	MAJOR UNIT OVERHAUL
17 Jun	1818.0	9.8	XP	N	UNIT POWER REDUCTION OWING TO AN INCREASE IN CIRCULATING WATER TEMPERATURE
01 Sep	1071.0	3.1	XP	Z	UNIT POWER REDUCTION OWING TO HEAT EXTRACTION FOR HEATING ABOVE THE LEVEL PERMITTED IN THE TECHNICAL SPECIFICATIONS FOR THE TURBINE
15 Oct	396.0	234.3	PF	D	ROUTINE UNIT MAINTENANCE
01 Nov	166.0	2.2	XP	Z	UNIT POWER REDUCTION OWING TO HEAT EXTRACTION FOR HEATING ABOVE THE LEVEL PERMITTED IN THE TECHNICAL SPECIFICATIONS FOR THE TURBINE
07 Nov	46.0	17.7	UP1	A32	UNIT POWER REDUCTION OWING TO SHUTDOWN OF LOOP 4 TO ELIMINATE A LEAK IN THE DISCHARGE LINE OF THE DRAIN FROM THE MAIN STEAM LINE
09 Nov	1296.0	12.2	XP	Z	UNIT POWER REDUCTION OWING TO HEAT EXTRACTION FOR HEATING ABOVE THE LEVEL PERMITTED IN THE TECHNICAL SPECIFICATIONS FOR THE TURBINE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					202	
B. Refuelling without a maintenanc					2	
C. Inspection, maintenance or repai combined with refuelling				1337		
D. Inspection, maintenance or repai without refuelling	1924			331	10	
J. Grid failure or grid unavailabilit						6
Subtotal	1924	0	0	1668	214	6
Total		1924			1888	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
13. Reactor Auxiliary System:		27
15. Reactor Cooling System:		3
21. Fuel Handling and Storage Facilitie		7
32. Feedwater and Main Steam Syster		4
Total	0	41

# RU-141 BILIBINO UNIT A

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

## 1. Station Details

**Type:** LWGR  
**Maximum Net Capacity at the beginning of 2003:** 11.0 MW(e)  
**Design Net Capacity:** 11.0 MW(e)  
**Design Discharge Burnup:** 3000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 25.8 GW(e).h  
**Energy Availability Factor:** 34.1%  
**Load Factor:** 26.8%  
**Operating Factor:** 54.9%  
**Energy Unavailability Factor:** 65.9%  
**Total Off-line Time:** 3955 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	3.9	0.0	2.5	5.4	4.2	3.6	0.2	0.0	0.0	3.3	0.5	2.0	25.8
<b>EAF (%)</b>	57.2	0.0	42.3	76.2	61.5	56.0	10.4	0.0	0.0	49.0	18.8	35.1	34.1
<b>UCF (%)</b>	79.6	0.0	56.8	90.5	81.7	100.0	16.9	0.0	0.3	100.0	38.9	100.0	55.8
<b>LF (%)</b>	48.2	0.0	30.8	68.7	51.6	44.9	2.8	0.0	0.0	40.6	6.5	24.8	26.8
<b>OF (%)</b>	78.6	0.0	54.7	90.1	80.9	100.0	12.9	0.0	0.0	99.9	36.0	100.0	54.9
<b>EU (%)</b>	42.8	100.0	57.7	23.8	38.5	44.0	89.6	100.0	100.0	51.0	81.2	64.9	65.9
<b>PU (%)</b>	20.4	100.0	43.2	9.5	18.3	0.0	83.1	100.0	99.7	0.0	61.1	0.0	44.2
<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>	22.4	0.0	14.4	14.3	20.2	44.0	6.4	0.0	0.3	51.0	20.1	64.9	21.7

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION.

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1970  
**Date of First Criticality:** 11 Dec 1973  
**Date of Grid Connection:** 12 Jan 1974  
**Date of Commercial Operation:** 01 Apr 1974

**Lifetime Generation:** 1711.9 GW(e).h  
**Cumulative Energy Availability Factor:** 72.4%  
**Cumulative Load Factor:** 61.5%  
**Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 27.6%

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	69.9	10.0	88.7	84.7	83.3	79.0	79.8	66.8	7810	89.2
1984	77.9	10.0	88.9	85.1	88.0	79.9	88.7	69.0	7854	89.4
1985	77.7	10.0	91.2	85.7	88.4	80.7	88.7	70.7	8025	91.6
1986	73.2	10.0	86.1	85.7	83.2	80.9	83.5	71.8	7603	86.8
1987	76.7	12.0	81.3	85.3	81.3	80.9	73.0	71.9	7117	81.2
1988	79.6	11.0	90.3	85.7	90.3	81.6	82.4	72.7	7895	89.9
1989	70.9	11.0	90.0	86.0	90.0	82.2	73.5	72.8	7841	89.5
1990	76.6	11.0	85.1	86.0	85.1	82.4	79.5	73.2	7397	84.4
1991	71.6	11.0	78.6	85.5	78.6	82.2	74.3	73.3	6802	77.6
1992	67.1	11.0	85.8	85.5	85.8	82.4	69.4	73.1	7477	85.1
1993	53.2	11.0	86.3	85.6	82.7	81.3	55.2	72.1	7492	85.5
1994	49.6	11.0	86.9	85.6	86.9	81.6	51.5	71.0	7501	85.6
1995	26.6	11.0	41.6	83.4	41.6	79.6	27.6	68.8	3624	41.4
1996	29.6	11.0	54.1	82.0	54.1	78.4	30.7	67.0	4572	52.0
1997	35.2	11.0	56.5	80.9	56.5	77.4	36.6	65.6	4877	55.7
1998	55.5	11.0	96.3	81.5	67.0	76.9	57.6	65.3	8414	96.1
1999	33.4	11.0	55.0	80.4	40.3	75.4	34.7	64.0	4779	54.6
2000	58.8	11.0	87.4	80.7	68.1	75.1	60.8	63.9	7616	86.7
2001	45.9	11.0	72.9	80.4	55.0	74.4	47.6	63.2	6393	73.0
2002	49.6	11.0	84.5	80.6	60.0	73.8	51.5	62.8	7375	84.2
2003	25.8	11.0	55.8	79.7	34.1	72.4	26.8	61.5	4805	54.9

## RU-141 BILIBINO UNIT A

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	585.0	1.8	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
25 Jan	1168.0	12.3	PF	C	MEDIUM-SCALE UNIT MAINTENANCE
15 Mar	1055.0	2.3	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
28 Apr	214.0	2.2	PF	C	ROUTINE UNIT MAINTENANCE
06 May	1418.0	5.7	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
05 Jul	2109.0	22.1	PF	C	MEDIUM-SCALE UNIT MAINTENANCE
30 Sep	939.0	4.6	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
09 Nov	461.0	4.8	PF	C	ROUTINE UNIT MAINTENANCE
28 Nov	811.0	6.5	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					82	
C. Inspection, maintenance or repair combined with refuelling	3952			1032		
D. Inspection, maintenance or repair without refuelling				441	20	
E. Testing of plant systems or components				1		
J. Grid failure or grid unavailability				2	0	45
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				9	12	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					2	
Subtotal	3952	0	0	1485	116	45
Total		3952			1646	

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

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		0
13. Reactor Auxiliary Systems		5
14. Safety Systems		1
15. Reactor Cooling Systems		2
31. Turbine and auxiliaries		27
32. Feedwater and Main Steam System		11
33. Circulating Water System		5
35. All other I&C Systems		3
41. Main Generator Systems		18
42. Electrical Power Supply Systems		1
Total	0	75

## RU-142 BILIBINO UNIT B

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

### 1. Station Details

**Type:** LWGR  
**Maximum Net Capacity at the beginning of 2003:** 11.0 MW(e)  
**Design Net Capacity:** 11.0 MW(e)  
**Design Discharge Burnup:** 3000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 33.3 GW(e).h  
**Energy Availability Factor:** 44.5%  
**Load Factor:** 34.5%  
**Operating Factor:** 81.8%  
**Energy Unavailability Factor:** 55.5%  
**Total Off-line Time:** 1598 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	4.3	3.6	2.3	0.0	0.1	1.6	1.5	2.9	3.7	3.8	4.7	4.8	33.3
<b>EAF (%)</b>	61.0	58.7	37.1	0.0	10.6	33.6	31.9	47.0	57.6	57.3	71.3	68.5	44.5
<b>UCF (%)</b>	100.0	100.0	66.2	0.0	21.6	100.0	100.0	100.0	99.5	100.0	100.0	100.0	82.2
<b>LF (%)</b>	52.1	49.4	27.8	0.0	1.1	20.7	18.7	35.2	46.1	46.2	58.9	59.1	34.5
<b>OF (%)</b>	100.0	100.0	64.7	0.0	17.9	100.0	100.0	100.0	99.4	99.9	100.0	100.0	81.8
<b>EU (%)</b>	39.0	41.3	62.9	100.0	89.4	66.4	68.1	53.0	42.4	42.7	28.7	31.5	55.5
<b>PU (%)</b>	0.0	0.0	33.8	100.0	78.4	0.0	0.0	0.0	0.5	0.0	0.0	0.0	17.8
<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>	39.0	41.3	29.1	0.0	11.0	66.4	68.1	53.0	41.9	42.7	28.7	31.5	37.7

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION.

### 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:** 1656.9 GW(e).h  
**Cumulative Energy Availability Factor:** 73.6%  
**Cumulative Load Factor:** 61.0%  
**Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1983	73.8	10.0	90.1	84.1	86.9	80.5	84.2	68.0	7880	90.0
1984	77.6	10.0	89.3	84.7	88.5	81.4	88.4	70.2	7891	89.8
1985	78.0	10.0	90.3	85.2	88.6	82.1	89.0	72.1	7940	90.6
1986	76.3	10.0	87.0	85.4	84.7	82.4	87.1	73.5	7679	87.7
1987	88.4	12.0	89.1	85.8	89.1	83.0	84.1	74.5	7794	89.0
1988	75.1	11.0	90.8	86.2	90.8	83.7	77.7	74.8	7927	90.2
1989	74.8	11.0	91.4	86.6	91.4	84.3	77.6	75.0	7943	90.7
1990	72.6	11.0	84.6	86.4	84.6	84.3	75.4	75.0	7274	83.0
1991	57.8	11.0	64.9	85.0	64.9	83.0	60.0	74.0	4821	55.0
1992	68.2	11.0	89.9	85.3	89.9	83.4	70.6	73.8	7857	89.4
1993	52.4	11.0	81.9	85.1	62.2	82.2	54.4	72.7	7072	80.7
1994	47.8	11.0	78.7	84.8	77.3	81.9	49.6	71.4	6763	77.2
1995	45.4	11.0	99.2	85.5	97.2	82.7	47.2	70.2	8677	99.1
1996	16.8	11.0	33.5	82.9	33.5	80.3	17.4	67.5	2894	32.9
1997	44.1	11.0	92.7	83.4	87.7	80.6	45.8	66.5	8050	91.9
1998	18.2	11.0	42.9	81.6	23.3	78.0	18.8	64.3	3727	42.5
1999	54.2	11.0	84.7	81.7	64.1	77.4	56.2	64.0	7355	84.0
2000	48.5	11.0	78.2	81.5	56.3	76.5	50.2	63.4	6656	75.8
2001	56.7	11.0	85.2	81.7	65.8	76.1	58.9	63.2	7439	84.9
2002	30.0	11.0	66.4	81.1	38.4	74.7	31.2	62.0	5744	65.6
2003	33.3	11.0	82.2	81.2	44.5	73.6	34.5	61.0	7162	81.8

## RU-142 BILIBINO UNIT B

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	1897.0	8.6	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
21 Mar	1594.0	16.7	PF	C	MEDIUM-SCALE UNIT MAINTENANCE
26 May	2725.0	17.8	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
17 Sep	4.0	0.0	PF	D31	UNIT SHUT DOWN TO TEST THE AUTOMATED TURBINE SAFETY SYSTEM
17 Sep	2540.0	9.9	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1975 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					149	
B. Refuelling without a maintenance					5	
C. Inspection, maintenance or repair combined with refuelling	1594			1246	103	
D. Inspection, maintenance or repair without refuelling	4			149		
E. Testing of plant systems or components				2		
J. Grid failure or grid unavailability					0	19
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				7		
Subtotal	1598	0	0	1404	257	19
Total		1598			1680	

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

System	2003 Hours Lost	1975 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		87
12. Reactor I&C Systems		2
14. Safety Systems		0
15. Reactor Cooling Systems		8
31. Turbine and auxiliaries		25
32. Feedwater and Main Steam System		10
33. Circulating Water System		0
41. Main Generator Systems		8
Total	0	140

## RU-143 BILIBINO UNIT C

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

### 1. Station Details

**Type:** LWGR  
**Maximum Net Capacity at the beginning of 2003:** 11.0 MW(e)  
**Design Net Capacity:** 11.0 MW(e)  
**Design Discharge Burnup:** 3000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 35.4 GW(e).h  
**Energy Availability Factor:** 46.7%  
**Load Factor:** 36.8%  
**Operating Factor:** 81.0%  
**Energy Unavailability Factor:** 53.3%  
**Total Off-line Time:** 1663 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	1.0	4.2	4.4	3.7	1.2	0.0	2.7	4.0	4.6	2.3	4.2	3.3	35.4
<b>EAF (%)</b>	24.6	66.4	62.5	58.4	22.9	0.0	46.3	60.7	67.7	39.8	63.3	50.0	46.7
<b>UCF (%)</b>	46.8	100.0	100.0	100.0	41.6	0.0	93.1	100.0	100.0	97.7	100.0	100.0	81.5
<b>LF (%)</b>	11.7	57.4	54.1	46.6	14.1	0.0	32.9	48.4	57.5	27.9	52.4	40.4	36.8
<b>OF (%)</b>	44.2	100.0	100.0	100.1	38.7	0.0	92.7	100.0	100.0	97.4	100.0	100.0	81.0
<b>EUF (%)</b>	75.4	33.6	37.5	41.6	77.1	100.0	53.7	39.3	32.3	60.2	36.7	50.0	53.3
<b>PUF (%)</b>	53.3	0.0	0.0	0.0	58.4	100.0	7.0	0.0	0.0	2.3	0.0	0.0	18.5
<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>	22.2	33.6	37.5	41.6	18.6	0.0	46.7	39.3	32.3	57.9	36.7	50.0	34.8

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION.

### 5. Historical Summary

**Date of Construction Start:** 01 Jan 1970  
**Date of First Criticality:** 06 Dec 1975  
**Date of Grid Connection:** 22 Dec 1975  
**Date of Commercial Operation:** 01 Feb 1976

**Lifetime Generation:** 1650.8 GW(e).h  
**Cumulative Energy Availability Factor:** 72.5%  
**Cumulative Load Factor:** 63.3%  
**Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1983	72.8	10.0	88.8	91.5	85.3	87.8	83.1	80.2	7782	88.8
1984	76.5	10.0	89.1	91.2	87.4	87.8	87.1	81.0	7876	89.7
1985	69.8	10.0	80.3	90.0	78.5	86.7	79.7	80.9	7119	81.3
1986	77.1	10.0	91.0	90.1	87.7	86.8	88.0	81.6	8001	91.3
1987	89.1	12.0	89.1	90.0	89.1	87.1	84.7	81.9	7801	89.1
1988	76.7	11.0	89.5	90.0	89.5	87.3	79.4	81.7	7815	89.0
1989	74.3	11.0	89.5	89.9	89.1	87.4	77.1	81.3	7756	88.5
1990	73.7	11.0	92.0	90.1	91.1	87.7	76.5	81.0	8024	91.6
1991	66.2	11.0	78.1	89.2	76.6	86.9	68.7	80.1	6749	77.0
1992	70.9	11.0	88.5	89.2	79.7	86.4	73.4	79.7	7727	88.0
1993	52.6	11.0	83.2	88.8	61.5	84.9	54.6	78.1	7218	82.4
1994	44.7	11.0	73.7	87.9	72.0	84.2	46.4	76.3	6342	72.4
1995	17.3	11.0	38.1	85.2	34.9	81.4	17.9	73.1	3293	37.6
1996	52.6	11.0	82.3	85.0	82.3	81.5	54.5	72.1	7142	81.3
1997	25.8	11.0	42.9	83.0	42.9	79.6	26.8	69.8	3769	43.0
1998	23.2	11.0	49.1	81.3	29.1	77.2	24.0	67.7	4200	47.9
1999	51.4	11.0	75.8	81.1	59.9	76.4	53.4	67.0	6607	75.4
2000	45.2	11.0	86.8	81.3	54.8	75.5	46.8	66.2	7569	86.2
2001	53.9	11.0	84.9	81.5	63.0	75.0	56.0	65.7	7383	84.3
2002	30.7	11.0	71.5	81.1	39.4	73.6	31.9	64.4	6250	71.3
2003	35.4	11.0	81.5	81.1	46.7	72.5	36.8	63.3	7097	81.0

## RU-143 BILIBINO UNIT C

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	279.0	2.9	PF	C	END OF MAJOR UNIT OVERHAUL (STARTED ON 26 SEPTEMBER 2002)
12 Jan	54.0	0.3	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
14 Jan	92.0	1.0	PF	C	ROUTINE UNIT MAINTENANCE
18 Jan	245.0	1.4	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
28 Jan	44.0	0.5	PF	C	ROUTINE UNIT MAINTENANCE TO ELIMINATE A FAULT IN THE GENERATOR EXCITATION SYSTEM
30 Jan	2454.0	10.5	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
13 May	1230.0	12.9	PF	D	MEDIUM-SCALE UNIT MAINTENANCE
03 Jul	2515.0	12.0	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
16 Oct	18.0	0.2	PF	E31	UNIT SHUT DOWN TO CHECK THE AUTOMATED TURBINE SAFETY SYSTEM
16 Oct	1829.0	9.4	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1976 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					73	
C. Inspection, maintenance or repair combined with refuelling	415			1160		
D. Inspection, maintenance or repair without refuelling	1230			358		
E. Testing of plant systems or components	18			5		
J. Grid failure or grid unavailability					1	55
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				18	1	
Subtotal	1663	0	0	1541	75	55
Total		1663			1671	

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

System	2003 Hours Lost	1976 to 2003 Average Hours Lost Per Year
13. Reactor Auxiliary Systems		2
15. Reactor Cooling Systems		20
31. Turbine and auxiliaries		16
32. Feedwater and Main Steam System		11
33. Circulating Water System		0
Total	0	49

# RU-144 BILIBINO UNIT D

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

## 1. Station Details

**Type:** LWGR  
**Maximum Net Capacity at the beginning of 2003:** 11.0 MW(e)  
**Design Net Capacity:** 11.0 MW(e)  
**Design Discharge Burnup:** 3000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 24.5 GW(e).h  
**Energy Availability Factor:** 34.0%  
**Load Factor:** 25.4%  
**Operating Factor:** 66.8%  
**Energy Unavailability Factor:** 66.0%  
**Total Off-line Time:** 2911 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	2.9	3.7	0.6	0.5	3.2	2.3	2.5	3.4	3.8	0.0	0.0	1.6	24.5
<b>EAF (%)</b>	46.2	59.7	15.5	15.2	49.4	41.9	42.8	52.7	55.5	0.0	0.0	31.4	34.0
<b>UCF (%)</b>	92.2	100.0	29.2	21.2	88.4	100.0	100.0	97.3	100.0	0.1	0.0	83.2	67.5
<b>LF (%)</b>	36.0	50.5	7.3	6.7	39.1	29.2	30.3	41.4	47.8	0.0	0.0	19.0	25.4
<b>OF (%)</b>	91.9	100.0	25.9	17.5	87.9	100.0	100.0	97.2	100.0	0.0	0.0	82.4	66.8
<b>EU (%)</b>	53.8	40.3	84.5	84.8	50.6	58.1	57.2	47.3	44.5	100.0	100.0	68.6	66.0
<b>PU (%)</b>	7.8	0.0	70.8	78.8	11.6	0.0	0.0	2.7	0.0	99.9	100.0	16.8	32.5
<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>	46.1	40.3	13.7	6.0	39.0	58.1	57.2	44.7	44.5	0.1	0.0	51.9	33.5

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION.

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1970  
**Date of First Criticality:** 12 Dec 1976  
**Date of Grid Connection:** 27 Dec 1976  
**Date of Commercial Operation:** 01 Jan 1977

**Lifetime Generation:** 1568.6 GW(e).h  
**Cumulative Energy Availability Factor:** 71.1%  
**Cumulative Load Factor:** 62.1%  
**Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
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	89.5	93.3	87.8	90.9	84.0	8154	93.1
1988	75.8	11.0	87.3	89.3	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



## RU-144 BILIBINO UNIT D

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	504.0	2.8	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
22 Jan	61.0	0.6	PF	C	ROUTINE UNIT MAINTENANCE
24 Jan	1045.0	5.1	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
09 Mar	1145.0	12.0	PF	C	MEDIUM-SCALE UNIT MAINTENANCE
25 Apr	294.0	1.3	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
08 May	90.0	0.9	PF	C	ROUTINE UNIT MAINTENANCE
11 May	2151.0	12.7	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
08 Aug	21.0	0.2	PF	E	UNIT SHUTDOWN TO TEST THE AUTOMATED TURBINE SAFETY SYSTEM
09 Aug	1243.0	6.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
01 Oct	1594.0	16.7	PF	D	MAJOR UNIT OVERHAUL
06 Dec	613.0	4.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1977 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					68	
C. Inspection, maintenance or repair combined with refuelling	1296			1339		
D. Inspection, maintenance or repair without refuelling	1594			453		
E. Testing of plant systems or components	21			5		
J. Grid failure or grid unavailability						86
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					1	
Subtotal	2911	0	0	1797	69	86
Total	2911			1952		

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

System	2003 Hours Lost	1977 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		16
13. Reactor Auxiliary Systems		9
15. Reactor Cooling Systems		1
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		7
33. Circulating Water System		6
41. Main Generator Systems		21
Total	0	64

# RU-30 KALININ-1

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7155.9 GW(e).h  
**Energy Availability Factor:** 83.1%  
**Load Factor:** 86.0%  
**Operating Factor:** 84.6%  
**Energy Unavailability Factor:** 16.9%  
**Total Off-line Time:** 1352 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	727.5	662.8	604.2	703.2	720.2	443.5	0.0	567.7	721.4	568.0	701.8	735.7	7155.9
<b>EAF (%)</b>	99.7	100.0	82.7	99.7	99.5	65.2	0.0	77.8	100.0	77.4	98.5	99.5	83.1
<b>UCF (%)</b>	100.0	100.0	82.7	99.7	100.0	70.2	0.0	77.8	100.0	77.4	100.0	100.0	83.8
<b>LF (%)</b>	102.9	103.8	85.5	102.9	101.9	64.8	0.0	80.3	105.5	80.2	102.6	104.1	86.0
<b>OF (%)</b>	100.0	100.0	82.8	100.1	100.0	70.6	0.0	84.0	100.0	79.9	100.0	100.0	84.6
<b>EUf (%)</b>	0.3	0.0	17.3	0.3	0.5	34.8	100.0	22.2	0.0	22.6	1.5	0.5	16.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	29.8	100.0	17.1	0.0	0.0	0.0	0.0	12.4
<b>UCLF (%)</b>	0.0	0.0	17.3	0.3	0.0	0.0	0.0	5.1	0.0	22.6	0.0	0.0	3.9
<b>XUF (%)</b>	0.3	0.0	0.0	0.0	0.5	5.0	0.0	0.0	0.0	0.0	1.5	0.5	0.6

UCLF replaces previously used UUF.

## 4. 2003 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, FEBRUARY, MARCH, APRIL, MAY, JUNE, AUGUST, SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 212503 MWH.

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1977  
**Date of First Criticality:** 10 Apr 1984  
**Date of Grid Connection:** 09 May 1984  
**Date of Commercial Operation:** 12 Jun 1985

**Lifetime Generation:** 111279.7 GW(e).h  
**Cumulative Energy Availability Factor:** 69.6%  
**Cumulative Load Factor:** 70.2%  
**Cumulative Unit Capability Factor:** 77.8%  
**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	4487.6	950.0	0.0	0.0	75.5	100.0	53.9	0.0	5824	66.5
1986	5297.7	950.0	62.9	62.9	62.8	62.8	63.7	63.7	5946	67.9
1987	6842.5	1000.0	78.7	71.0	78.7	71.0	78.1	71.1	6972	79.6
1988	5891.6	950.0	70.1	70.7	70.1	70.7	70.6	70.9	6187	70.4
1989	6129.7	950.0	71.9	71.0	71.9	71.0	73.7	71.6	6396	73.0
1990	5192.3	950.0	61.6	69.1	61.5	69.1	62.4	69.8	5435	62.0
1991	6482.7	950.0	78.1	70.6	77.1	70.4	77.9	71.1	7161	81.7
1992	6781.4	950.0	80.4	72.0	80.3	71.8	81.3	72.6	7388	84.1
1993	4927.2	950.0	66.6	71.3	59.4	70.3	59.2	70.9	6133	70.0
1994	4437.6	950.0	54.4	69.5	54.1	68.5	53.3	69.0	5440	62.1
1995	4699.0	950.0	57.0	68.2	56.8	67.3	56.5	67.7	6265	71.5
1996	4431.7	950.0	53.3	66.9	53.2	66.1	53.1	66.4	5628	64.1
1997	5197.1	950.0	65.0	66.7	63.2	65.8	62.4	66.1	6195	70.7
1998	6101.0	950.0	73.3	67.2	73.0	66.4	73.3	66.6	6937	79.2
1999	5775.1	950.0	73.1	67.6	69.3	66.6	69.4	66.8	6589	75.2
2000	6289.7	950.0	76.8	68.2	75.0	67.1	75.4	67.4	6784	77.2
2001	6627.5	950.0	79.4	68.9	78.2	67.8	79.6	68.2	7020	80.1
2002	7248.4	950.0	86.1	69.9	84.7	68.8	87.1	69.3	7568	86.4
2003	7155.9	950.0	83.8	70.7	83.1	69.6	86.0	70.2	7408	84.6

# RU-30 KALININ-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	78.0	2.4	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
26 Mar	127.0	122.6	UF5	A31	UNIT SHUT DOWN FROM EMERGENCY PROTECTION SYSTEM NO. 1 KEY TO ELIMINATE A LEAK IN A HIGH-PRESSURE HEATER HEATING STEAM CONDENSATE DRAINAGE LINE
01 Apr	28.0	1.8	UP1	A32	UNIT POWER REDUCTION WHEN BOTH GROUPS OF HIGH-PRESSURE HEATERS WERE SHUT DOWN FOR MAINTENANCE
01 May	180.0	3.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER (THREE TIMES IN MAY)
01 Jun	508.0	34.5	XP	S	POWER REDUCTION WHILE UNIT OPERATING IN COASTDOWN
22 Jun	1075.0	1031.8	PF	C	MEDIUM-SCALE UNIT MAINTENANCE
05 Aug	90.0	30.4	UP1	A32	UNIT POWER REDUCTION OWING TO A FAULT IN A TURBINE-DRIVEN FEEDWATER PUMP
09 Aug	14.0	5.4	UP1	A31	UNIT POWER REDUCTION TO ELIMINATE A FAULT IN THE STEAM SEPARATOR/REHEATER MEMBRANE
04 Oct	125.0	121.8	UF2	A16	UNIT SHUT DOWN OWING TO A LEAK IN THE STEAM GENERATOR PIPING SYSTEM
09 Oct	38.0	9.9	UP1	A31	UNIT POWER REDUCTION OWING TO A LEAK IN THE STEAM LINE FROM THE TURBINE HIGH-PRESSURE CYLINDER INTO THE STEAM SEPARATOR/REHEATER
11 Oct	24.0	28.6	UF1	A31	UNIT SHUT DOWN TO ELIMINATE A LEAK IN THE STEAM LINE FROM THE TURBINE HIGH-PRESSURE CYLINDER INTO THE STEAM SEPARATOR/REHEATER
16 Nov	107.0	10.0	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER (THREE TIMES IN NOVEMBER)
01 Dec	30.0	3.6	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER (TWICE IN DECEMBER)

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		276			280	
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling	1075			1617	47	
D. Inspection, maintenance or repair without refuelling				132		
E. Testing of plant systems or component					2	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					66	
Subtotal	1075	276	0	1749	401	0
Total		1351			2150	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems		2
15. Reactor Cooling Systems		4
16. Steam generation system:	125	30
17. Safety I&C Systems (excluding reactor I&C)		6
31. Turbine and auxiliaries	151	35
32. Feedwater and Main Steam System		32
35. All other I&C Systems		10
41. Main Generator System:		129
42. Electrical Power Supply System:		11
Total	276	267

## RU-31 KALININ-2

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

### 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 7329.5 GW(e).h  
**Energy Availability Factor:** 85.3%  
**Load Factor:** 88.1%  
**Operating Factor:** 86.1%  
**Energy Unavailability Factor:** 14.7%  
**Total Off-line Time:** 1219 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	674.7	650.2	723.7	231.8	0.0	702.4	724.9	732.5	708.3	737.3	704.3	739.4	7329.5
<b>EAF (%)</b>	93.6	99.4	99.8	34.2	0.0	99.2	99.4	100.0	100.0	100.0	99.3	100.0	85.3
<b>UCF (%)</b>	96.3	99.4	100.0	37.2	0.0	99.2	99.5	100.0	100.0	100.0	100.0	100.0	85.9
<b>LF (%)</b>	95.5	101.8	102.4	33.9	0.0	102.7	102.6	103.6	103.6	104.2	103.0	104.6	88.1
<b>OF (%)</b>	96.8	100.0	99.9	37.4	0.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	86.1
<b>EUF (%)</b>	6.4	0.6	0.2	65.8	100.0	0.8	0.6	0.0	0.0	0.0	0.7	0.0	14.7
<b>PUF (%)</b>	0.0	0.0	0.0	62.8	97.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	13.4
<b>UCLF (%)</b>	3.7	0.6	0.0	0.0	3.1	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.7
<b>XUF (%)</b>	2.7	0.0	0.2	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.6

UCLF replaces previously used UUF.

### 4. 2003 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, FEBRUARY, MARCH, JUNE, JULY, AUGUST, SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 184314 MWH.

### 5. Historical Summary

**Date of Construction Start:** 01 Feb 1982  
**Date of First Criticality:** 25 Nov 1986  
**Date of Grid Connection:** 03 Dec 1986  
**Date of Commercial Operation:** 03 Mar 1987

**Lifetime Generation:** 99276.3 GW(e).h  
**Cumulative Energy Availability Factor:** 67.7%  
**Cumulative Load Factor:** 69.6%  
**Cumulative Unit Capability Factor:** 78.2%  
**Cumulative Energy Unavailability Factor:** 32.3%

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	6494.0	1000.0	0.0	0.0	88.5	100.0	74.1	0.0	7605	86.8
1988	5829.4	950.0	71.7	71.7	71.7	71.7	69.9	69.9	6446	73.4
1989	6580.5	950.0	78.5	75.1	78.5	75.1	79.1	74.5	7034	80.3
1990	6788.2	950.0	79.5	76.5	79.5	76.5	81.6	76.8	7083	80.9
1991	4729.7	950.0	49.8	69.8	49.8	69.8	56.8	71.8	5154	58.8
1992	5496.3	950.0	65.7	69.0	65.7	69.0	65.9	70.6	6145	70.0
1993	5862.3	950.0	58.1	67.2	51.9	66.2	70.4	70.6	7078	80.8
1994	4463.8	950.0	54.9	65.4	54.9	64.6	53.6	68.2	6989	79.8
1995	5769.7	950.0	72.4	66.3	69.5	65.2	69.3	68.3	7283	83.1
1996	4595.2	950.0	78.4	67.7	56.0	64.2	55.1	66.9	7501	85.4
1997	3880.6	950.0	62.7	67.2	47.3	62.5	46.6	64.8	6117	69.8
1998	4946.7	950.0	60.0	66.5	59.7	62.2	59.4	64.3	6839	78.1
1999	6379.3	950.0	80.0	67.6	76.2	63.4	76.7	65.4	7155	81.7
2000	6418.7	950.0	83.6	68.9	76.3	64.4	76.9	66.3	7441	84.7
2001	6709.0	950.0	80.0	69.7	79.2	65.4	80.6	67.3	7070	80.7
2002	7003.4	950.0	85.8	70.7	82.7	66.6	84.2	68.4	7554	86.2
2003	7329.5	950.0	85.9	71.7	85.3	67.7	88.1	69.6	7541	86.1

## RU-31 KALININ-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	78.0	19.1	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
04 Jan	24.0	26.1	UF5	A12	UNIT SHUT DOWN FROM EMERGENCY PROTECTION SYSTEM KEY OWING TO SPONTANEOUS DROP OF RCPS CONTROL ELEMENTS
26 Feb	20.0	3.8	UP2	L	UNIT POWER REDUCTION OWING TO CUT-OUT OF A SET OF PUMP UNITS CAUSED BY ERROR OF ELECTRICAL WORKSHOP STAFF
26 Feb	12.0	3.9	UP2	A15	UNIT POWER REDUCTION OWING TO CUT-OUT OF REACTOR COOLANT PUMP BECAUSE A VALVE IN THE OIL SUPPLY CLOSED AS A RESULT OF A SPURIOUS SIGNAL FOR TRIGGERING OF AN INTERLOCK
29 Mar	320.0	21.2	XP	S	POWER REDUCTION WHILE UNIT OPERATING IN COASTDOWN
12 Apr	1171.0	1113.6	PF	C	MEDIUM-SCALE UNIT MAINTENANCE
31 May	23.0	21.5	UF3	Z	EXTENSION OF UNIT OUTAGE FOR MEDIUM-SCALE MAINTENANCE
01 Jun	96.0	4.6	PP	E	PLANNED UNIT POWER RAISE FOLLOWING MAINTENANCE
07 Nov	47.0	4.7	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER (TWICE IN NOVEMBER)

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		24			212	
B. Refuelling without a maintenance					17	
C. Inspection, maintenance or repair combined with refuelling	1171			1353	12	
D. Inspection, maintenance or repair without refuelling				115		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					4	
Z. Others		23				
Subtotal	1171	47	0	1468	245	0
Total		1218			1713	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems	24	7
15. Reactor Cooling System:		39
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		54
32. Feedwater and Main Steam System		6
35. All other I&C Systems:		3
41. Main Generator System:		72
42. Electrical Power Supply System:		2
XX. Miscellaneous Systems		3
Total	24	195

# RU-12 KOLA-1

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)  
**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 411.0 MW(e)  
**Design Net Capacity:** 411.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 2164.0 GW(e).h  
**Energy Availability Factor:** 60.4%  
**Load Factor:** 60.1%  
**Operating Factor:** 73.6%  
**Energy Unavailability Factor:** 39.6%  
**Total Off-line Time:** 2316 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	275.4	42.6	0.0	0.0	50.5	266.5	235.9	301.7	301.0	314.4	186.5	189.4	2164.0
<b>EAF (%)</b>	90.5	17.2	0.0	0.0	18.7	90.4	77.9	98.8	100.0	100.0	64.3	63.2	60.4
<b>UCF (%)</b>	100.0	50.2	0.0	0.0	58.8	100.0	94.5	100.0	100.0	100.0	100.0	100.0	75.5
<b>LF (%)</b>	90.1	15.4	0.0	0.0	16.5	90.1	77.2	98.7	101.7	102.7	63.0	61.9	60.1
<b>OF (%)</b>	100.0	50.1	0.0	0.0	39.9	100.0	90.5	100.0	100.0	100.0	100.0	100.0	73.6
<b>EUf (%)</b>	9.5	82.8	100.0	100.0	81.3	9.6	22.1	1.2	0.0	0.0	35.7	36.8	39.6
<b>PUf (%)</b>	0.0	49.8	100.0	100.0	40.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	1.0	0.0	5.5	0.0	0.0	0.0	0.0	0.0	0.6
<b>XUF (%)</b>	9.5	32.9	0.0	0.0	40.1	9.6	16.6	1.2	0.0	0.0	35.7	36.8	15.1

UCLF replaces previously used UUF.

## 4. 2003 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 SEPTEMBER, OCTOBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 12385 MWH.

## 5. Historical Summary

**Date of Construction Start:** 01 May 1970  
**Date of First Criticality:** 26 Jun 1973  
**Date of Grid Connection:** 29 Jun 1973  
**Date of Commercial Operation:** 28 Dec 1973

**Lifetime Generation:** 71446.6 GW(e).h  
**Cumulative Energy Availability Factor:** 69.1%  
**Cumulative Load Factor:** 65.1%  
**Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1984	3112.0	411.0	84.9	78.1	84.9	78.0	86.2	71.8	8060	91.8
1985	2388.8	411.0	67.0	77.2	67.0	77.1	66.3	71.3	6001	68.5
1986	2805.8	411.0	85.1	77.8	85.1	77.7	77.9	71.9	8074	92.2
1987	3268.2	440.0	86.0	78.4	86.0	78.4	84.8	72.8	7972	91.0
1988	2925.0	411.0	82.7	78.7	82.7	78.6	81.0	73.4	7482	85.2
1989	2675.5	411.0	76.2	78.5	75.4	78.4	74.3	73.4	6731	76.8
1990	2735.5	411.0	76.0	78.4	76.0	78.3	76.0	73.6	6838	78.1
1991	2773.1	411.0	77.3	78.3	77.3	78.2	77.0	73.8	6965	79.5
1992	2271.4	411.0	63.7	77.5	63.4	77.5	62.9	73.2	6651	75.7
1993	1992.6	411.0	59.6	76.7	56.1	76.4	55.3	72.3	5663	64.6
1994	1971.6	411.0	58.6	75.8	56.5	75.5	54.8	71.5	5359	61.2
1995	1581.4	411.0	62.2	75.2	62.2	74.9	43.9	70.2	5398	61.6
1996	1410.0	411.0	47.4	74.0	46.4	73.6	39.1	68.9	4466	50.8
1997	2404.1	411.0	88.5	74.6	88.5	74.2	66.8	68.8	7942	90.7
1998	1291.7	411.0	59.3	74.0	37.7	72.8	35.9	67.5	5658	64.6
1999	2028.5	411.0	86.6	74.5	58.0	72.2	56.3	67.1	7355	84.0
2000	1298.8	411.0	84.1	74.8	37.2	70.9	36.0	65.9	4643	52.9
2001	2243.2	411.0	81.6	75.0	63.3	70.6	62.3	65.8	7098	81.0
2002	1841.5	411.0	68.9	74.8	51.7	70.0	51.1	65.3	5660	64.6
2003	2164.0	411.0	75.5	74.9	60.4	69.7	60.1	65.1	6444	73.6

# RU-12 KOLA-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	769.0	41.5	XP	S	POWER REDUCTION WHILE UNIT OPERATING IN COASTDOWN
01 Jan	1081.0	78.4	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER AND SHUTDOWN OF TURBOGENERATOR NO. 2
15 Feb	2088.0	858.2	PF	D	UNIT MAINTENANCE
13 May	127.0	28.4	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER AND OUTAGE OF TURBOGENERATOR NO. 1
18 May	30.0	2.3	UF4	A35	UNIT SHUT DOWN OWING TO DISCONNECTION OF THE LAST OPERATIONAL TURBOGENERATOR NO. 2 FROM THE 330 KV GRID AS A RESULT OF A SPURIOUS SIGNAL WHICH CONSEQUENTLY TRIGGERED REACTOR EMERGENCY PROTECTION SYSTEM NO. 1 FOR A TOTAL UNIT POWER FAILURE
19 May	1248.0	79.6	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER AND SUBSEQUENT SHUTDOWN OF TURBOGENERATORS NOS 1 AND 2
01 Jul	673.0	5.8	XP	N	UNIT POWER REDUCTION OWING TO HIGH CIRCULATING WATER
01 Jul	673.0	20.1	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER AND SHUTDOWN OF TURBOGENERATOR NO. 1
12 Jul	6.0	16.8	UP1	A12	UNIT POWER REDUCTION (WITH SHUTDOWN OF TURBOGENERATOR NO.1) WHEN AN RCPS CONTROL ELEMENT DROPPED TO THE LOWER STOP
14 Jul	71.0	28.8	XF	J	UNIT SHUTDOWN OWING TO LIMITATION IMPOSED BY THE DISPATCHER
01 Nov	1464.0	218.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER AND SUBSEQUENT SHUTDOWN OF TURBOGENERATORS NOS 1 AND 2

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		30			67	
B. Refuelling without a maintenanc					1	
C. Inspection, maintenance or repai combined with refuelling				1454	4	
D. Inspection, maintenance or repai without refuelling	2088			93		
F. TMajor back-fitting, refurbishment o upgrading activities with refuelling				87		
G. Major back-fitting, refurbishment o upgrading activities without refuelling						7
J. Grid failure or grid unavailabilit			71			151
K. Load-following (frequency contro reserve shutdown due to reduced energ demand)					13	2
Subtotal	2088	30	71	1634	85	160
Total		2189			1879	

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

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		5
13. Reactor Auxiliary System:		5
15. Reactor Cooling System:		18
17. Safety I&C Systems (excluding reactor I&C		1
31. Turbine and auxiliaries:		2
32. Feedwater and Main Steam Syster		9
35. All other I&C Systems	30	0
42. Electrical Power Supply System:		1
Total	30	41

# RU-13 KOLA-2

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 411.0 MW(e)  
**Design Net Capacity:** 411.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 1866.1 GW(e).h  
**Energy Availability Factor:** 52.0%  
**Load Factor:** 51.8%  
**Operating Factor:** 62.3%  
**Energy Unavailability Factor:** 48.0%  
**Total Off-line Time:** 3301 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	79.6	252.6	295.8	197.9	70.2	0.0	0.0	0.0	132.9	257.1	275.7	304.5	1866.1
<b>EAF (%)</b>	27.4	91.6	64.6	77.5	45.9	0.0	0.0	0.0	46.1	83.7	92.8	99.0	52.0
<b>UCF (%)</b>	100.0	100.0	95.8	100.0	45.9	0.0	0.0	0.0	75.4	84.1	99.3	100.0	66.4
<b>LF (%)</b>	26.0	91.5	96.7	67.0	22.9	0.0	0.0	0.0	44.9	84.0	93.2	99.6	51.8
<b>OF (%)</b>	49.5	100.0	96.2	100.1	47.2	0.0	0.0	0.0	75.7	84.3	99.3	100.0	62.3
<b>EUF (%)</b>	72.6	8.4	35.4	22.5	54.1	100.0	100.0	100.0	53.9	16.3	7.2	1.0	48.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	54.1	100.0	100.0	100.0	24.7	15.9	0.7	0.0	33.2
<b>UCLF (%)</b>	0.0	0.0	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
<b>XUF (%)</b>	72.6	8.4	31.2	22.5	0.0	0.0	0.0	0.0	29.3	0.4	6.5	1.0	14.4

UCLF replaces previously used UUF.

## 4. 2003 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 MARCH. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 2677 MWH.

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1973  
**Date of First Criticality:** 30 Nov 1974  
**Date of Grid Connection:** 09 Dec 1974  
**Date of Commercial Operation:** 21 Feb 1975

**Lifetime Generation:** 68815.2 GW(e).h  
**Cumulative Energy Availability Factor:** 69.9%  
**Cumulative Load Factor:** 66.6%  
**Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1984	3034.5	411.0	86.8	81.2	86.8	81.1	84.1	78.9	8079	92.0
1985	3055.6	411.0	84.9	81.6	84.9	81.5	84.9	79.5	7872	89.9
1986	2844.2	411.0	79.8	81.4	79.7	81.3	79.0	79.5	7405	84.5
1987	3345.4	440.0	89.6	82.2	89.6	82.0	86.8	80.1	7900	90.2
1988	2873.3	411.0	80.5	82.0	80.5	81.9	79.6	80.1	7451	84.8
1989	2707.3	411.0	78.0	81.8	74.8	81.4	75.2	79.7	6859	78.3
1990	2610.9	411.0	72.9	81.2	72.7	80.8	72.5	79.2	6751	77.1
1991	2701.9	411.0	75.4	80.8	75.3	80.5	75.0	79.0	6983	79.7
1992	2133.0	411.0	61.9	79.7	61.8	79.4	59.1	77.8	5871	66.8
1993	2138.8	411.0	65.7	78.9	60.7	78.4	59.4	76.8	6377	72.8
1994	398.6	411.0	16.7	75.7	16.7	75.1	11.1	73.4	1466	16.7
1995	2205.8	411.0	93.6	76.5	93.6	76.0	61.3	72.8	6846	78.2
1996	1946.2	411.0	66.3	76.1	65.5	75.5	53.9	71.9	6243	71.1
1997	1157.9	411.0	53.4	75.0	40.6	74.0	32.2	70.1	3955	45.1
1998	2655.6	411.0	83.6	75.4	74.5	74.0	73.8	70.2	8029	91.7
1999	1272.6	411.0	49.0	74.3	36.3	72.4	35.3	68.8	4423	50.5
2000	2430.5	411.0	83.4	74.7	68.2	72.3	67.3	68.7	7626	86.8
2001	1722.3	411.0	84.7	75.1	49.1	71.4	47.8	67.9	6574	75.0
2002	1738.7	411.0	83.2	75.4	48.7	70.5	48.3	67.2	5564	63.5
2003	1866.1	411.0	66.4	75.0	52.0	69.9	51.8	66.6	5459	62.3



# RU-13 KOLA-2

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	266.0	109.4	XF3	J	CONTINUATION OF UNIT OUTAGE OWING TO LIMITATION IMPOSED BY THE DISPATCHER (BEGUN 20 OCTOBER 2002)
12 Jan	1040.0	90.6	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER AND OUTAGE OF TURBOGENERATOR NO. 2 (TWICE IN JANUARY)
24 Jan	110.0	45.2	XF	J	UNIT SHUTDOWN OWING TO LIMITATION IMPOSED BY THE DISPATCHER
19 Mar	27.0	12.9	UF4	N42	UNIT SHUT DOWN BY REACTOR EMERGENCY PROTECTION SYSTEM NO. 1 FOR A UNIT POWER FAILURE WHEN THE UNIT WAS DISCONNECTED FROM THE 330 KV GRID BY THE BUSBAR DIFFERENTIAL PROTECTION SYSTEM OWING TO A BREACH IN THE UNIT TRANSFORMER CIRCUIT CAUSED BY A GALE
03 Apr	1023.0	53.9	XP	S	POWER REDUCTION WHILE UNIT OPERATING IN COASTDOWN
10 Apr	832.0	108.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER AND SHUTDOWN OF TURBOGENERATOR NO. 2
15 May	2776.0	1145.9	PF	F	MAJOR UNIT OVERHAUL INCLUDING MODERNIZATION AND RECONSTRUCTION OF A NUMBER OF SYSTEMS TO EXTEND UNIT OPERATING LIFE
08 Sep	397.0	77.4	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER DURING TURBOGENERATOR NO. 1 OUTAGE
28 Sep	664.0	10.4	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER AND SHUTDOWN OF TURBOGENERATOR NO. 1
27 Oct	122.0	50.7	PF	D	ROUTINE UNIT MAINTENANCE
01 Nov	1464.0	22.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER AND SHUTDOWN OF TURBOGENERATOR NO. 1

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1975 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					101	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling				1498		
D. Inspection, maintenance or repair without refuelling	122			76		
E. Testing of plant systems or components				10		
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling	2776					
J. Grid failure or grid unavailability			376			183
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					0	3
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)		27				
Subtotal	2898	27	376	1584	101	186
Total		3301			1871	

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

System	2003 Hours Lost	1975 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		58
12. Reactor I&C Systems		1
13. Reactor Auxiliary Systems		3
14. Safety Systems		3
15. Reactor Cooling Systems		25
16. Steam generation systems		4
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		0
35. All other I&C Systems		0
41. Main Generator Systems		0
42. Electrical Power Supply Systems		0
Total	0	95

# RU-32 KOLA-3

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 411.0 MW(e)  
**Design Net Capacity:** 411.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 2740.7 GW(e).h  
**Energy Availability Factor:** 75.6%  
**Load Factor:** 76.1%  
**Operating Factor:** 83.7%  
**Energy Unavailability Factor:** 24.4%  
**Total Off-line Time:** 1425 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	290.5	261.4	314.2	285.9	309.4	286.3	152.6	0.0	94.5	307.5	150.8	287.8	2740.7
<b>EAF (%)</b>	94.3	94.0	100.0	95.9	100.0	96.0	50.5	0.0	33.0	99.5	51.8	93.3	75.6
<b>UCF (%)</b>	94.3	97.3	100.0	100.0	100.0	100.0	56.1	0.0	58.6	100.0	100.0	100.0	83.7
<b>LF (%)</b>	95.0	94.6	102.8	96.7	101.2	96.7	49.9	0.0	31.9	100.4	51.0	94.1	76.1
<b>OF (%)</b>	94.0	93.0	99.9	100.1	100.0	100.0	60.9	0.0	58.6	100.0	100.0	100.0	83.7
<b>EU (%)</b>	5.7	6.0	0.0	4.1	0.0	4.0	49.5	100.0	67.0	0.5	48.2	6.7	24.4
<b>PU (%)</b>	5.7	2.7	0.0	0.0	0.0	0.0	43.3	100.0	41.4	0.0	0.0	0.0	16.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.1
<b>XUF (%)</b>	0.0	3.3	0.0	4.1	0.0	4.0	5.6	0.0	25.6	0.5	48.2	6.7	8.1

UCLF replaces previously used UUF.

## 4. 2003 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 MARCH, MAY. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 6585 MWH.

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1977      **Lifetime Generation:** 58273.2 GW(e).h  
**Date of First Criticality:** 07 Feb 1981      **Cumulative Energy Availability Factor:** 75.9%  
**Date of Grid Connection:** 24 Mar 1981      **Cumulative Load Factor:** 73.1%  
**Date of Commercial Operation:** 03 Dec 1982      **Cumulative Unit Capability Factor:** 77.6%  
**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 (%)
1984	2830.7	411.0	82.7	77.4	82.7	77.3	78.4	73.4	7610	86.6
1985	2972.6	411.0	86.8	80.5	86.7	80.5	82.6	76.4	7814	89.2
1986	2627.3	411.0	74.1	78.9	74.1	78.9	73.0	75.6	7244	82.7
1987	2837.8	440.0	74.8	78.0	74.8	78.0	73.6	75.2	7024	80.2
1988	2933.2	411.0	81.5	78.6	81.4	78.6	81.2	76.2	7913	90.1
1989	3186.7	411.0	90.5	80.3	87.8	79.9	88.5	77.9	8047	91.9
1990	3256.9	411.0	89.8	81.5	89.7	81.1	90.5	79.5	8022	91.6
1991	2935.2	411.0	79.8	81.3	79.8	81.0	81.5	79.7	7188	82.1
1992	2806.4	411.0	88.0	81.9	87.8	81.6	77.7	79.5	7396	84.2
1993	2548.0	411.0	81.9	81.9	70.5	80.6	70.8	78.7	6833	78.0
1994	2466.0	411.0	70.9	81.0	70.8	79.8	68.5	77.9	6373	72.8
1995	2526.1	411.0	81.0	81.0	80.6	79.9	70.2	77.3	7083	80.9
1996	2327.3	411.0	79.8	80.9	79.8	79.9	64.5	76.4	6928	78.9
1997	2340.5	411.0	78.5	80.8	75.0	79.5	65.0	75.6	7114	81.2
1998	2006.3	411.0	86.3	81.1	56.3	78.1	55.7	74.4	6705	76.5
1999	2140.6	411.0	72.6	80.6	59.9	77.0	59.5	73.5	7040	80.4
2000	2244.7	411.0	87.9	81.0	62.5	76.2	62.2	72.9	7731	88.0
2001	2543.3	411.0	85.3	81.2	70.6	75.9	70.6	72.8	7057	80.6
2002	2742.4	411.0	91.4	81.8	75.9	75.9	76.2	72.9	7909	90.3
2003	2740.7	411.0	83.7	81.8	75.6	75.9	76.1	73.1	7335	83.7

## RU-32 KOLA-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
30 Jan	64.0	24.8	PF	D	ROUTINE UNIT MAINTENANCE
01 Feb	37.0	9.1	XF	J	UNIT SHUTDOWN OWING TO LIMITATION IMPOSED BY THE DISPATCHER
07 Apr	63.0	12.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER AND SUBSEQUENT SHUTDOWN OF TURBOGENERATORS NOS 1 AND 2
01 Jun	1173.0	24.3	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
17 Jul	66.0	73.1	PP	D31	UNIT POWER REDUCTION DURING SHUTDOWN OF TURBOGENERATOR NO. 2 FOR MAJOR OVERHAUL
19 Jul	1324.0	487.4	PF	C	MAJOR UNIT OVERHAUL
13 Sep	356.0	71.6	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER DURING TURBOGENERATOR NO. 2 OUTAGE
30 Sep	877.0	240.4	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER WITH SUBSEQUENT SHUTDOWN OF TURBOGENERATORS NOS. 1 AND 2 (TWICE IN SEPTEMBER, NOVEMBER)

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1982 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					84	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	1324			1027		
D. Inspection, maintenance or repair without refuelling	64			97		
E. Testing of plant systems or components				18	1	
J. Grid failure or grid unavailability			37		18	102
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					5	1
L. Human factor related					1	
Subtotal	1388	0	37	1142	109	103
Total		1425			1354	

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

System	2003 Hours Lost	1982 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems		40
15. Reactor Cooling Systems		9
16. Steam generation systems		10
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		8
42. Electrical Power Supply Systems		6
XX. Miscellaneous Systems		0
Total	0	81

**RU-33 KOLA-4**

Operator: REA (ROSENERGOATOM, CONSORTIUM)

Contractor: MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

**1. Station Details**

Type: WWER  
 Maximum Net Capacity  
 at the beginning of 2003: 411.0 MW(e)  
 Design Net Capacity: 411.0 MW(e)  
 Design Discharge Burnup: 28600 MW.d/t

**2. Production Summary 2003**

Energy Production: 2480.8 GW(e).h  
 Energy Availability Factor: 68.7%  
 Load Factor: 68.9%  
 Operating Factor: 76.1%  
 Energy Unavailability Factor: 31.3%  
 Total Off-line Time: 2097 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	279.3	278.6	252.2	292.1	190.6	0.0	139.6	287.3	222.9	17.2	299.1	221.8	2480.8
EAF (%)	90.8	99.9	82.1	97.8	62.7	0.0	46.1	93.4	75.7	6.4	99.9	72.6	68.7
UCF (%)	100.0	100.0	84.3	100.0	100.0	100.0	100.0	100.0	100.0	8.5	100.0	100.0	90.9
LF (%)	91.3	100.9	82.5	98.9	62.3	0.0	45.7	94.0	75.3	5.6	101.1	72.5	68.9
OF (%)	100.0	100.0	84.1	100.1	62.6	0.0	56.7	100.0	100.0	11.4	100.0	100.0	76.1
EU (%)	9.2	0.1	17.9	2.2	37.3	100.0	53.9	6.6	24.3	93.6	0.1	27.4	31.3
PU (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	91.5	0.0	0.0	7.8
UCLF (%)	0.0	0.0	15.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3
XUF (%)	9.2	0.1	2.2	2.2	37.3	100.0	53.9	6.6	24.3	2.1	0.1	27.4	22.2

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation**

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION.

**5. Historical Summary**

Date of Construction Start: 01 Aug 1976      Lifetime Generation: 49655.2 GW(e).h  
 Date of First Criticality: 07 Oct 1984      Cumulative Energy Availability Factor: 73.7%  
 Date of Grid Connection: 11 Oct 1984      Cumulative Load Factor: 71.9%  
 Date of Commercial Operation: 06 Dec 1984      Cumulative Unit Capability Factor: 77.8%  
    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 (%)
1984	249.4	411.0	0.0	0.0	7.1	100.0	7.1	0.0	1605	18.8
1985	2585.8	411.0	78.2	78.2	78.2	78.2	71.8	71.8	7751	88.5
1986	2690.2	411.0	72.4	75.3	72.4	75.3	74.7	73.3	7230	82.5
1987	3341.2	440.0	85.5	78.8	85.5	78.8	86.7	77.9	7861	89.7
1988	3124.2	411.0	85.0	80.3	84.9	80.3	86.5	80.1	7762	88.4
1989	3111.5	411.0	87.6	81.8	85.8	81.4	86.4	81.3	7793	89.0
1990	2930.4	411.0	80.3	81.5	80.2	81.2	81.4	81.3	7142	81.5
1991	2790.5	411.0	76.7	80.8	76.7	80.6	77.5	80.8	7429	84.8
1992	2764.9	411.0	80.5	80.8	80.0	80.5	76.6	80.3	7253	82.6
1993	2827.0	411.0	92.4	82.1	79.0	80.3	78.5	80.1	8247	94.1
1994	1939.8	411.0	62.7	80.2	55.8	77.9	53.9	77.5	5915	67.5
1995	2288.8	411.0	73.8	79.6	73.8	77.5	63.6	76.2	7022	80.2
1996	2537.7	411.0	84.1	80.0	84.1	78.1	70.3	75.7	7792	88.7
1997	2271.7	411.0	76.2	79.7	74.6	77.8	63.1	74.8	6848	78.2
1998	1927.6	411.0	69.4	78.9	49.2	75.8	53.5	73.3	6336	72.3
1999	2567.5	411.0	82.0	79.1	71.2	75.5	71.3	73.1	7193	82.1
2000	2177.5	411.0	86.3	79.6	60.4	74.5	60.3	72.3	7096	80.8
2001	2447.1	411.0	87.4	80.0	68.0	74.1	68.0	72.1	7149	81.6
2002	2601.7	411.0	79.7	80.0	71.5	74.0	72.3	72.1	7281	83.1
2003	2480.8	411.0	90.9	80.6	68.7	73.7	68.9	71.9	6663	76.1

## RU-33 KOLA-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	2042.0	35.1	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER AND SHUTDOWN OF TURBOGENERATOR NO. 1
18 Mar	117.0	48.1	UF2	A12	UNIT SHUT DOWN TO ELIMINATE A LEAK IN AN EMERGENCY CONTROL ASSEMBLY (RCPS)
01 Apr	1464.0	120.7	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER AND SHUTDOWN OF TURBOGENERATOR NO. 1 (FOUR TIMES IN MAY)
19 May	288.0	118.0	XF3	J	CONTINUATION OF UNIT OUTAGE OWING TO LIMITATION IMPOSED BY THE DISPATCHER
01 Jun	1031.0	429.2	XF	J	UNIT SHUTDOWN OWING TO LIMITATION IMPOSED BY THE DISPATCHER
14 Jul	1166.0	45.1	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER AND SHUTDOWN OF TURBOGENERATOR NO. 1
23 Aug	912.0	54.9	XP	S	POWER REDUCTION WHILE UNIT OPERATING IN COASTDOWN
27 Sep	143.0	20.3	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER AND SHUTDOWN OF TURBOGENERATOR NO. 1
01 Oct	660.0	280.1	PF	C	MEDIUM-SCALE UNIT MAINTENANCE
29 Oct	1500.0	90.5	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER AND SHUTDOWN OF TURBOGENERATOR NO. 1 (TWICE IN OCTOBER, DECEMBER)

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		117			65	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	660			1068	31	
D. Inspection, maintenance or repair without refuelling				107		
E. Testing of plant systems or components				8		
J. Grid failure or grid unavailability			1319			104
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					0	0
Subtotal	660	117	1319	1183	97	104
Total		2096			1384	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems	117	8
14. Safety Systems		3
15. Reactor Cooling Systems		7
16. Steam generation systems		9
17. Safety I&C Systems (excluding reactor I&C)		0
32. Feedwater and Main Steam System		9
42. Electrical Power Supply Systems		21
Total	117	60

**RU-17 KURSK-1****Operator:** REA (ROSENERGOATOM, CONSORTIUM)**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)**1. Station Details**

**Type:** LWGR  
**Maximum Net Capacity at the beginning of 2003:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 22200 MW.d/t

**2. Production Summary 2003**

**Energy Production:** 6452.7 GW(e).h  
**Energy Availability Factor:** 78.9%  
**Load Factor:** 79.6%  
**Operating Factor:** 82.9%  
**Energy Unavailability Factor:** 21.1%  
**Total Off-line Time:** 1498 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	645.1	626.8	655.5	639.3	597.9	0.0	46.4	520.8	674.1	710.3	644.8	691.6	6452.7
<b>EAF (%)</b>	93.2	99.9	95.2	95.9	86.9	0.0	6.7	75.6	100.0	100.0	95.6	98.9	78.9
<b>UCF (%)</b>	96.3	99.9	95.2	96.5	94.0	0.0	6.7	76.0	100.0	100.0	98.5	100.0	80.2
<b>LF (%)</b>	93.7	100.8	95.2	96.1	86.9	0.0	6.7	75.7	101.2	103.1	96.8	100.5	79.6
<b>OF (%)</b>	100.0	100.0	99.9	100.1	96.8	0.0	6.7	91.9	100.0	100.0	100.0	100.0	82.9
<b>EUf (%)</b>	6.8	0.1	4.8	4.1	13.1	100.0	93.3	24.4	0.0	0.0	4.4	1.1	21.1
<b>PUF (%)</b>	0.0	0.1	0.1	0.0	2.5	100.0	64.5	0.0	0.0	0.0	0.0	0.0	13.9
<b>UCLF (%)</b>	3.8	0.0	4.7	3.5	3.5	0.0	28.8	24.0	0.0	0.0	1.5	0.0	5.9
<b>XUF (%)</b>	3.0	0.0	0.0	0.6	7.1	0.0	0.0	0.4	0.0	0.0	2.9	1.1	1.3

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation**

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION. NPP OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY, FEBRUARY, MARCH, APRIL, MAY, AUGUST, SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 59761 MWH.

**5. Historical Summary**

**Date of Construction Start:** 01 Jun 1972      **Lifetime Generation:** 121112.8 GW(e).h  
**Date of First Criticality:** 25 Oct 1976      **Cumulative Energy Availability Factor:** 55.9%  
**Date of Grid Connection:** 19 Dec 1976      **Cumulative Load Factor:** 55.5%  
**Date of Commercial Operation:** 12 Oct 1977      **Cumulative Unit Capability Factor:** 77.2%  
**Cumulative Energy Unavailability Factor:** 44.1%

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	6346.8	925.0	76.9	77.4	76.8	77.3	78.3	77.6	7186	82.0
1986	5675.8	925.0	69.2	76.5	69.2	76.4	70.0	76.8	6598	75.3
1987	7022.7	1000.0	82.6	77.2	82.6	77.0	80.2	77.1	7407	84.6
1988	6638.0	925.0	81.8	77.6	81.7	77.5	81.7	77.5	7350	83.7
1989	5745.4	925.0	68.3	76.8	68.3	76.7	70.9	77.0	6582	75.1
1990	5090.5	925.0	65.7	76.0	65.7	75.9	62.8	75.9	6817	77.8
1991	4163.1	925.0	53.5	74.4	52.5	74.2	51.4	74.2	7038	80.3
1992	3669.2	925.0	46.3	72.5	46.3	72.3	45.2	72.2	6103	69.5
1993	4809.4	925.0	91.6	73.7	61.8	71.7	59.4	71.4	8145	93.0
1994	1560.6	925.0	20.6	70.6	19.8	68.7	19.3	68.4	2686	30.7
1995	0.0	925.0	0.0	66.7	0.0	64.9	0.0	64.6	0	0.0
1996	0.0	925.0	0.0	63.2	0.0	61.5	0.0	61.2	0	0.0
1997	27.8	925.0	0.5	60.1	0.5	58.4	0.3	58.2	61	0.7
1998	4508.6	925.0	59.3	60.0	57.4	58.4	55.6	58.1	7845	89.6
1999	4557.0	925.0	58.7	60.0	57.6	58.3	56.2	58.0	7464	85.2
2000	3449.7	925.0	44.3	59.3	43.6	57.7	42.5	57.3	5531	63.0
2001	1296.1	925.0	16.6	57.5	16.4	56.0	16.0	55.6	2042	23.3
2002	2462.7	925.0	32.5	56.5	30.8	55.0	30.4	54.6	3439	39.3
2003	6452.7	925.0	80.2	57.4	78.9	55.9	79.6	55.5	7262	82.9

# RU-17 KURSK-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
18 Jan	30.0	25.8	UP1	A31	UNIT POWER REDUCTION OWING TO LOAD SHEDDING AND SHUTDOWN OF TURBOGENERATOR 2 OWING TO THE FORMATION OF A BLOWHOLE IN THE BYPASS STEAM LINE FROM THE TURBOGENERATOR 2 HIGH-PRESSURE CYLINDER TO STEAM SEPARATOR/REHEATER 21
08 Mar	62.0	32.1	UP1	A31	UNIT POWER REDUCTION OWING TO LOAD SHEDDING AND SHUTDOWN OF TURBOGENERATOR 1 TO CLEAN THE TURBINE CONDENSER
01 Apr	1446.0	26.1	XP	N	UNIT POWER REDUCTION OWING TO AN INCREASE IN CIRCULATING WATER TEMPERATURE
19 Apr	42.0	23.4	UP1	A31	UNIT POWER REDUCTION OWING TO LOAD SHEDDING AND SHUTDOWN OF TURBOGENERATOR 2 TO CLEAN TURBINE CONDENSER
01 May	86.0	24.3	UP1	A31	UNIT POWER REDUCTION OWING TO LOAD SHEDDING AND SHUTDOWN OF TURBOGENERATOR 2 TO CLEAN TURBINE CONDENSER
31 May	1218.0	1127.1	PF	D	MEDIUM-SCALE UNIT MAINTENANCE
21 Jul	275.0	132.6	UP3	A31	UNIT POWER LIMITATION OWING TO ONGOING MEDIUM-SCALE MAINTENANCE OF TURBOGENERATOR NO. 1
21 Jul	154.0	142.4	UF3	Z	EXTENSION OF UNIT OUTAGE FOR MEDIUM-SCALE MAINTENANCE OF TG-1
08 Aug	60.0	87.9	UF2	A12	UNIT SHUT DOWN IN FAST POWER REDUCTION MODE DURING WORK TO REPLACE A FAULTY POWER TRANSDUCER
07 Nov	1056.0	27.0	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1977 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		60			59	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling				517		
D. Inspection, maintenance or repair without refuelling	1218			1933	18	
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling				192		
H. Nuclear regulatory requirements					13	
J. Grid failure or grid unavailability					0	
Z. Others		154				
Subtotal	1218	214	0	2642	92	0
Total		1432			2734	

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

System	2003 Hours Lost	1977 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems	60	4
13. Reactor Auxiliary Systems		2
15. Reactor Cooling Systems		18
16. Steam generation systems		4
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		3
35. All other I&C Systems		1
41. Main Generator Systems		2
42. Electrical Power Supply Systems		7
Total	60	46

# RU-22 KURSK-2

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

## 1. Station Details

**Type:** LWGR  
**Maximum Net Capacity at the beginning of 2003:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 22200 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3756.2 GW(e).h  
**Energy Availability Factor:** 46.4%  
**Load Factor:** 46.4%  
**Operating Factor:** 66.6%  
**Energy Unavailability Factor:** 53.6%  
**Total Off-line Time:** 2926 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	494.3	441.5	487.7	475.1	471.5	466.2	455.5	462.5	1.8	0.0	0.0	0.0	3756.2
<b>EAF (%)</b>	71.8	71.0	71.0	71.3	68.5	70.0	66.2	67.2	0.3	0.0	0.0	0.0	46.4
<b>UCF (%)</b>	72.1	71.0	71.0	71.3	70.2	70.3	70.0	70.0	0.3	0.0	0.0	0.0	47.1
<b>LF (%)</b>	71.8	71.0	70.9	71.4	68.5	70.0	66.2	67.2	0.3	0.0	0.0	0.0	46.4
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	100.0	100.0	100.0	0.4	0.0	0.0	0.0	66.6
<b>EUF (%)</b>	28.2	29.0	29.0	28.7	31.5	30.0	33.8	32.8	99.7	100.0	100.0	100.0	53.6
<b>PUF (%)</b>	27.9	29.0	29.0	28.7	29.8	29.7	30.0	30.0	99.7	100.0	100.0	100.0	52.9
<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>	0.2	0.0	0.0	0.0	1.7	0.3	3.8	2.8	0.0	0.0	0.0	0.0	0.7

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION. UNIT POWER REDUCTION OWING TO LIMITATION 0.7 RATED REACTOR THERMAL POWER BY ORDER OF GOSATOMNADZOR RUSSIA FOR SAFETY REASONS.

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1973  
**Date of First Criticality:** 16 Dec 1978  
**Date of Grid Connection:** 28 Jan 1979  
**Date of Commercial Operation:** 17 Aug 1979

**Lifetime Generation:** 119361.3 GW(e).h  
**Cumulative Energy Availability Factor:** 60.0%  
**Cumulative Load Factor:** 59.3%  
**Cumulative Unit Capability Factor:** 77.3%  
**Cumulative Energy Unavailability Factor:** 40.0%

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	6326.5	925.0	77.1	75.2	77.1	75.1	77.9	75.7	7219	82.2
1985	6459.9	925.0	79.4	75.9	79.4	75.8	79.7	76.4	7598	86.7
1986	5617.3	925.0	69.1	74.9	69.1	74.8	69.3	75.4	6575	75.1
1987	7196.7	1000.0	83.3	76.0	83.3	76.0	82.2	76.3	7539	86.1
1988	5725.7	925.0	73.9	75.8	73.9	75.7	70.5	75.6	6609	75.2
1989	6164.2	925.0	74.9	75.7	74.9	75.7	76.1	75.7	6797	77.6
1990	4789.7	925.0	62.2	74.5	62.2	74.4	59.1	74.2	6874	78.5
1991	4376.0	925.0	56.3	73.0	55.3	72.9	54.0	72.5	7361	84.0
1992	2158.4	925.0	27.2	69.5	27.2	69.4	26.6	69.0	3552	40.4
1993	4438.2	925.0	85.0	70.6	57.1	68.5	54.8	68.0	7432	84.8
1994	4212.2	925.0	55.3	69.6	53.5	67.5	52.0	66.9	7385	84.3
1995	4745.4	925.0	90.8	70.9	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	65.5	7099	80.8
1997	4354.3	925.0	55.3	69.0	54.9	65.6	53.7	64.9	7076	80.8
1998	1685.1	925.0	21.7	66.5	21.3	63.2	20.8	62.6	2805	32.0
1999	3708.1	925.0	48.0	65.6	46.8	62.4	45.8	61.7	6066	69.2
2000	3668.1	925.0	48.9	64.8	46.2	61.7	45.1	60.9	6211	70.7
2001	4768.1	925.0	61.1	64.7	60.1	61.6	58.8	60.9	7667	87.5
2002	3027.8	925.0	38.3	63.5	38.1	60.6	37.4	59.8	4770	54.5
2003	3756.2	925.0	47.1	62.8	46.4	60.0	46.4	59.3	5834	66.6



## RU-22 KURSK-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	8760.0	2391.7	PP	H	UNIT POWER REDUCTION OWING TO REACTOR THERMAL POWER LIMITATION BY ORDER OF GOSATOMNADZOR RUSSIA
01 May	2952.0	54.3	XP	N	UNIT POWER REDUCTION OWING TO AN INCREASE IN CIRCULATING WATER TEMPERATURE
01 Sep	2926.0	1894.7	PF	D	MAJOR UNIT OVERHAUL

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1979 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					116	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling				854		
D. Inspection, maintenance or repair without refuelling	2926			908	23	
J. Grid failure or grid unavailability					1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					48	
Subtotal	2926	0	0	1762	190	0
Total		2926			1952	

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

System	2003 Hours Lost	1979 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		65
12. Reactor I&C Systems		12
13. Reactor Auxiliary System:		8
14. Safety Systems		2
15. Reactor Cooling System:		18
32. Feedwater and Main Steam System		5
41. Main Generator System:		2
42. Electrical Power Supply System:		2
Total	0	114

**RU-38 KURSK-3**

Operator: REA (ROSENERGOATOM, CONSORTIUM)

Contractor: MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

**1. Station Details**

Type: LWGR  
 Maximum Net Capacity  
 at the beginning of 2003: 925.0 MW(e)  
 Design Net Capacity: 925.0 MW(e)  
 Design Discharge Burnup: 22200 MW.d/t

**2. Production Summary 2003**

Energy Production: 5100.6 GW(e).h  
 Energy Availability Factor: 61.8%  
 Load Factor: 62.9%  
 Operating Factor: 62.4%  
 Energy Unavailability Factor: 38.2%  
 Total Off-line Time: 3291 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	690.8	630.4	543.4	0.0	0.0	0.0	0.0	482.6	682.6	706.8	675.8	688.2	5100.6
EAF (%)	98.5	100.0	78.1	0.0	0.0	0.0	0.0	69.9	100.0	100.0	99.2	98.4	61.8
UCF (%)	100.0	100.0	78.1	0.0	0.0	0.0	0.0	70.5	100.0	100.0	100.0	100.0	62.2
LF (%)	100.4	101.4	79.0	0.0	0.0	0.0	0.0	70.1	102.5	102.6	101.5	100.0	62.9
OF (%)	100.0	100.0	78.4	0.0	0.0	0.0	0.0	72.7	100.0	100.0	100.0	100.0	62.4
EUf (%)	1.5	0.0	21.9	100.0	100.0	100.0	100.0	30.1	0.0	0.0	0.8	1.6	38.2
PUF (%)	0.0	0.0	21.9	100.0	100.0	100.0	100.0	29.5	0.0	0.0	0.0	0.0	37.8
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 (%)	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.8	1.6	0.4

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation**

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION. NPP OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY, FEBRUARY, MARCH, AUGUST, SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 90701 MWH.

**5. Historical Summary**

Date of Construction Start: 01 Apr 1978  
 Date of First Criticality: 09 Aug 1983  
 Date of Grid Connection: 17 Oct 1983  
 Date of Commercial Operation: 30 Mar 1984

Lifetime Generation: 115546.1 GW(e).h  
 Cumulative Energy Availability Factor: 71.6%  
 Cumulative Load Factor: 70.6%  
 Cumulative Unit Capability Factor: 77.8%  
 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 (%)
1985	6260.8	925.0	77.9	77.9	77.6	77.6	77.3	77.3	7250	82.8
1986	4810.8	925.0	60.4	69.2	60.0	68.8	59.4	68.3	6269	71.6
1987	5458.9	1000.0	69.0	69.1	66.4	68.0	62.3	66.2	6185	70.6
1988	6693.6	925.0	83.6	72.7	83.6	71.8	82.4	70.2	7471	85.1
1989	5900.5	925.0	74.3	73.0	74.3	72.3	72.8	70.7	7200	82.2
1990	6889.4	925.0	86.5	75.2	86.5	74.6	85.0	73.1	8096	92.4
1991	5139.0	925.0	63.4	73.6	63.2	73.0	63.4	71.7	5704	65.1
1992	6630.5	925.0	82.1	74.6	82.1	74.1	81.6	72.9	8126	92.5
1993	5562.3	925.0	71.2	74.3	70.3	73.7	68.6	72.5	6438	73.5
1994	5077.9	925.0	73.6	74.2	66.7	73.0	62.7	71.5	6495	74.1
1995	5318.1	925.0	65.7	73.4	65.4	72.3	65.6	71.0	5974	68.2
1996	6739.3	925.0	82.9	74.2	82.7	73.2	82.9	71.9	7383	84.1
1997	6548.7	925.0	82.5	74.8	81.6	73.8	80.8	72.6	7325	83.6
1998	4528.3	925.0	60.3	73.8	56.5	72.6	55.9	71.4	5405	61.7
1999	6006.9	925.0	75.3	73.9	74.3	72.7	74.1	71.6	6749	77.0
2000	6382.3	925.0	78.8	74.2	78.3	73.1	78.5	72.0	7415	84.4
2001	3535.2	925.0	44.6	72.5	43.5	71.3	43.6	70.4	3948	45.1
2002	6699.8	925.0	88.2	73.3	85.1	72.1	82.7	71.1	7788	88.9
2003	5100.6	925.0	62.2	72.8	61.8	71.6	62.9	70.6	5469	62.4

## RU-38 KURSK-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	744.0	10.1	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
25 Mar	3291.0	3061.8	PF	C	MEDIUM-SCALE UNIT MAINTENANCE
07 Nov	1056.0	16.8	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					171	
C. Inspection, maintenance or repair combined with refuelling	3291			856		
D. Inspection, maintenance or repair without refuelling				871		
J. Grid failure or grid unavailability					2	2
Subtotal	3291	0	0	1727	173	2
Total		3291			1902	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		28
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		5
14. Safety Systems		20
15. Reactor Cooling Systems		77
17. Safety I&C Systems (excluding reactor I&C)		4
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		11
41. Main Generator Systems		1
42. Electrical Power Supply Systems		3
Total	0	159

## RU-39 KURSK-4

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

### 1. Station Details

**Type:** LWGR  
**Maximum Net Capacity at the beginning of 2003:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 22200 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 6233.4 GW(e).h  
**Energy Availability Factor:** 75.8%  
**Load Factor:** 76.9%  
**Operating Factor:** 77.6%  
**Energy Unavailability Factor:** 24.2%  
**Total Off-line Time:** 1958 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	697.4	640.4	707.0	675.7	653.3	656.5	660.3	52.4	0.0	166.1	669.0	655.3	6233.4
<b>EAF (%)</b>	98.6	100.0	100.0	100.0	94.8	98.6	96.0	7.6	0.0	23.6	98.9	94.3	75.8
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	97.7	100.0	99.9	7.9	0.0	23.6	100.0	100.0	77.3
<b>LF (%)</b>	101.3	103.0	102.7	101.6	94.9	98.6	96.0	7.6	0.0	24.1	100.5	95.2	76.9
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	100.0	100.0	8.1	0.0	25.6	100.0	100.0	77.6
<b>EUf (%)</b>	1.4	0.0	0.0	0.0	5.2	1.4	4.0	92.4	100.0	76.4	1.1	5.7	24.2
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	92.1	100.0	76.4	0.0	0.0	22.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.1	2.3	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2
<b>XUF (%)</b>	1.4	0.0	0.0	0.0	2.9	1.4	4.0	0.3	0.0	0.0	1.1	5.7	1.4

UCLF replaces previously used UUF.

### 4. 2003 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, FEBRUARY, MARCH, APRIL, MAY, OCTOBER, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 88204 MWH.

### 5. Historical Summary

**Date of Construction Start:** 01 May 1981      **Lifetime Generation:** 112507.2 GW(e).h  
**Date of First Criticality:** 31 Oct 1985      **Cumulative Energy Availability Factor:** 76.5%  
**Date of Grid Connection:** 02 Dec 1985      **Cumulative Load Factor:** 76.5%  
**Date of Commercial Operation:** 05 Feb 1986      **Cumulative Unit Capability Factor:** 78.1%  
**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 (%)
1985	174.0	925.0	0.0	0.0	2.2	100.0	2.2	0.0	528	6.1
1986	6328.5	925.0	0.0	0.0	82.0	100.0	78.1	0.0	7574	86.5
1987	6167.7	1000.0	72.4	72.4	72.3	72.3	70.4	70.4	6704	76.5
1988	6653.0	925.0	81.7	76.9	81.7	76.8	81.9	75.9	7390	84.1
1989	6131.8	925.0	76.0	76.6	76.0	76.6	75.7	75.8	6954	79.4
1990	6050.0	925.0	73.7	75.9	73.6	75.8	74.7	75.6	6922	79.0
1991	7356.1	925.0	92.5	79.2	90.3	78.7	90.8	78.6	8469	96.7
1992	6117.4	925.0	75.4	78.6	75.4	78.1	75.3	78.0	7324	83.4
1993	5638.3	925.0	71.7	77.6	71.0	77.1	69.6	76.8	6439	73.5
1994	5369.4	925.0	71.5	76.8	67.0	75.9	66.3	75.5	6255	71.4
1995	6207.5	925.0	78.6	77.0	77.0	76.0	76.6	75.6	7001	79.9
1996	6590.2	925.0	81.4	77.5	80.2	76.4	81.1	76.2	7373	83.9
1997	5971.7	925.0	73.9	77.2	73.1	76.1	73.7	76.0	6664	76.1
1998	6641.4	925.0	86.7	77.9	82.3	76.6	82.0	76.5	7751	88.5
1999	5895.4	925.0	74.2	77.7	72.8	76.3	72.8	76.2	6595	75.3
2000	6778.8	925.0	83.5	78.1	82.8	76.8	83.4	76.7	7423	84.5
2001	6671.6	925.0	82.2	78.3	81.5	77.1	82.3	77.1	7281	83.1
2002	5531.0	925.0	68.3	77.7	67.6	76.5	68.3	76.5	6094	69.6
2003	6233.4	925.0	77.3	77.7	75.8	76.5	76.9	76.5	6802	77.6

**RU-39 KURSK-4****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
01 May	2268.0	53.2	XP	N	UNIT POWER LIMITATION OWING TO AN INCREASE IN CIRCULATING WATER TEMPERATURE
18 May	28.0	15.9	UP2	A41	UNIT POWER REDUCTION OWING TO LOAD SHEDDING AND SHUTDOWN OF TURBOGENERATOR 1 DUE TO FAULTS IN THE GENERATOR COOLING SYSTEM
03 Aug	1958.0	1826.1	PF	D	MAJOR UNIT OVERHAUL
07 Nov	1056.0	46.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER

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

Outage Cause	2003 Hours Lost			1986 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					66	
B. Refuelling without a maintenanc					5	
C. Inspection, maintenance or repai combined with refuelling				819		
D. Inspection, maintenance or repai without refuelling	1958			673		
J. Grid failure or grid unavailabilit					1	
K. Load-following (frequency contro reserve shutdown due to reduced energ demand)					11	
Subtotal	1958	0	0	1492	83	0
Total		1958			1575	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1986 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		2
15. Reactor Cooling System:		17
32. Feedwater and Main Steam Syster		13
42. Electrical Power Supply System:		30
Total	0	65

# RU-15 LENINGRAD-1

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

## 1. Station Details

**Type:** LWGR  
**Maximum Net Capacity at the beginning of 2003:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 22200 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7446.3 GW(e).h  
**Energy Availability Factor:** 92.2%  
**Load Factor:** 91.9%  
**Operating Factor:** 97.0%  
**Energy Unavailability Factor:** 7.8%  
**Total Off-line Time:** 265 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	680.2	623.0	690.2	668.4	660.9	651.0	640.3	636.2	608.5	649.4	589.4	348.8	7446.3
<b>EAF (%)</b>	98.8	99.5	99.8	100.0	96.1	97.9	93.8	93.5	92.5	95.0	89.0	52.1	92.2
<b>UCF (%)</b>	99.5	99.5	99.9	100.0	98.7	99.2	94.8	96.1	93.8	95.6	99.1	64.5	95.0
<b>LF (%)</b>	98.8	100.2	100.3	100.5	96.0	97.7	93.0	92.4	91.4	94.2	88.5	50.7	91.9
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	64.4	97.0
<b>EUf (%)</b>	1.2	0.5	0.2	0.0	3.9	2.1	6.2	6.5	7.6	5.0	11.0	47.9	7.8
<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	35.5	3.0
<b>UCLF (%)</b>	0.5	0.5	0.2	0.0	1.3	0.8	5.2	3.9	6.2	4.4	0.9	0.0	2.0
<b>XUF (%)</b>	0.8	0.0	0.1	0.0	2.6	1.3	1.0	2.6	1.4	0.5	10.2	12.4	2.8

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION. NPP OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY, FEBRUARY, MARCH, APRIL, MAY, JUNE, JULY, OCTOBER, NOVEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 18412 MWH.

## 5. Historical Summary

**Date of Construction Start:** 01 Mar 1970  
**Date of First Criticality:** 12 Sep 1973  
**Date of Grid Connection:** 21 Dec 1973  
**Date of Commercial Operation:** 01 Nov 1974

**Lifetime Generation:** 165996.0 GW(e).h  
**Cumulative Energy Availability Factor:** 69.3%  
**Cumulative Load Factor:** 68.9%  
**Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1985	7008.1	925.0	86.5	72.5	86.3	72.4	86.5	72.0	8059	92.0
1986	5924.1	925.0	73.3	72.6	73.3	72.5	73.1	72.1	6677	76.2
1987	8113.0	1000.0	93.5	74.3	92.7	74.1	92.6	73.8	8255	94.2
1988	6620.3	925.0	81.7	74.8	81.7	74.7	81.5	74.4	7519	85.6
1989	4577.0	925.0	56.4	73.6	56.0	73.4	56.5	73.2	4993	57.0
1990	0.0	925.0	0.0	69.0	0.0	68.9	0.0	68.6	0	0.0
1991	3934.0	925.0	49.9	67.9	49.9	67.8	48.5	67.5	6385	72.9
1992	7191.6	925.0	88.6	69.1	88.1	68.9	88.5	68.6	7995	91.0
1993	6520.4	925.0	83.5	69.8	81.7	69.6	80.5	69.2	7354	83.9
1994	5531.2	925.0	77.7	70.2	77.6	70.0	68.3	69.2	6956	79.4
1995	0.0	925.0	0.0	66.9	0.0	66.6	0.0	65.9	0	0.0
1996	3852.8	925.0	47.6	66.0	47.5	65.8	47.4	65.1	4454	50.7
1997	6872.4	925.0	88.6	67.0	86.1	66.7	84.8	65.9	7785	88.9
1998	5630.3	925.0	69.8	67.1	68.8	66.7	69.5	66.1	6220	71.0
1999	6637.9	925.0	81.8	67.7	81.3	67.3	81.9	66.7	7431	84.8
2000	6317.8	925.0	78.5	68.1	77.2	67.7	77.8	67.1	7069	80.5
2001	7097.8	925.0	89.2	68.9	87.4	68.4	87.6	67.9	7923	90.4
2002	5824.6	925.0	72.4	69.0	71.2	68.5	71.9	68.0	7104	81.1
2003	7446.3	925.0	95.0	69.9	92.2	69.3	91.9	68.9	8495	97.0

# RU-15 LENINGRAD-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	80.0	5.3	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
03 Jan	77.0	7.5	UP1	A31	UNIT POWER REDUCTION TO REPAIR CONDENSERS
01 May	122.0	17.3	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
18 May	52.0	8.7	UP1	A31	UNIT POWER REDUCTION TO REPAIR CONDENSERS
23 May	3144.0	32.2	XP	N	UNIT POWER REDUCTION OWING TO AN INCREASE IN CIRCULATING WATER TEMPERATURE
01 Jun	4393.0	97.3	UP1	A31	UNIT POWER REDUCTION BECAUSE CONDENSERS OPERATING ON SEA WATER
29 Jun	28.0	3.4	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
11 Jul	112.0	28.2	UP1	A31	UNIT POWER REDUCTION TO REPAIR CONDENSERS
25 Jul	10.0	0.9	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
03 Aug	13.0	1.8	UP1	A31	UNIT POWER REDUCTION TO REPAIR TURBINE NO. 2 CONDENSER
17 Aug	21.0	4.4	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
05 Sep	24.0	2.5	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
03 Oct	48.0	13.8	UP1	A31	UNIT POWER REDUCTION TO CLEAN CONDENSERS
05 Oct	17.0	3.7	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
02 Nov	10.0	1.4	UP1	A31	UNIT POWER REDUCTION TO REPAIR TURBINE NO. 1 CONDENSER
14 Nov	959.0	153.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
20 Dec	265.0	244.2	PF	F	MAJOR UNIT OVERHAUL

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					118	
B. Refuelling without a maintenance					8	
C. Inspection, maintenance or repair combined with refuelling				1137		
D. Inspection, maintenance or repair without refuelling				749		
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling	265					
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					7	
Subtotal	265	0	0	1886	133	0
Total	265			2019		

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

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		16
14. Safety Systems		8
15. Reactor Cooling Systems		39
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries		3
32. Feedwater and Main Steam System		5
35. All other I&C Systems		3
41. Main Generator Systems		2
42. Electrical Power Supply Systems		1
Total	0	79

## RU-16 LENINGRAD-2

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

### 1. Station Details

**Type:** LWGR  
**Maximum Net Capacity at the beginning of 2003:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 22200 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 7134.4 GW(e).h  
**Energy Availability Factor:** 88.0%  
**Load Factor:** 88.0%  
**Operating Factor:** 94.7%  
**Energy Unavailability Factor:** 12.0%  
**Total Off-line Time:** 462 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	111.4	505.3	696.4	669.8	675.9	661.0	682.2	663.3	651.8	669.8	567.7	579.7	7134.4
<b>EAF (%)</b>	18.2	81.0	100.0	99.6	97.5	98.6	99.1	97.3	97.8	96.3	85.6	84.8	88.0
<b>UCF (%)</b>	18.3	81.0	100.0	99.6	100.0	99.2	99.6	98.4	98.5	97.2	99.4	100.0	90.9
<b>LF (%)</b>	16.2	81.3	101.2	100.7	98.2	99.2	99.1	96.4	97.9	97.2	85.2	84.2	88.0
<b>OF (%)</b>	37.9	100.0	99.9	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.7
<b>EUf (%)</b>	81.8	19.0	0.0	0.4	2.5	1.4	0.9	2.7	2.2	3.7	14.4	15.2	12.0
<b>PUF (%)</b>	65.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6
<b>UCLF (%)</b>	16.0	19.0	0.0	0.4	0.0	0.8	0.4	1.6	1.5	2.8	0.6	0.0	3.5
<b>XUF (%)</b>	0.1	0.0	0.0	0.0	2.5	0.6	0.5	1.1	0.7	0.9	13.8	15.2	3.0

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION. NPP OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN FEBRUARY, MARCH, APRIL, MAY, JUNE, JULY, AUGUST, SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 45774 MWH.

### 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:** 162669.5 GW(e).h  
**Cumulative Energy Availability Factor:** 71.0%  
**Cumulative Load Factor:** 70.8%  
**Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1985	5962.6	925.0	74.4	77.0	74.3	76.9	73.6	76.8	6604	75.4
1986	7152.3	925.0	88.4	78.2	88.1	78.0	88.3	78.0	7914	90.3
1987	7228.2	1000.0	83.7	78.7	83.0	78.5	82.5	78.4	7513	85.8
1988	6814.9	925.0	83.6	79.1	83.6	78.9	83.9	78.9	7417	84.4
1989	6111.5	925.0	75.8	78.9	75.6	78.6	75.4	78.6	7102	81.1
1990	5998.3	925.0	75.5	78.6	75.3	78.4	74.0	78.3	8125	92.8
1991	4410.8	925.0	56.4	77.2	56.3	76.9	54.4	76.7	7204	82.2
1992	0.0	925.0	0.0	72.3	0.0	72.2	0.0	71.9	0	0.0
1993	0.0	925.0	0.0	68.1	0.0	67.9	0.0	67.7	0	0.0
1994	164.1	925.0	2.3	64.5	2.3	64.3	2.0	64.1	660	7.5
1995	6812.0	925.0	93.4	66.0	86.2	65.4	84.1	65.1	8280	94.5
1996	7244.9	925.0	89.4	67.2	89.1	66.6	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	67.3	6643	75.8
1999	6557.8	925.0	80.6	68.7	80.2	68.2	80.9	67.9	7299	83.3
2000	7252.5	925.0	90.1	69.6	88.6	69.0	89.3	68.8	7972	90.8
2001	7073.5	925.0	88.5	70.3	86.6	69.7	87.3	69.5	7904	90.2
2002	7024.9	925.0	88.7	71.1	86.6	70.4	86.7	70.2	7961	90.9
2003	7134.4	925.0	90.9	71.8	88.0	71.0	88.0	70.8	8298	94.7



## RU-16 LENINGRAD-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	462.0	451.7	PF	C	MEDIUM-SCALE UNIT MAINTENANCE
21 Jan	16.0	0.8	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
22 Jan	282.0	108.8	PP	D	MEDIUM-SCALE MAINTENANCE OF TURBOGENERATOR NO. 1
22 Feb	25.0	3.9	UP1	A31	UNIT POWER REDUCTION TO REPAIR TURBOGENERATOR NO. 2 CONDENSERS
03 May	76.0	16.9	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
01 Jun	720.0	0.2	XP	J	UNIT POWER REDUCTION BECAUSE CONDENSERS OPERATING ON SEA WATER
20 Jun	37.0	5.3	UP1	A31	UNIT POWER REDUCTION TO REPAIR TURBINE NO. 2 STEAM SEPARATOR/REHEATER
29 Jun	29.0	3.8	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
01 Jul	1488.0	6.2	XP	N	UNIT POWER REDUCTION OWING TO AN INCREASE IN CIRCULATING WATER TEMPERATURE
18 Jul	21.0	2.8	UP1	A31	UNIT POWER REDUCTION TO REPAIR TURBINE NO. 1 CONDENSERS
25 Jul	10.0	0.7	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
01 Aug	1464.0	4.1	UP1	A31	UNIT POWER REDUCTION BECAUSE CONDENSERS OPERATING ON SEA WATER
02 Aug	61.0	7.5	UP1	A31	UNIT POWER REDUCTION TO REPAIR TURBINE NO. 1 STEAM SEPARATOR/REHEATER
17 Aug	30.0	3.7	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
31 Aug	18.0	3.0	UP1	A31	UNIT POWER REDUCTION TO REPAIR TURBINE NO. 1 CONDENSER
05 Sep	19.0	4.7	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
13 Sep	17.0	2.5	UP1	A31	UNIT POWER REDUCTION TO REPAIR TURBINE NO. 2 CONDENSER
27 Sep	19.0	3.0	UP1	A31	UNIT POWER REDUCTION TO REPAIR TURBINE NO. 1 CONDENSER
14 Oct	59.0	6.3	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
17 Oct	50.0	19.4	UP1	A31	UNIT POWER REDUCTION AND SHUTDOWN OF TURBOGENERATOR NO. 2 TO DISCONNECT STEAM SEPARATOR/REHEATER MODULES
14 Nov	947.0	196.9	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1976 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					91	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	462			745		
D. Inspection, maintenance or repair without refuelling				1108	10	
E. Testing of plant systems or components					2	
Subtotal	462	0	0	1853	106	0
Total		462			1959	

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

System	2003 Hours Lost	1976 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		10
12. Reactor I&C Systems		8
13. Reactor Auxiliary Systems		7
15. Reactor Cooling Systems		21
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		5
35. All other I&C Systems		2
42. Electrical Power Supply Systems		5
Total	0	61

## RU-34 LENINGRAD-3

Operator: REA (ROSENERGOATOM, CONSORTIUM)

Contractor: MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

### 1. Station Details

Type: LWGR  
 Maximum Net Capacity at the beginning of 2003: 925.0 MW(e)  
 Design Net Capacity: 925.0 MW(e)  
 Design Discharge Burnup: 22200 MW.d/t

### 2. Production Summary 2003

Energy Production: 6729.2 GW(e).h  
 Energy Availability Factor: 84.5%  
 Load Factor: 83.0%  
 Operating Factor: 92.5%  
 Energy Unavailability Factor: 15.5%  
 Total Off-line Time: 660 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	642.8	578.0	644.6	630.1	609.0	623.1	636.6	614.8	608.7	345.9	282.1	513.4	6729.2
EAF (%)	94.8	94.5	95.4	95.9	90.0	95.1	93.3	90.3	93.1	51.8	44.4	76.4	84.5
UCF (%)	95.5	94.7	95.4	95.9	91.6	95.9	94.6	92.4	94.1	52.6	51.0	86.6	86.7
LF (%)	93.4	93.0	93.7	94.7	88.5	93.6	92.5	89.3	91.4	50.2	42.4	74.6	83.0
OF (%)	100.0	100.0	99.9	100.1	100.0	100.0	100.0	100.0	100.0	55.6	54.3	100.0	92.5
EUf (%)	5.2	5.5	4.6	4.1	10.0	4.9	6.7	9.7	6.9	48.2	55.6	23.6	15.5
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.7	49.0	0.0	7.8
UCLF (%)	4.5	5.3	4.6	4.1	8.4	4.1	5.4	7.6	5.9	2.8	0.0	13.4	5.5
XUF (%)	0.7	0.2	0.0	0.0	1.6	0.8	1.3	2.0	1.0	0.7	6.6	10.2	2.1

UCLF replaces previously used UUF.

### 4. 2003 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 DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 218 MWH.

### 5. Historical Summary

Date of Construction Start: 01 Dec 1973  
 Date of First Criticality: 17 Sep 1979  
 Date of Grid Connection: 07 Dec 1979  
 Date of Commercial Operation: 29 Jun 1980

Lifetime Generation: 132851.8 GW(e).h  
 Cumulative Energy Availability Factor: 69.0%  
 Cumulative Load Factor: 68.1%  
 Cumulative Unit Capability Factor: 77.4%  
 Cumulative Energy Unavailability Factor: 31.0%

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	7214.9	925.0	89.8	80.9	89.2	80.4	88.8	79.8	8060	91.8
1985	6831.9	925.0	85.4	81.8	84.9	81.3	84.3	80.7	7835	89.4
1986	6890.9	925.0	86.4	82.6	85.9	82.1	85.0	81.4	7935	90.6
1987	6010.3	1000.0	70.4	80.7	69.4	80.2	68.6	79.5	6362	72.6
1988	6951.7	925.0	86.5	81.4	86.5	80.9	85.6	80.2	7885	89.8
1989	6938.1	925.0	86.2	82.0	85.9	81.5	85.6	80.8	7455	85.1
1990	7531.9	925.0	93.0	83.0	92.4	82.6	93.0	82.0	8280	94.5
1991	6506.6	925.0	80.6	82.8	80.6	82.4	80.3	81.9	7197	82.2
1992	5516.6	925.0	68.5	81.6	68.4	81.2	67.9	80.7	6122	69.7
1993	7143.8	925.0	90.1	82.3	88.9	81.8	88.2	81.3	7966	90.9
1994	6631.8	925.0	92.4	83.0	91.0	82.5	81.8	81.3	8135	92.9
1995	3586.0	925.0	49.4	80.8	46.5	80.1	44.3	78.9	4332	49.5
1996	0.0	925.0	0.0	75.8	0.0	75.1	0.0	74.0	0	0.0
1997	0.0	925.0	0.0	71.3	0.0	70.7	0.0	69.6	0	0.0
1998	1390.1	925.0	17.5	68.3	17.5	67.8	17.2	66.7	1610	18.4
1999	7853.1	925.0	99.7	70.0	97.1	69.3	96.9	68.3	8701	99.3
2000	6352.8	925.0	79.6	70.5	78.2	69.7	78.2	68.8	7169	81.6
2001	6173.5	925.0	78.9	70.9	76.6	70.1	76.2	69.2	7007	80.0
2002	2514.7	925.0	33.6	69.2	31.9	68.3	31.0	67.4	3332	38.0
2003	6729.2	925.0	86.7	69.9	84.5	69.0	83.0	68.1	8100	92.5

## RU-34 LENINGRAD-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	61.0	4.8	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
01 Jan	7296.0	249.5	UP1	A31	UNIT POWER REDUCTION OWING TO A DEFECT IN THE ROTOR OF THE TURBINE NO. 1 HIGH-PRESSURE CYLINDER
20 Jan	42.0	6.5	UP1	A31	UNIT POWER REDUCTION TO REPAIR CONDENSERS
01 Feb	22.0	1.7	UP1	A31	UNIT POWER REDUCTION TO REPAIR CONDENSERS
22 Feb	18.0	4.5	UP1	A31	UNIT POWER REDUCTION TO REPAIR TURBINE NO. 1 STEAM SEPARATOR/REHEATER MODULES
22 Mar	21.0	2.2	UP1	A31	UNIT POWER REDUCTION TO REPAIR TURBINE NO. 2 CONDENSER
05 Apr	22.0	1.7	UP1	A31	UNIT POWER REDUCTION TO REPAIR TURBINE NO. 1 CONDENSER
01 May	67.0	9.4	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
09 May	49.0	29.8	UP1	A31	UNIT POWER REDUCTION TURBOGENERATOR NO. 2 TO REPAIR CONDENSER EJECTOR
23 May	3144.0	33.4	XP	N	UNIT POWER REDUCTION OWING TO AN INCREASE IN CIRCULATING WATER TEMPERATURE
29 Jun	16.0	1.8	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
01 Jul	2953.0	56.7	UP1	A31	UNIT POWER REDUCTION BECAUSE CONDENSERS OPERATING ON SEA WATER
17 Aug	28.0	0.3	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
14 Oct	27.0	5.1	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
18 Oct	660.0	633.9	PF	D	MEDIUM-SCALE UNIT MAINTENANCE
14 Nov	947.0	113.9	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
19 Dec	300.0	92.0	UP1	A41	UNIT POWER REDUCTION AND SHUTDOWN OF TURBOGENERATOR NO. 1 BY THE CURRENT PHASE BALANCE PROTECTION SYSTEM OWING TO MELTING OF PART OF THE GENERATOR STATOR WINDING

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1980 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					64	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling				496		
D. Inspection, maintenance or repair without refuelling	660			1530		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				218		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					2	2
Subtotal	660	0	0	2244	70	2
Total		660			2316	

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

System	2003 Hours Lost	1980 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		13
14. Safety Systems		1
15. Reactor Cooling System:		9
17. Safety I&C Systems (excluding reactor I&C)		10
31. Turbine and auxiliaries:		8
32. Feedwater and Main Steam System		2
41. Main Generator System:		3
42. Electrical Power Supply System:		14
Total	0	60

## RU-35 LENINGRAD-4

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

### 1. Station Details

**Type:** LWGR  
**Maximum Net Capacity at the beginning of 2003:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 22200 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 1957.2 GW(e).h  
**Energy Availability Factor:** 24.7%  
**Load Factor:** 24.2%  
**Operating Factor:** 27.4%  
**Energy Unavailability Factor:** 75.3%  
**Total Off-line Time:** 6361 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	408.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	329.1	577.9	642.2	1957.2
<b>EAF (%)</b>	61.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.3	87.9	94.1	24.7
<b>UCF (%)</b>	62.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.7	96.4	100.0	26.0
<b>LF (%)</b>	59.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.8	86.8	93.3	24.2
<b>OF (%)</b>	67.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.3	100.0	100.0	27.4
<b>EUF (%)</b>	38.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	49.7	12.1	5.9	75.3
<b>PUF (%)</b>	32.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	49.3	0.0	0.0	73.3
<b>UCLF (%)</b>	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.7
<b>XUF (%)</b>	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	8.4	5.9	1.3

UCLF replaces previously used UUF.

### 4. 2003 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 OCTOBER, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 5435 MWH.

### 5. Historical Summary

**Date of Construction Start:** 01 Feb 1975  
**Date of First Criticality:** 29 Dec 1980  
**Date of Grid Connection:** 09 Feb 1981  
**Date of Commercial Operation:** 29 Aug 1981

**Lifetime Generation:** 128825.5 GW(e).h  
**Cumulative Energy Availability Factor:** 70.9%  
**Cumulative Load Factor:** 69.8%  
**Cumulative Unit Capability Factor:** 77.4%  
**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 (%)
1984	6126.3	925.0	74.9	81.6	74.4	81.1	75.4	80.9	6803	77.4
1985	7335.3	925.0	91.2	84.0	90.9	83.6	90.5	83.3	8309	94.9
1986	7060.9	925.0	88.7	84.9	87.6	84.4	87.1	84.1	7826	89.3
1987	7319.2	1000.0	85.0	84.9	84.1	84.3	83.6	84.0	7530	86.0
1988	6050.4	925.0	74.8	83.5	74.8	83.0	74.5	82.6	6667	75.9
1989	7409.7	925.0	91.9	84.5	91.5	84.0	91.4	83.7	8185	93.4
1990	7762.6	925.0	96.1	85.8	95.4	85.3	95.8	85.1	8588	98.0
1991	6130.7	925.0	76.8	84.9	76.1	84.4	75.7	84.1	6870	78.4
1992	5618.1	925.0	70.8	83.6	70.3	83.1	69.2	82.8	6617	75.3
1993	6735.7	925.0	87.6	84.0	85.3	83.3	83.1	82.8	7762	88.6
1994	6167.1	925.0	83.2	83.9	82.1	83.2	76.1	82.3	7340	83.8
1995	6141.0	925.0	86.1	84.1	83.0	83.2	75.8	81.8	7270	83.0
1996	7079.7	925.0	88.8	84.4	88.3	83.5	87.1	82.2	8048	91.6
1997	7644.7	925.0	98.2	85.2	95.9	84.3	94.3	82.9	8760	100.0
1998	3682.0	925.0	47.3	83.0	46.0	82.0	45.4	80.7	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	74.3	0.0	73.4	0.0	72.3	0	0.0
2001	3585.7	925.0	45.5	72.9	44.6	72.0	44.3	70.9	4387	50.1
2002	7528.5	925.0	97.5	74.0	93.9	73.0	92.9	71.9	8760	100.0
2003	1957.2	925.0	26.0	71.9	24.7	70.9	24.2	69.8	2399	27.4

## RU-35 LENINGRAD-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	501.0	28.6	UP1	A31	UNIT POWER REDUCTION BECAUSE CONDENSERS OPERATING ON SEA WATER
01 Jan	33.0	3.9	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
03 Jan	33.0	3.2	UP1	A31	UNIT POWER REDUCTION TO REPAIR TURBINE NO. 1 CONDENSER
20 Jan	34.0	5.9	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
21 Jan	6361.0	5934.7	PF	F	MAJOR UNIT OVERHAUL INCLUDING RECONSTRUCTION OF SEVERAL SYSTEMS AND LARGE-SCALE REPLACEMENT OF FUEL CHANNELS (TURBOGENERATOR NO. 1 WAS CONNECTED TO THE GRID ON 13 OCTOBER 2003)
13 Oct	85.0	2.9	PP	D	UNIT OPERATING AT REDUCED POWER OWING TO EXTENSION OF MAJOR OVERHAUL OF TURBOGENERATOR NO.2
19 Oct	52.0	3.0	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
07 Nov	28.0	24.2	UP1	A41	UNIT POWER REDUCTION AND SHUTDOWN OF TURBOGENERATOR NO. 2 TO REPLACE THE GENERATOR ROTOR GAS COOLER
14 Nov	803.0	96.5	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					40	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling				1502		
D. Inspection, maintenance or repair without refuelling				310		
E. Testing of plant systems or components					0	
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling	6361					
J. Grid failure or grid unavailability					2	13
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					33	1
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					0	
Subtotal	6361	0	0	1812	76	14
Total		6361			1902	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		1
15. Reactor Cooling Systems		24
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		6
41. Main Generator Systems		0
42. Electrical Power Supply Systems		3
Total	0	36

# RU-9 NOVovoronezh-3

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 385.0 MW(e)  
**Design Net Capacity:** 385.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 2335.0 GW(e).h  
**Energy Availability Factor:** 68.9%  
**Load Factor:** 69.2%  
**Operating Factor:** 71.2%  
**Energy Unavailability Factor:** 31.1%  
**Total Off-line Time:** 2524 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	210.1	181.5	280.9	270.8	275.9	16.0	0.0	0.0	246.0	289.2	282.1	282.5	2335.0
<b>EAF (%)</b>	73.2	68.6	96.5	99.1	96.6	5.9	0.0	0.0	89.0	99.4	100.0	98.6	68.9
<b>UCF (%)</b>	76.4	68.6	96.5	99.9	100.0	6.1	0.0	0.0	89.7	99.9	100.0	98.6	69.6
<b>LF (%)</b>	73.3	70.2	98.1	97.8	96.3	5.8	0.0	0.0	88.8	100.8	101.8	98.6	69.2
<b>OF (%)</b>	80.0	72.3	99.9	100.1	100.0	6.1	0.0	0.0	96.5	100.0	100.0	100.0	71.2
<b>EUf (%)</b>	26.8	31.4	3.5	0.9	3.4	94.1	100.0	100.0	11.0	0.6	0.0	1.4	31.1
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	93.9	100.0	84.1	0.0	0.0	0.0	0.0	23.4
<b>UCLF (%)</b>	23.6	31.4	3.5	0.2	0.0	0.0	0.0	15.9	10.3	0.2	0.0	1.4	7.1
<b>XUF (%)</b>	3.2	0.0	0.0	0.7	3.4	0.2	0.0	0.0	0.6	0.4	0.0	0.0	0.7

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION. NPP OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY, FEBRUARY, MARCH, APRIL, SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 18868 MWH.

## 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:** 76175.0 GW(e).h  
**Cumulative Energy Availability Factor:** 71.6%  
**Cumulative Load Factor:** 71.0%  
**Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1985	3003.8	385.0	88.9	77.8	88.9	77.8	89.1	77.5	8195	93.6
1986	2705.5	385.0	80.5	78.0	80.5	77.9	80.2	77.7	8048	91.9
1987	2321.9	417.0	66.5	77.1	66.5	77.1	63.6	76.7	6361	72.6
1988	2906.1	385.0	91.0	78.0	91.0	78.0	85.9	77.3	8110	92.3
1989	1984.6	385.0	66.0	77.3	66.0	77.3	58.8	76.2	6040	68.9
1990	2767.4	385.0	85.6	77.8	84.4	77.7	82.1	76.5	8611	98.3
1991	1614.0	385.0	49.2	76.3	48.7	76.2	47.9	75.0	5176	59.1
1992	2580.4	385.0	76.9	76.3	76.2	76.2	76.3	75.1	6991	79.6
1993	1810.5	385.0	53.8	75.2	53.0	75.1	53.7	74.1	4991	57.0
1994	2714.6	385.0	82.0	75.5	79.1	75.2	80.5	74.3	7300	83.3
1995	1364.0	385.0	41.3	74.0	40.6	73.7	40.4	72.9	3945	45.0
1996	1947.0	385.0	58.8	73.4	57.1	73.1	57.6	72.2	5510	62.7
1997	2624.0	385.0	79.7	73.7	77.4	73.2	77.8	72.5	7075	80.8
1998	2535.6	385.0	76.4	73.8	74.4	73.3	75.2	72.6	6822	77.9
1999	1919.3	385.0	61.4	73.3	57.1	72.7	56.9	72.0	5669	64.7
2000	2621.5	385.0	79.8	73.5	77.2	72.8	77.5	72.2	7131	81.2
2001	1293.4	385.0	38.5	72.3	38.2	71.6	38.3	71.0	3529	40.3
2002	2431.9	385.0	72.7	72.3	71.9	71.7	72.1	71.1	6415	73.2
2003	2335.0	385.0	69.6	72.3	68.9	71.6	69.2	71.0	6236	71.2

## RU-9 NOVovoronezh-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	217.0	9.3	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
16 Jan	216.0	6.4	UP1	A13	UNIT POWER REDUCTION OWING TO REACTOR LOAD SHEDDING TO OBSERVE THE OPERATING LIMITS FOR THE IODINE CONCENTRATION
25 Jan	335.0	138.7	UF2	A16	UNIT SHUT DOWN TO ELIMINATE LEAK IN STEAM GENERATOR PIPING SYSTEM
11 Feb	298.0	13.6	UP1	A13	UNIT POWER REDUCTION OWING TO REACTOR LOAD SHEDDING TO OBSERVE THE OPERATING LIMITS FOR THE IODINE CONCENTRATION IN THE PRIMARY CIRCUIT
01 Apr	2904.0	6.8	XP	Z	UNIT POWER REDUCTION OWING TO HEAT TRANSFER TO OUTSIDE CONSUMERS ABOVE THE LEVEL LAID DOWN IN THE TECHNICAL SPECIFICATIONS
01 May	788.0	7.9	XP	N	UNIT POWER REDUCTION OWING TO AN INCREASE IN CIRCULATING WATER TEMPERATURE
02 Jun	2048.0	785.4	PF	C	MAJOR UNIT OVERHAUL
27 Aug	112.0	45.4	UF3	Z	EXTENSION OF UNIT OUTAGE FOR MAJOR OVERHAUL
31 Aug	81.0	16.0	PP	D31	UNIT POWER REDUCTION OWING TO ONGOING MAJOR OVERHAUL OF TURBOGENERATOR NO. 1
24 Sep	26.0	11.2	UF4	A35	UNIT SHUT DOWN BY EMERGENCY PROTECTION SYSTEM 1 BECAUSE THE STOP VALUE OF THE LAST OPERATIONAL TURBOGENERATOR (NO. 2) CLOSED AS A RESULT OF A SPURIOUS SIGNAL FOR A LEVEL INCREASE IN THE HIGH-PRESSURE HEATER UP TO THE SECOND LIMIT
09 Dec	552.0	4.1	UP2	A11	UNIT POWER REDUCTION OWING TO REACTOR POWER LIMITATION OWING TO A TEMPERATURE DROP IN AN ASSEMBLY

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1972 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		361			114	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	2048			1453		
D. Inspection, maintenance or repair without refuelling				156		
Z. Others		112				
Subtotal	2048	473	0	1609	114	0
Total		2521			1723	

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

System	2003 Hours Lost	1972 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		15
15. Reactor Cooling Systems		1
16. Steam generation systems	335	54
32. Feedwater and Main Steam System		12
35. All other I&C Systems	26	
42. Electrical Power Supply Systems		1
Total	361	84

# RU-11 NOVOVORONEZH-4

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 385.0 MW(e)  
**Design Net Capacity:** 385.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 2583.1 GW(e).h  
**Energy Availability Factor:** 76.8%  
**Load Factor:** 76.6%  
**Operating Factor:** 79.3%  
**Energy Unavailability Factor:** 23.2%  
**Total Off-line Time:** 1810 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	275.7	256.4	288.3	251.0	275.9	271.6	269.0	271.1	104.7	0.0	35.2	284.1	2583.1
<b>EAF (%)</b>	95.6	98.7	99.9	88.8	96.4	98.2	95.2	96.3	39.0	0.0	14.3	98.8	76.8
<b>UCF (%)</b>	99.7	100.0	100.0	88.8	100.0	99.7	100.0	99.8	41.8	0.0	16.3	99.2	78.8
<b>LF (%)</b>	96.3	99.1	100.7	90.7	96.3	98.0	93.9	94.7	37.8	0.0	12.7	99.2	76.6
<b>OF (%)</b>	100.0	100.0	99.9	89.6	100.0	100.0	100.0	100.0	43.3	0.0	19.3	100.0	79.3
<b>EUf (%)</b>	4.4	1.3	0.1	11.2	3.6	1.8	4.8	3.7	61.0	100.0	85.7	1.2	23.2
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.2	100.0	83.7	0.0	20.2
<b>UCLF (%)</b>	0.3	0.0	0.0	11.2	0.0	0.3	0.0	0.2	0.0	0.0	0.0	0.8	1.1
<b>XUF (%)</b>	4.0	1.3	0.1	0.0	3.6	1.6	4.8	3.6	2.8	0.0	2.0	0.4	2.0

UCLF replaces previously used UUF.

## 4. 2003 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, FEBRUARY, MARCH, APRIL, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 13448 MWH.

## 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:** 80790.1 GW(e).h  
**Cumulative Energy Availability Factor:** 77.5%  
**Cumulative Load Factor:** 77.0%  
**Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1985	3097.9	385.0	91.3	82.5	91.3	82.5	91.9	82.9	8250	94.2
1986	2792.2	385.0	82.6	82.5	82.6	82.5	82.8	82.9	7688	87.8
1987	3262.7	417.0	91.7	83.2	91.7	83.2	89.3	83.4	8252	94.2
1988	2529.4	385.0	80.0	83.0	80.0	83.0	74.8	82.8	7152	81.4
1989	2710.3	385.0	90.2	83.4	90.2	83.4	80.4	82.7	8357	95.4
1990	2244.7	385.0	70.5	82.7	69.6	82.6	66.6	81.7	6622	75.6
1991	1827.6	385.0	58.2	81.3	58.0	81.3	54.2	80.2	5540	63.2
1992	2853.4	385.0	87.3	81.6	82.4	81.3	84.4	80.4	8163	92.9
1993	2613.7	385.0	79.7	81.5	76.6	81.1	77.5	80.3	7204	82.2
1994	1954.3	385.0	66.9	80.8	56.6	79.9	57.9	79.2	6033	68.9
1995	2120.0	385.0	65.5	80.2	62.2	79.1	62.9	78.5	5818	66.4
1996	3080.3	385.0	93.8	80.8	90.4	79.6	91.1	79.0	8362	95.2
1997	2235.5	385.0	70.3	80.3	67.0	79.1	66.3	78.5	6690	76.4
1998	2714.9	385.0	83.2	80.4	80.2	79.1	80.5	78.6	7366	84.1
1999	1791.5	385.0	54.9	79.5	53.2	78.1	53.1	77.6	4927	56.2
2000	2474.3	385.0	74.6	79.3	73.1	77.9	73.2	77.4	6784	77.2
2001	2656.0	385.0	80.7	79.3	79.2	78.0	78.8	77.5	7173	81.9
2002	2184.8	385.0	65.4	78.8	64.2	77.5	64.8	77.1	5857	66.9
2003	2583.1	385.0	78.8	78.8	76.8	77.5	76.6	77.0	6950	79.3



## RU-11 NOVOVORONEZH-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	232.0	10.8	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
01 Jan	3624.0	7.1	XP	Z	UNIT POWER REDUCTION OWING TO HEAT TRANSFER TO OUTSIDE CONSUMERS ABOVE THE LEVEL LAID DOWN IN THE TECHNICAL SPECIFICATIONS
03 Apr	76.0	30.6	UF2	A16	UNIT SHUTDOWN TO ELIMINATE COOLANT LEAKS IN A VALVE IN THE PRIMARY CIRCUIT LOOP BLOWDOWN LINE
01 May	3264.0	34.8	XP	N	UNIT POWER REDUCTION OWING TO AN INCREASE IN CIRCULATING WATER TEMPERATURE
07 Sep	134.0	3.5	XP	S	POWER REDUCTION WHILE UNIT OPERATING IN COASTDOWN
14 Sep	1734.0	679.8	PF	D	MAJOR UNIT OVERHAUL
26 Nov	26.0	5.4	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1973 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		76			55	
B. Refuelling without a maintenanc					2	
C. Inspection, maintenance or repai combined with refuelling				1092		
D. Inspection, maintenance or repai without refuelling	1734			86		
E. Testing of plant systems or component				18		
F. TMajor back-fitting, refurbishment o upgrading activities with refuelling				87		
K. Load-following (frequency contro reserve shutdown due to reduced energ demand)				3	20	
Subtotal	1734	76	0	1286	77	0
Total		1810			1363	

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

System	2003 Hours Lost	1973 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		16
15. Reactor Cooling System:		1
16. Steam generation system:	76	23
32. Feedwater and Main Steam Syser		13
Total	76	53

## RU-20 NOVOVORONEZH-5

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

### 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 6951.2 GW(e).h  
**Energy Availability Factor:** 83.1%  
**Load Factor:** 83.5%  
**Operating Factor:** 85.7%  
**Energy Unavailability Factor:** 16.9%  
**Total Off-line Time:** 1253 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	689.6	643.6	712.3	657.6	643.6	669.9	384.9	0.0	460.3	713.5	679.5	696.3	6951.2
<b>EAF (%)</b>	96.7	99.8	100.0	95.7	91.1	97.8	54.6	0.0	68.1	99.9	98.3	97.0	83.1
<b>UCF (%)</b>	100.0	100.0	100.0	95.8	99.0	99.6	56.6	0.0	68.1	99.9	100.0	97.5	84.5
<b>LF (%)</b>	97.6	100.8	100.8	96.3	91.1	97.9	54.5	0.0	67.3	100.8	99.3	98.5	83.5
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	100.0	58.1	0.0	72.6	100.0	100.0	100.0	85.7
<b>EUf (%)</b>	3.3	0.2	0.0	4.3	8.9	2.2	45.4	100.0	31.9	0.1	1.7	3.0	16.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	42.3	100.0	31.7	0.1	0.0	0.0	14.7
<b>UCLF (%)</b>	0.0	0.0	0.0	4.2	1.1	0.4	1.1	0.0	0.1	0.0	0.0	2.5	0.8
<b>XUF (%)</b>	3.3	0.2	0.0	0.0	7.8	1.7	2.0	0.0	0.0	0.0	1.7	0.5	1.5

UCLF replaces previously used UUF.

### 4. 2003 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, FEBRUARY, MARCH, APRIL, OCTOBER, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 34559 MWH.

### 5. Historical Summary

**Date of Construction Start:** 01 Mar 1974      **Lifetime Generation:** 119961.3 GW(e).h  
**Date of First Criticality:** 30 Apr 1980      **Cumulative Energy Availability Factor:** 62.6%  
**Date of Grid Connection:** 31 May 1980      **Cumulative Load Factor:** 62.3%  
**Date of Commercial Operation:** 20 Feb 1981      **Cumulative Unit Capability Factor:** 77.4%  
**Cumulative Energy Unavailability Factor:** 37.4%

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	6894.3	950.0	83.1	76.7	83.1	76.7	82.8	76.6	7979	91.1
1986	5523.8	950.0	66.0	74.6	65.9	74.6	66.4	74.6	6806	77.7
1987	7052.7	1000.0	81.8	75.8	81.8	75.8	80.5	75.6	7399	84.5
1988	3017.8	950.0	36.5	70.3	36.5	70.2	36.2	70.0	3439	39.2
1989	3308.9	950.0	40.9	66.6	40.9	66.6	39.8	66.3	3778	43.1
1990	3913.3	950.0	47.7	64.5	47.6	64.5	47.0	64.1	4715	53.8
1991	5878.2	950.0	71.5	65.2	71.5	65.2	70.6	64.8	6996	79.9
1992	3752.8	950.0	45.9	63.5	45.7	63.4	45.0	63.0	5244	59.7
1993	5935.4	950.0	73.8	64.3	72.6	64.2	71.3	63.7	7448	85.0
1994	2281.9	950.0	33.2	61.9	28.9	61.5	27.4	60.9	4288	48.9
1995	4753.7	950.0	63.9	62.1	57.5	61.2	57.1	60.6	6670	76.1
1996	3861.8	950.0	46.7	61.0	46.7	60.2	46.3	59.7	4759	54.2
1997	5949.3	950.0	71.7	61.7	71.4	60.9	71.5	60.4	6854	78.2
1998	3771.8	950.0	45.5	60.8	44.9	60.0	45.3	59.5	4457	50.9
1999	4845.4	950.0	61.2	60.8	58.7	59.9	58.2	59.5	6062	69.2
2000	5278.6	950.0	65.6	61.0	63.5	60.1	63.3	59.7	6479	73.8
2001	5984.6	950.0	73.2	61.6	72.3	60.7	71.9	60.3	7508	85.7
2002	6762.2	950.0	83.1	62.7	80.7	61.7	81.3	61.3	7430	84.8
2003	6951.2	950.0	84.5	63.7	83.1	62.6	83.5	62.3	7507	85.7

## RU-20 NOVORONEZH-5

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	82.0	17.3	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
18 Jan	45.0	4.0	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
21 Jan	89.0	2.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
01 Apr	2616.0	37.6	XP	N	UNIT POWER REDUCTION OWING TO AN INCREASE IN CIRCULATING WATER TEMPERATURE
19 Apr	26.0	12.8	UP1	A32	UNIT POWER REDUCTION WHILE TURBOGENERATOR NO. 1 WAS SHUT DOWN TO ELIMINATE A LEAK THROUGH THE VALVE SPINDLE LID JOINT OF A NON-RETURN VALVE IN THE NON-ISOLABLE SECTION OF THE FEEDWATER LINE AFTER THE TURBINE-DRIVEN FEED PUMP
20 Apr	31.0	16.1	UP1	A41	UNIT POWER REDUCTION WHILE TURBOGENERATOR NO. 2 WAS SHUT DOWN TO ELIMINATE A HYDROGEN LEAK FROM THE GENERATOR HOUSING
01 May	103.0	24.9	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
01 May	744.0	7.1	UP1	A31	UNIT POWER REDUCTION OWING TO FOULING OF THE TURBINE CONDENSER HEAT EXCHANGE SURFACES
09 May	78.0	14.5	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
25 May	29.0	4.6	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
12 Jun	10.0	1.2	UP1	A31	UNIT POWER REDUCTION TO CLEAN THE TURBOGENERATOR NO. 2 CONDENSER PIPES
22 Jun	15.0	1.8	UP1	A31	UNIT POWER REDUCTION TO ELIMINATE INFILTRATION IN THE TURBINE NO. 2 CONDENSER
01 Jul	432.0	3.0	UP1	A31	UNIT POWER REDUCTION OWING TO FOULING OF THE TURBINE CONDENSER HEAT EXCHANGE SURFACES
15 Jul	26.0	4.5	UP2	A15	UNIT POWER REDUCTION WHEN A REACTOR COOLANT PUMP CUT OUT OWING TO THE FAILURE OF AN ELECTRONIC MODULE IN THE STEAM GENERATOR NO. 1 LEVEL CONTROLLER CIRCUIT
19 Jul	1253.0	1214.2	PF	D	MEDIUM-SCALE UNIT MAINTENANCE
11 Sep	751.0	9.2	PP	H	UNIT POWER REDUCTION OWING TO REGULATORY LIMITATIONS ON THE REACTOR POWER RAISE RATE AS A RESULT OF THE FUEL LOAD CONDITIONS DURING THE FIRST 32 EFFECTIVE DAYS
26 Nov	106.0	12.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
13 Dec	36.0	17.6	UP2	A31	UNIT POWER REDUCTION OWING TO SHUTDOWN OF TURBOGENERATOR NO. 2 AS A RESULT OF AN OIL VAPOUR JET IN THE VICINITY OF THE FRONT SUPPORT
31 Dec	23.0	2.8	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					608	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling				1382		
D. Inspection, maintenance or repair without refuelling	1253			534		
Subtotal	1253	0	0	1916	609	0
Total		1253			2525	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		51
12. Reactor I&C Systems		21
13. Reactor Auxiliary System:		4
14. Safety Systems		3
15. Reactor Cooling System:		64
16. Steam generation system:		327
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System		23
35. All other I&C Systems		4
41. Main Generator System:		86
42. Electrical Power Supply System:		3
XX. Miscellaneous Systems		10
Total	0	603

# RU-59 ROSTOV-1

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 6973.9 GW(e).h  
**Energy Availability Factor:** 81.3%  
**Load Factor:** 83.8%  
**Operating Factor:** 81.7%  
**Energy Unavailability Factor:** 18.7%  
**Total Off-line Time:** 1606 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	725.5	663.0	734.4	710.3	0.0	36.6	718.7	717.3	707.6	731.6	494.3	734.4	6973.9
<b>EAF (%)</b>	99.0	99.8	99.6	99.7	0.0	7.0	100.0	99.6	100.0	100.0	71.5	100.0	81.3
<b>UCF (%)</b>	99.9	99.8	99.6	99.8	12.8	7.0	100.0	100.0	100.0	100.0	71.8	100.0	82.6
<b>LF (%)</b>	102.6	103.9	103.9	104.0	0.0	5.3	101.7	101.5	103.5	103.4	72.3	103.9	83.8
<b>OF (%)</b>	100.0	100.0	99.9	100.1	0.0	8.2	100.0	100.0	100.0	100.0	72.1	100.0	81.7
<b>EUf (%)</b>	1.0	0.2	0.4	0.3	100.0	93.0	0.0	0.4	0.0	0.0	28.5	0.0	18.7
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	87.2	93.0	0.0	0.0	0.0	0.0	0.0	0.0	15.1
<b>UCLF (%)</b>	0.1	0.2	0.4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	28.2	0.0	2.4
<b>XUF (%)</b>	0.9	0.0	0.0	0.1	12.8	0.0	0.0	0.4	0.0	0.0	0.2	0.0	1.2

UCLF replaces previously used UUF.

## 4. 2003 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, FEBRUARY, MARCH, APRIL, JULY, AUGUST, SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 165210 MWH.

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1981      **Lifetime Generation:** 14150.1 GW(e).h  
**Date of First Criticality:** 23 Feb 2001      **Cumulative Energy Availability Factor:** 82.7%  
**Date of Grid Connection:** 30 Mar 2001      **Cumulative Load Factor:** 85.0%  
**Date of Commercial Operation:** 25 Dec 2001      **Cumulative Unit Capability Factor:** 83.0%  
**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 (%)
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

# RU-59 ROSTOV-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	78.0	6.3	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
16 Feb	11.0	1.1	UP1	A31	UNIT POWER REDUCTION TO ELIMINATE LEAK IN THE TURBINE CONDENSER PIPING SYSTEM
29 Mar	14.0	1.7	UP1	A31	UNIT POWER REDUCTION TO ELIMINATE LEAK IN THE TURBINE CONDENSER PIPING SYSTEM
05 Apr	9.0	1.1	UP1	A31	UNIT POWER REDUCTION TO ELIMINATE LEAK IN THE TURBINE CONDENSER PIPING SYSTEM
29 Apr	48.0	0.8	XP	S	POWER REDUCTION WHILE UNIT OPERATING IN COASTDOWN
01 May	94.0	90.5	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
05 May	1309.0	1251.7	PF	C	MAJOR UNIT OVERHAUL
16 Aug	10.0	1.7	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
17 Aug	7.0	1.3	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
07 Nov	200.0	191.0	UF5	A41	UNIT SHUT DOWN BY THE EMERGENCY PROTECTION SYSTEM FROM THE OPERATOR'S KEY PURSUANT TO TRIGGERING OF THE GENERATOR PROTECTION SYSTEM FOR A LOSS OF EXCITATION
15 Nov	5.0	2.2	UP2	A41	POWER INCREASE FOLLOWING UNSCHEDULED UNIT SHUTDOWN IN LINE WITH THE REQUIREMENTS OF THE OPERATING PROCEDURES
16 Nov	29.0	1.3	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			2002 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		200			34	
C. Inspection, maintenance or repair combined with refuelling	1309			573		
Subtotal	1309	200	0	573	34	0
Total		1509			607	

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

System	2003 Hours Lost	2002 to 2003 Average Hours Lost Per Year
17. Safety I&C Systems (excluding reactor I&C)		16
41. Main Generator Systems	200	18
Total	200	34

## RU-23 SMOLENSK-1

Operator: REA (ROSENERGOATOM, CONSORTIUM)

Contractor: MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

### 1. Station Details

Type: LWGR  
 Maximum Net Capacity at the beginning of 2003: 925.0 MW(e)  
 Design Net Capacity: 925.0 MW(e)  
 Design Discharge Burnup: 22200 MW.d/t

### 2. Production Summary 2003

Energy Production: 6711.8 GW(e).h  
 Energy Availability Factor: 82.9%  
 Load Factor: 82.8%  
 Operating Factor: 86.0%  
 Energy Unavailability Factor: 17.1%  
 Total Off-line Time: 1227 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	689.6	592.4	687.4	0.0	298.4	651.6	496.8	668.0	600.3	692.5	660.7	674.1	6711.8
EAF (%)	97.8	93.5	98.3	0.0	44.8	97.3	72.8	96.9	99.0	99.3	97.9	96.9	82.9
UCF (%)	100.0	93.5	98.8	0.0	45.8	98.3	76.3	100.0	100.0	99.3	100.0	100.0	84.4
LF (%)	100.2	95.3	99.9	0.0	43.4	97.8	72.2	97.1	90.1	100.5	99.2	97.9	82.8
OF (%)	100.0	100.0	99.9	0.0	53.5	100.0	78.4	100.0	100.0	100.0	100.0	100.0	86.0
EUf (%)	2.2	6.5	1.7	100.0	55.2	2.7	27.2	3.1	1.0	0.7	2.1	3.1	17.1
PUF (%)	0.0	0.0	0.4	100.0	54.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.8
UCLF (%)	0.0	6.5	0.7	0.0	0.0	1.7	23.7	0.0	0.0	0.7	0.0	0.0	2.8
XUF (%)	2.2	0.0	0.5	0.0	1.0	1.0	3.5	3.1	1.0	0.0	2.1	3.1	1.5

UCLF replaces previously used UUF.

### 4. 2003 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, FEBRUARY, MARCH, OCTOBER, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 41838 MWH.

### 5. Historical Summary

Date of Construction Start: 01 Oct 1975      Lifetime Generation: 121025.1 GW(e).h  
 Date of First Criticality: 10 Sep 1982      Cumulative Energy Availability Factor: 71.6%  
 Date of Grid Connection: 09 Dec 1982      Cumulative Load Factor: 71.3%  
 Date of Commercial Operation: 30 Sep 1983      Cumulative Unit Capability Factor: 77.7%  
 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 (%)
1985	5850.2	925.0	74.9	79.6	72.4	78.3	72.2	78.7	6806	77.7
1986	3039.8	925.0	37.8	65.7	37.8	64.8	37.5	65.0	3472	39.6
1987	7445.8	1000.0	86.7	71.2	86.7	70.6	85.0	70.3	7620	87.0
1988	6695.6	925.0	81.9	73.3	81.9	72.8	82.4	72.7	7288	83.0
1989	6506.5	925.0	79.7	74.4	79.3	73.9	80.3	73.9	7177	81.9
1990	6227.8	925.0	76.6	74.7	76.1	74.2	76.9	74.3	6851	78.2
1991	6693.9	925.0	81.3	75.5	81.3	75.1	82.6	75.4	7252	82.8
1992	6849.4	925.0	83.7	76.4	83.7	76.0	84.3	76.3	7563	86.1
1993	6290.6	925.0	78.4	76.6	78.0	76.2	77.6	76.5	6993	79.8
1994	4217.8	925.0	71.0	76.1	57.8	74.6	52.1	74.3	6286	71.8
1995	5002.5	925.0	77.3	76.2	63.0	73.6	61.7	73.2	6390	72.9
1996	5666.4	925.0	71.7	75.9	71.6	73.5	69.7	73.0	6604	75.2
1997	4674.5	925.0	59.1	74.7	57.8	72.3	57.7	71.9	5366	61.3
1998	3554.1	925.0	58.9	73.6	45.0	70.5	43.9	70.0	5411	61.8
1999	6478.9	925.0	83.5	74.2	80.1	71.1	80.0	70.6	7417	84.7
2000	5228.5	925.0	64.4	73.7	63.8	70.7	64.3	70.3	5738	65.3
2001	5165.1	925.0	67.4	73.3	63.2	70.3	63.7	69.9	5940	67.8
2002	6866.7	925.0	85.1	73.9	83.7	71.0	84.7	70.7	7587	86.6
2003	6711.8	925.0	84.4	74.5	82.9	71.6	82.8	71.3	7533	86.0

# RU-23 SMOLENSK-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	96.0	14.9	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
12 Feb	37.0	19.7	UP1	A41	UNIT POWER REDUCTION AND SHUTDOWN OF TURBOGENERATOR NO. 1 OWING TO INCREASED SPARKING IN THE GENERATOR BRUSH CONTACTS
23 Feb	38.0	20.6	UP1	A41	UNIT POWER REDUCTION AND SHUTDOWN OF TURBOGENERATOR NO. 2 TO ELIMINATE FAULTS IN THE GENERATOR BRUSH CONTACTS
21 Mar	5.0	5.1	UP1	A41	UNIT POWER REDUCTION OWING TO SHUTDOWN OF TURBOGENERATOR NO. 2 BY THE CURRENT PROTECTION SYSTEM CAUSED BY RELAY MALFUNCTION
01 Apr	1051.0	1031.8	PF	C	MEDIUM-SCALE UNIT MAINTENANCE
25 May	32.0	5.0	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
26 May	840.0	5.7	XP	N	UNIT POWER REDUCTION OWING TO AN INCREASE IN CIRCULATING WATER TEMPERATURE
01 Jun	17.0	11.4	UP1	A32	UNIT POWER REDUCTION AND SHUTDOWN OF TURBOGENERATOR NO. 2 TO REPAIR A VALVE IN THE CONDENSATE DUMP FROM THE MOISTURE SEPARATOR TO THE LOW-PRESSURE HEATER
02 Jun	704.0	3.5	XP	N	UNIT POWER REDUCTION OWING TO AN INCREASE IN CIRCULATING WATER TEMPERATURE
28 Jun	528.0	24.0	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION
20 Jul	161.0	163.2	UF1	A12	UNIT SHUTDOWN TO ELIMINATE A FAULT IN THE FUEL CHANNEL WATER FLOW MONITORING SYSTEM
29 Jul	1608.0	31.4	XP	N	UNIT POWER REDUCTION OWING TO AN INCREASE IN CIRCULATING WATER TEMPERATURE
06 Oct	4.0	4.6	UP1	A32	UNIT POWER REDUCTION AND SHUTDOWN OF TURBOGENERATOR NO. 1 BY THE PROTECTION SYSTEM FOR A HIGH LEVEL IN THE MOISTURE SEPARATOR OWING TO A FAULT IN THE PROTECTIVE MECHANISM IN THE LEVEL MEASUREMENT CIRCUITS
04 Nov	288.0	14.3	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		161			76	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	1051			1171		
D. Inspection, maintenance or repair without refuelling				510		
G. Major back-fitting, refurbishment or upgrading activities without refuelling						22
Subtotal	1051	161	0	1681	76	22
Total		1212			1779	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		21
12. Reactor I&C Systems	161	12
13. Reactor Auxiliary System:		15
14. Safety Systems		8
32. Feedwater and Main Steam System		14
42. Electrical Power Supply System:		0
Total	161	70

## RU-24 SMOLENSK-2

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

### 1. Station Details

**Type:** LWGR  
**Maximum Net Capacity at the beginning of 2003:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 22200 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 6438.6 GW(e).h  
**Energy Availability Factor:** 79.1%  
**Load Factor:** 79.5%  
**Operating Factor:** 88.3%  
**Energy Unavailability Factor:** 20.9%  
**Total Off-line Time:** 1026 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	374.9	430.7	633.3	611.4	662.6	652.4	653.8	661.0	490.3	0.0	580.9	687.4	6438.6
<b>EAF (%)</b>	55.7	69.6	91.2	91.1	95.7	97.4	94.9	95.8	73.8	0.0	86.3	98.2	79.1
<b>UCF (%)</b>	56.6	69.6	91.3	91.1	99.7	100.0	100.0	100.0	74.4	0.0	94.5	100.0	81.4
<b>LF (%)</b>	54.5	69.3	92.0	91.9	96.3	98.0	95.0	96.0	73.6	0.0	87.2	99.9	79.5
<b>OF (%)</b>	100.0	100.0	92.2	92.2	100.0	100.0	100.0	100.0	76.8	0.0	100.0	100.0	88.3
<b>EUF (%)</b>	44.3	30.4	8.8	8.9	4.3	2.6	5.1	4.2	26.3	100.0	13.7	1.8	20.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.6	100.0	5.5	0.0	11.1
<b>UCLF (%)</b>	43.4	30.4	8.8	8.9	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.5
<b>XUF (%)</b>	0.8	0.0	0.1	0.0	4.0	2.6	5.1	4.2	0.6	0.0	8.1	1.8	2.3

UCLF replaces previously used UUF.

### 4. 2003 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 FEBRUARY, MARCH, APRIL, MAY, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 20058 MWH.

### 5. Historical Summary

**Date of Construction Start:** 01 Jun 1976  
**Date of First Criticality:** 09 Apr 1985  
**Date of Grid Connection:** 31 May 1985  
**Date of Commercial Operation:** 02 Jul 1985

**Lifetime Generation:** 111182.6 GW(e).h  
**Cumulative Energy Availability Factor:** 73.6%  
**Cumulative Load Factor:** 73.4%  
**Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1985	3623.9	925.0	0.0	0.0	90.6	100.0	44.7	0.0	4593	52.4
1986	6667.3	925.0	82.6	82.6	82.6	82.6	82.3	82.3	7442	85.0
1987	6364.9	1000.0	74.5	78.4	74.5	78.4	72.7	77.3	6707	76.6
1988	6757.2	925.0	83.5	80.1	83.5	80.0	83.2	79.2	7594	86.5
1989	6627.3	925.0	81.8	80.5	81.5	80.4	81.8	79.8	7336	83.7
1990	6710.6	925.0	83.0	81.0	82.5	80.8	82.8	80.4	7453	85.1
1991	5796.7	925.0	71.4	79.4	71.4	79.3	71.5	79.0	6495	74.1
1992	6731.6	925.0	83.9	80.0	82.6	79.7	82.9	79.5	7472	85.1
1993	6634.1	925.0	84.9	80.6	82.7	80.1	81.9	79.8	7492	85.5
1994	5259.8	925.0	80.3	80.6	66.6	78.6	64.9	78.2	7044	80.4
1995	5337.4	925.0	80.3	80.6	66.8	77.4	65.9	76.9	6738	76.9
1996	6127.7	925.0	79.1	80.4	77.8	77.5	75.4	76.8	7010	79.8
1997	4991.0	925.0	61.7	78.9	61.6	76.2	61.6	75.5	5642	64.4
1998	5297.0	925.0	73.9	78.5	65.6	75.4	65.4	74.8	6576	75.1
1999	5362.5	925.0	69.1	77.8	66.0	74.7	66.2	74.2	6090	69.5
2000	6566.1	925.0	80.5	78.0	80.1	75.1	80.8	74.6	7108	80.9
2001	6457.6	925.0	81.0	78.2	79.0	75.3	79.7	74.9	7537	86.0
2002	3431.1	925.0	43.6	76.2	41.7	73.3	42.3	73.0	3890	44.4
2003	6438.6	925.0	81.4	76.5	79.1	73.6	79.5	73.4	7734	88.3



## RU-24 SMOLENSK-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	96.0	5.7	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
04 Jan	1078.0	487.9	UP1	A31	UNIT POWER REDUCTION AND SHUTDOWN OF TURBOGENERATOR NO. 1 BY THE GENERATOR PROTECTION SYSTEM FOR A SHORT CIRCUIT TO EARTH
12 Mar	32.0	0.4	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION
21 Mar	57.0	60.2	XF4	J42	UNIT SHUT DOWN BY THE EMERGENCY PROTECTION SYSTEM WHEN THE UNIT TRANSFORMERS WERE SHUT DOWN BY THE 500 KV BUSBAR DIFFERENTIAL PROTECTION SYSTEMS OWING TO A SHORT CIRCUIT IN THE POWER TRANSMISSION LINE SUPPORT
20 Apr	57.0	59.1	UF4	A42	UNIT SHUT DOWN BY THE EMERGENCY PROTECTION SYSTEM OWING TO SHUTDOWN OF THE UNIT TRANSFORMERS BY THE 500 KV BUSBAR DIFFERENTIAL PROTECTION SYSTEM BECAUSE OF A RELAY FAULT IN THE PROTECTION SYSTEM CIRCUITS
01 May	96.0	1.0	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION
09 May	5.0	1.8	UP1	P41	UNIT POWER REDUCTION AND SHUTDOWN OF TURBOGENERATOR NO. 1 OWING TO A FIRE IN THE GENERATOR BRUSH CONTACTS
09 May	101.0	20.9	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
21 May	984.0	20.4	XP	N	UNIT POWER REDUCTION OWING TO AN INCREASE IN CIRCULATING WATER TEMPERATURE
28 Jun	528.0	22.2	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION
20 Jul	1557.0	48.2	XP	N	UNIT POWER REDUCTION OWING TO AN INCREASE IN CIRCULATING WATER TEMPERATURE
24 Sep	892.0	851.4	PF	C	MEDIUM-SCALE UNIT MAINTENANCE
01 Nov	58.0	36.9	UP3	Z	EXTENSION OF MEDIUM-SCALE MAINTENANCE OF TURBOGENERATOR NO. 2, INCLUDING BALANCING OF ROTOR
04 Nov	288.0	54.2	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		57			69	
B. Refuelling without a maintenanc					4	
C. Inspection, maintenance or repai combined with refuelling	892			965		
D. Inspection, maintenance or repai without refuelling				457		
F. TMajor back-fitting, refurbishment o upgrading activities with refuelling				253		
G. Major back-fitting, refurbishment o upgrading activities without refuelling						19
J. Grid failure or grid unavailabilit			57			
K. Load-following (frequency contro reserve shutdown due to reduced energ demand)					3	
Subtotal	892	57	57	1675	76	19
Total		1006			1770	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		14
15. Reactor Cooling System:		26
16. Steam generation system:		2
17. Safety I&C Systems (excluding reactor I&C		3
31. Turbine and auxiliarie:		1
42. Electrical Power Supply System:	57	16
Total	57	62

## RU-67 SMOLENSK-3

**Operator:** REA (ROSENERGOATOM, CONSORTIUM)

**Contractor:** MNE (MINISTRY OF NUCLEAR ENERGY OF RUSSIAN FEDERATION)

### 1. Station Details

**Type:** LWGR  
**Maximum Net Capacity at the beginning of 2003:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 22200 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 7038.2 GW(e).h  
**Energy Availability Factor:** 86.3%  
**Load Factor:** 86.9%  
**Operating Factor:** 87.9%  
**Energy Unavailability Factor:** 13.7%  
**Total Off-line Time:** 1063 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	694.8	632.3	700.5	676.6	671.8	7.8	276.7	678.2	677.2	701.1	661.3	659.8	7038.2
<b>EAF (%)</b>	99.0	99.5	100.0	100.0	97.5	3.3	42.6	99.2	100.0	100.0	98.2	95.7	86.3
<b>UCF (%)</b>	99.0	99.6	100.0	100.0	99.3	3.3	43.7	100.0	100.0	100.0	100.0	100.0	87.1
<b>LF (%)</b>	101.0	101.7	101.8	101.7	97.6	1.2	40.2	98.6	101.7	101.7	99.3	95.9	86.9
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	4.9	49.2	100.0	100.0	100.0	100.0	100.0	87.9
<b>EUf (%)</b>	1.0	0.5	0.0	0.0	2.5	96.7	57.4	0.8	0.0	0.0	1.8	4.3	13.7
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	96.7	56.3	0.0	0.0	0.0	0.0	0.0	12.7
<b>UCLF (%)</b>	1.0	0.5	0.0	0.0	0.7	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	1.8	0.0	1.0	0.8	0.0	0.0	1.8	4.3	0.8

UCLF replaces previously used UUF.

### 4. 2003 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, FEBRUARY, MARCH, APRIL, MAY, AUGUST, SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 94799.

### 5. Historical Summary

**Date of Construction Start:** 01 May 1984  
**Date of First Criticality:** 01 Dec 1989  
**Date of Grid Connection:** 17 Jan 1990  
**Date of Commercial Operation:** 12 Oct 1990

**Lifetime Generation:** 86407.8 GW(e).h  
**Cumulative Energy Availability Factor:** 77.8%  
**Cumulative Load Factor:** 77.6%  
**Cumulative Unit Capability Factor:** 79.3%  
**Cumulative Energy Unavailability Factor:** 22.2%

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 (%)
1990	4570.8	925.0	0.0	0.0	60.4	100.0	59.1	0.0	6767	81.0
1991	6561.7	925.0	80.9	80.9	80.9	80.9	81.0	81.0	7338	83.8
1992	6866.6	925.0	83.9	82.4	83.9	82.4	84.5	82.8	7515	85.6
1993	6596.0	925.0	82.6	82.5	81.4	82.1	81.4	82.3	7419	84.7
1994	5513.7	925.0	82.3	82.4	72.5	79.7	68.0	78.7	6701	76.5
1995	5091.0	925.0	78.2	81.6	63.2	76.4	62.8	75.6	5844	66.7
1996	6496.6	925.0	82.2	81.7	80.8	77.1	80.0	76.3	7268	82.7
1997	5559.3	925.0	69.3	79.9	69.3	76.0	68.6	75.2	6469	73.8
1998	4575.9	925.0	69.0	78.5	57.5	73.7	56.5	72.9	6162	70.3
1999	6411.0	925.0	79.3	78.6	78.2	74.2	79.1	73.6	7063	80.6
2000	6970.5	925.0	84.7	79.2	84.6	75.2	85.8	74.8	7542	85.9
2001	6951.7	925.0	87.3	80.0	85.4	76.2	85.8	75.8	7823	89.3
2002	7204.9	925.0	88.7	80.7	87.7	77.1	88.9	76.9	7831	89.4
2003	7038.2	925.0	87.1	81.2	86.3	77.8	86.9	77.6	7697	87.9

## RU-67 SMOLENSK-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
12 Jan	6.0	6.9	UP1	A41	UNIT POWER REDUCTION AND SHUTDOWN OF TURBOGENERATOR NO. 2 BY THE GENERATOR PROTECTION SYSTEM FOR A LOSS OF EXCITATION
18 Feb	20.0	2.8	UP1	A31	UNIT POWER REDUCTION TO ELIMINATE INFILTRATION IN THE TURBOGENERATOR NO. 2 CONDENSER
13 Mar	14.0	0.3	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION
01 May	96.0	3.5	XP	M	UNIT POWER REDUCTION WHILE OPERATING IN LINE WITH THE INSTRUCTIONS OF THE FEDERAL ENERGY COMMISSION
09 May	110.0	9.1	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER
31 May	2.0	4.7	UP1	A41	UNIT POWER REDUCTION OWING TO SHUTDOWN OF TURBOGENERATOR NO. 2 BY THE GENERATOR PROTECTION SYSTEM
02 Jun	1063.0	1031.8	PF	C	MEDIUM-SCALE UNIT MAINTENANCE
20 Jul	1024.0	12.7	XP	N	UNIT POWER REDUCTION OWING TO AN INCREASE IN CIRCULATING WATER TEMPERATURE
04 Nov	744.0	41.1	XP	J	UNIT POWER REDUCTION OWING TO LIMITATION IMPOSED BY THE DISPATCHER

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1990 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					72	
C. Inspection, maintenance or repair combined with refuelling	1063			904		
D. Inspection, maintenance or repair without refuelling				423		
G. Major back-fitting, refurbishment or upgrading activities without refuelling						114
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					38	
Subtotal	1063	0	0	1327	110	114
Total		1063			1551	

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

System	2003 Hours Lost	1990 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		13
13. Reactor Auxiliary System:		7
21. Fuel Handling and Storage Facilities		26
35. All other I&C Systems		8
41. Main Generator System:		3
42. Electrical Power Supply System:		3
99. No System Code		9
Total	0	69

# SK-2 BOHUNICE-1

**Operator:** EBO (ELECTROSTATION BOHUNICE)  
**Contractor:** AEE (ATOMENERGOEXPORT)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 408.0 MW(e)  
**Design Net Capacity:** 381.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 2765.3 GW(e).h  
**Energy Availability Factor:** 84.1%  
**Load Factor:** 77.4%  
**Operating Factor:** 89.2%  
**Energy Unavailability Factor:** 15.9%  
**Total Off-line Time:** 944 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	259.6	259.3	57.6	102.4	248.8	238.1	254.4	262.0	259.9	285.4	266.0	271.9	2765.3
<b>EAF (%)</b>	98.9	96.6	19.7	42.2	94.3	92.5	90.9	92.0	95.1	96.7	95.1	95.7	84.1
<b>UCF (%)</b>	100.0	100.0	23.2	43.6	99.5	98.7	97.8	99.5	98.6	99.6	99.4	97.9	88.1
<b>LF (%)</b>	85.5	94.6	19.0	34.9	82.0	81.0	83.8	86.3	88.5	93.9	90.5	89.6	77.4
<b>OF (%)</b>	100.0	100.0	23.9	47.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.2
<b>EUf (%)</b>	1.1	3.4	80.3	57.8	5.7	7.5	9.1	8.0	4.9	3.3	4.9	4.3	15.9
<b>PUF (%)</b>	0.0	0.0	76.8	56.4	0.0	1.3	0.0	0.0	1.2	0.0	0.6	0.5	11.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.5	0.0	2.2	0.5	0.2	0.5	0.0	1.5	0.5
<b>XUF (%)</b>	1.1	3.4	3.5	1.4	5.2	6.3	6.9	7.5	3.5	2.9	4.3	2.2	4.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 24 Apr 1972      **Lifetime Generation:** 63505.7 GW(e).h  
**Date of First Criticality:** 27 Nov 1978      **Cumulative Energy Availability Factor:** 72.5%  
**Date of Grid Connection:** 17 Dec 1978      **Cumulative Load Factor:** 71.9%  
**Date of Commercial Operation:** 01 Apr 1980      **Cumulative Unit Capability Factor:** 77.4%  
**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 (%)
1982	2756.8	398.0	80.1	71.6	80.1	71.6	79.1	71.2	7513	85.8
1983	2754.1	398.0	78.9	74.0	78.9	74.0	79.0	73.8	7184	82.0
1984	3229.6	408.0	89.8	78.0	89.8	78.1	90.1	78.0	8449	96.2
1985	2445.7	408.0	72.0	76.8	72.0	76.8	68.4	76.0	6485	74.0
1986	2486.0	408.0	70.5	75.8	70.5	75.8	69.6	74.9	6874	78.5
1987	2701.7	408.0	78.1	76.1	77.3	76.0	75.6	75.0	7251	82.8
1988	2061.6	408.0	56.5	73.6	56.4	73.5	57.5	72.8	5280	60.1
1989	2846.6	408.0	80.2	74.3	80.1	74.2	79.6	73.6	7229	82.5
1990	2776.5	408.0	80.7	75.0	80.0	74.8	77.7	74.0	7435	84.9
1991	2839.5	408.0	82.3	75.7	81.4	75.4	79.4	74.5	7507	85.7
1992	2491.9	408.0	66.2	74.9	64.4	74.5	69.5	74.1	6118	69.6
1993	2307.7	408.0	67.1	74.3	64.6	73.7	64.6	73.3	6021	68.7
1994	2852.0	405.0	84.6	75.0	79.2	74.1	80.4	73.8	7594	86.7
1995	3002.2	408.0	82.7	75.5	81.3	74.6	84.0	74.5	7549	86.2
1996	2667.9	436.0	80.3	75.8	72.0	74.4	69.7	74.2	7182	81.8
1997	2426.0	408.0	73.7	75.7	63.2	73.8	67.9	73.8	6338	72.4
1998	2088.1	408.0	65.6	75.2	60.5	73.0	58.4	73.0	6015	68.7
1999	2268.9	408.0	86.2	75.7	63.4	72.5	63.5	72.5	6573	75.0
2000	1949.2	408.0	59.5	74.9	54.8	71.6	54.4	71.6	5422	61.7
2001	2397.2	408.0	77.4	75.0	68.0	71.5	67.1	71.3	7056	80.5
2002	2752.5	408.0	86.6	75.6	82.9	72.0	77.0	71.6	7634	87.1
2003	2765.3	408.0	88.1	76.1	84.1	72.5	77.4	71.9	7816	89.2

# SK-2 BOHUNICE-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	1584.0	7.6	XP	N	TG POWER REDUCTION DUE TO CIRCULATING WATER TEMPERATURE
17 Feb	450.0	15.6	XP	S	FUEL COAST-DOWN OPERATION
08 Mar	944.0	385.6	PF	C	ANNUAL MAINTENANCE AND REFUELLING
08 Mar	10.0	2.3	PP	E	REACTOR POWER REDUCTION BEFORE ANNUAL MAINTENANCE AND REFUELLING
16 Apr	6.0	9.1	PP	E	START-UP OPERATION
17 Apr	6216.0	120.6	XP	N	TG POWER REDUCTION DUE TO CIRCULATING WATER TEMPERATURE
22 Apr	38.0	1.6	PP	E	START-UP OPERATION
09 May	3.0	0.1	UP	E31	REACTOR POWER REDUCTION TO 95% DUE TO TEST OF TG11 ELECTROHYDRAULIC CONVERTER
11 May	8.0	1.4	UP	A31	SHUTDOWN OF TURBOGENERATOR TG11 DUE TO EXCHANGE OF TG11 ELECTROHYDRAULIC CONVERTER
29 Jun	18.0	3.7	PP	E31	TG11 SHUTDOWN FOR REGULAR TESTING OF PROTECTIONS
01 Jul	74.0	3.6	UP	N33	TURBINE POWER REDUCTION DUE TO WORSEN VACUUM SYSTEM BECAUSE OF HIGHER CIRCULATION COOLING WATER TEMPERATURE
07 Jul	15.0	3.1	UP2	A31	TG12 SHUTDOWN DUE TO LEAK OF EXTRACTION LINE 7
14 Aug	7.0	1.4	UP	A41	TG12 TRIP DUE TO ACTUATION OF GENERATOR ELECTRICAL PROTECTION – EARTH CONNECTION.
12 Sep	4.0	0.5	UP	A12	IN CORE MEASUREMENT SYSTEM FAILURE-COOLANT OUTLET OF FUEL RODS TEMPERATURE
28 Sep	17.0	3.5	PP	E31	ALTERNATING SHUTDOWN OF TURBINE TG21 AND TG22 FOR REGULAR TESTING OF PROTECTIONS
05 Oct	8.0	1.4	UP	A41	TG12 TRIP DUE TO ACTUATION OF GENERATOR ELECTRICAL PROTECTION – EARTH CONNECTION
02 Nov	9.0	1.6	PP	D41	TG12 SHUTDOWN DUE TO ENCLOSED BUSES REPAIR - WATER PENETRATION DURING THE RAIN
26 Nov	1.0	0.1	UP	A31	TG 12 SHARP REDUCTION TO 145 MW DUE TO TURBINE POWER CONTROLLER FAILURE. POWER UNIT REDUCTION FROM 97,4% TO 86,5%.
05 Dec	24.0	4.6	UP	A31	TG11 SHUTDOWN DUE TO LEAK REPAIR ON 6TH STEAM EXTRACTION LINE – PIPE BREAK
06 Dec	10.0	1.6	PP	E31	SHIFT OF TURBOGENERATOR 12 SHUTDOWN IN DISPATCHING RESERVE INTO PLANT RESERVE FOR REGULAR TESTING OF PROTECTIONS

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1978 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					116	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	944			1368		
D. Inspection, maintenance or repair without refuelling				156		
E. Testing of plant systems or component				8		
H. Nuclear regulatory requirement				2		
J. Grid failure or grid unavailability						43
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				28		6
Subtotal	944	0	0	1562	119	49
Total		944			1730	

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

System	2003 Hours Lost	1978 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		24
12. Reactor I&C Systems		5
15. Reactor Cooling System		17
16. Steam generation system		51
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		3
32. Feedwater and Main Steam System		8
41. Main Generator System		0
42. Electrical Power Supply System		3
Total	0	112

# SK-3 BOHUNICE-2

**Operator:** EBO (ELECTROSTATION BOHUNICE)  
**Contractor:** AEE (ATOMENERGOEXPORT)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 408.0 MW(e)  
**Design Net Capacity:** 381.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 2614.9 GW(e).h  
**Energy Availability Factor:** 76.6%  
**Load Factor:** 73.2%  
**Operating Factor:** 80.8%  
**Energy Unavailability Factor:** 23.4%  
**Total Off-line Time:** 1679 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	244.3	269.9	289.8	274.7	272.2	257.7	273.7	181.1	0.0	0.0	272.4	279.1	2614.9
<b>EAF (%)</b>	95.9	98.9	97.1	96.1	94.7	93.5	92.9	60.8	0.0	0.0	95.0	96.3	76.6
<b>UCF (%)</b>	96.7	100.0	98.3	98.4	100.0	100.0	99.8	71.2	0.0	0.0	98.5	98.6	80.0
<b>LF (%)</b>	80.5	98.4	95.5	93.6	89.7	87.7	90.2	59.7	0.0	0.0	92.7	92.0	73.2
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	100.0	100.0	71.6	0.0	0.0	99.6	100.0	80.8
<b>EUf (%)</b>	4.1	1.1	2.9	3.9	5.3	6.5	7.1	39.2	100.0	100.0	5.0	3.7	23.4
<b>PUF (%)</b>	0.0	0.0	1.7	0.0	0.0	0.0	0.0	28.8	100.0	100.0	1.5	0.0	19.4
<b>UCLF (%)</b>	3.3	0.0	0.0	1.6	0.0	0.0	0.2	0.0	0.0	0.0	0.0	1.4	0.6
<b>XUF (%)</b>	0.8	1.1	1.2	2.3	5.3	6.5	6.9	10.4	0.0	0.0	3.5	2.3	3.4

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 24 Apr 1972      **Lifetime Generation:** 62547.8 GW(e).h  
**Date of First Criticality:** 15 Mar 1980      **Cumulative Energy Availability Factor:** 73.9%  
**Date of Grid Connection:** 26 Mar 1980      **Cumulative Load Factor:** 73.7%  
**Date of Commercial Operation:** 01 Jan 1981      **Cumulative Unit Capability Factor:** 77.4%  
**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 (%)
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	84.9	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	76.0	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	74.5	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

## SK-3 BOHUNICE-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	5088.0	71.8	XP	N	TG POWER REDUCTION DUE TO CIRCULATING WATER TEMPERATURE
02 Jan	5.0	0.9	UP2	A41	SHIFT OF TG 22 FROM DISPATCHING RESERVE TO FAILURE AFTER UNSUCCESSFUL GVS 14 ( SELF-CONSUMPTION GENERATOR) SYNCHRONISATION BY DEMAND OF DISPATCHER FOR TG 22 SYNCHRONISATION TO SLOVAK ENERGY SYSTEM
04 Jan	16.0	3.2	UP2	A31	TG 22 SHUT DOWN BY CONTROL ROOM PERSONNEL AFTER DECREASE OF TG22 POWER FROM 190 MW TO 10 MW (DUE TO INCOMPLETE CLOSING OF TURBINE STOP VALVE) ON 92% REACTOR OPERATION, IT OCCURRED WITHOUT CAUSE SIGNALLING. ROOT CAUSE OF EVENT WAS NOT FOUND.
16 Jan	32.0	6.0	UP2	A31	TG22 SHUT DOWN DUE TO LEAK OF MAIN CONDENSER TUBES
30 Mar	29.0	5.0	PP	E31	ALTERNATING SHUTDOWN OF TURBINES TG21 AND TG22 FOR REGULAR TESTING OF SAFEGUARDS AND PROTECTIONS
16 Apr	26.0	4.8	UP2	A31	TG21 SHUTDOWN DUE TO REPAIR OF STEAM EXTRACTION 7 LINE
01 Jul	9.0	0.5	UP	N33	TURBINE POWER REDUCTION DUE TO WORSEN VACUUM SYSTEM BECAUE OF HIGHER CIRCULATION COOLING WATER TEMPERATURE
01 Aug	528.0	15.9	XP	N	TG POWER REDUCTION DUE TO CIRCULATING WATER TEMPERATURE IN AUGUST
05 Aug	411.0	15.7	XP	S	FUEL COAST-DOWN OPERATION
23 Aug	5.0	1.3	PP	E	REACTOR POWER REDUCTION BEFORE ANNAUL MAINTENANCE AND REFUELLING
23 Aug	1678.0	684.6	PF	C	ANNUAL MAINTENANCE AND REFUELLING
01 Nov	17.0	3.2	PP	E	START-UP OPERATION
01 Nov	1445.0	17.5	XP	N	TG POWER REDUCTION DUE TO CIRCULATING WATER TEMPERATURE IN NOVEMBER
18 Nov	2.0	0.1	UP	A33	POWER UNIT REDUCTION FROM 99% TO 96,8% DUE TO CIRCULATION COOLING WATER PUMP FAILURE
07 Dec	22.0	4.2	UP1	A31	TG22 TURBINE CONTROL OIL REPAIR – PIPES EXCHANGE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1980 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					73	
B. Refuelling without a maintenanc					1	
C. Inspection, maintenance or repai combined with refuelling	1678			1311		
D. Inspection, maintenance or repai without refuelling				319		
E. Testing of plant systems or component				4		
J. Grid failure or grid unavailabilit						1
K. Load-following (frequency contro reserve shutdown due to reduced energ demand)					0	
Subtotal	1678	0	0	1634	74	1
Total		1678			1709	

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

System	2003 Hours Lost	1980 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		13
12. Reactor I&C Systems		2
13. Reactor Auxiliary System:		16
14. Safety Systems		1
15. Reactor Cooling System:		1
16. Steam generation system:		5
17. Safety I&C Systems (excluding reactor I&C		15
31. Turbine and auxiliarie:		1
32. Feedwater and Main Steam Syster		5
35. All other I&C Systems		1
42. Electrical Power Supply System:		7
Total	0	67

**SK-13 BOHUNICE-3**

Operator: EBO (ELECTROSTATION BOHUNICE)

Contractor: SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

**1. Station Details**

Type: WWER  
 Maximum Net Capacity  
 at the beginning of 2003: 408.0 MW(e)  
 Design Net Capacity: 420.0 MW(e)  
 Design Discharge Burnup: —

**2. Production Summary 2003**

Energy Production: 2485.0 GW(e).h  
 Energy Availability Factor: 75.5%  
 Load Factor: 69.5%  
 Operating Factor: 78.9%  
 Energy Unavailability Factor: 24.5%  
 Total Off-line Time: 1852 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	230.9	255.9	284.0	265.7	271.0	175.1	0.0	0.0	203.3	272.0	257.8	269.2	2485.0
EAF (%)	98.9	97.8	97.1	96.5	93.9	60.3	0.0	0.0	76.5	94.5	95.3	97.8	75.5
UCF (%)	100.0	98.8	100.0	100.0	99.0	66.8	0.0	0.0	81.0	98.0	99.0	100.0	78.3
LF (%)	76.1	93.3	93.6	90.6	89.3	59.6	0.0	0.0	69.2	89.5	87.7	88.7	69.5
OF (%)	100.0	100.0	99.9	100.1	100.0	67.1	0.0	0.0	82.4	100.0	100.0	100.0	78.9
EUf (%)	1.1	2.2	2.9	3.5	6.1	39.7	100.0	100.0	23.5	5.5	4.7	2.2	24.5
PUF (%)	0.0	0.0	0.0	0.0	1.1	33.2	100.0	100.0	18.6	2.0	1.0	0.0	21.6
UCLF (%)	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.1
XUF (%)	1.1	1.0	2.9	3.5	5.1	6.4	0.0	0.0	4.5	3.5	3.7	2.2	2.8

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation**

THE UNIT OPERATION STARTED WITH UNIT SECONDARY LOAD CONTROL EXPLOITATION IN THIS YEAR.

**5. Historical Summary**

Date of Construction Start: 01 Dec 1976      Lifetime Generation: 52894.6 GW(e).h  
 Date of First Criticality: 07 Aug 1984      Cumulative Energy Availability Factor: 77.4%  
 Date of Grid Connection: 20 Aug 1984      Cumulative Load Factor: 76.3%  
 Date of Commercial Operation: 14 Feb 1985      Cumulative Unit Capability Factor: 77.8%  
    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 (%)
1984	685.6	408.0	0.0	0.0	81.8	100.0	20.2	0.0	2219	26.7
1985	2721.6	408.0	0.0	0.0	78.7	100.0	76.1	0.0	7057	80.6
1986	2674.1	408.0	75.4	75.4	75.4	75.4	74.8	74.8	7089	80.9
1987	1997.4	408.0	55.5	65.5	53.7	64.5	55.9	65.4	5181	59.1
1988	2866.9	408.0	80.2	70.4	79.9	69.7	80.0	70.2	7329	83.4
1989	2992.3	408.0	85.0	74.1	84.1	73.3	83.7	73.6	7633	87.1
1990	2829.1	408.0	80.5	75.3	79.2	74.5	79.2	74.7	7376	84.2
1991	2585.6	408.0	74.2	75.2	71.9	74.1	72.3	74.3	6717	76.7
1992	3140.7	408.0	83.9	76.4	82.8	75.3	87.6	76.2	7528	85.7
1993	2973.1	408.0	86.5	77.7	83.2	76.3	83.2	77.1	7721	88.1
1994	2806.8	405.0	84.0	78.4	79.1	76.6	79.1	77.3	7423	84.7
1995	2536.7	408.0	78.1	78.3	70.1	75.9	71.0	76.7	6440	73.5
1996	3045.9	436.0	85.6	79.0	82.5	76.6	79.5	77.0	7504	85.4
1997	3096.4	440.0	87.7	79.8	84.0	77.2	80.3	77.3	7711	88.0
1998	2804.6	408.0	85.3	80.2	81.8	77.6	78.5	77.4	7571	86.4
1999	2468.5	408.0	76.5	80.0	69.7	77.0	69.1	76.8	6620	75.6
2000	2806.7	408.0	87.9	80.5	79.8	77.2	78.3	76.9	7776	88.5
2001	2687.0	408.0	86.6	80.9	76.5	77.2	75.2	76.8	7680	87.7
2002	2690.7	408.0	87.4	81.3	83.9	77.6	75.3	76.7	7711	88.0
2003	2485.0	408.0	78.3	81.1	75.5	77.4	69.5	76.3	6908	78.9



# SK-13 BOHUNICE-3

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	4080.0	54.9	XP	N	TG POWER REDUCTION DUE TO CIRCULATING WATER TEMPERATURE
21 Feb	18.0	3.4	UP2	A31	TG 31 SHUT DOWN FOR ROTOR VIBRATIONS INCREASE CAUSED BY LEVEL REGULATING VALVE FAILURE IN CONDENSATE RECEIVER COMPARATIVE DEGREE OF TG 31 SEPARATOR - REHEATER. REGULATING VALVE WAS CHANGED. ROOT CAUSE WAS EQUIPMENT DEFORMATION FORCED BY EXCESSIVE MECHANIC STRESS.
23 May	17.0	3.2	PP	E	SHUTDOWN OF TURBOGENERATOR TG31 DUE TO TESTS OF INCREASE OF EFFICIENCY UNIT CONTROL ON THE END OF THE FUEL CYCLE
09 Jun	286.0	4.7	XP	S	FUEL COAST-DOWN OPERATION
20 Jun	3.0	0.9	PP	E	REACTOR POWER REDUCTION BEFORE ANNUAL MAINTENANCE AND REFUELLING
21 Jun	1852.0	755.6	PF	C	ANNUAL MAINTENANCE AND REFUELLING
06 Sep	13.0	2.5	PP	E	START-UP OPERATION
06 Sep	2801.0	41.2	XP	N	TG POWER REDUCTION DUE TO CIRCULATING WATER TEMPERATURE
24 Sep	1.0	0.0	PP	E35	UNIT SECONDARY LOAD CONTROL FUNCTIONING TEST
25 Sep	8.0	1.1	UP	A31	TG31 ELECTROHYDRAULIC CONVERTER FAILURE
29 Sep	4.0	0.2	PP	E35	UNIT SECONDARY LOAD CONTROL FUNCTIONING TEST
30 Sep	4.0	0.1	PP	E35	UNIT SECONDARY LOAD CONTROL FUNCTIONING TEST
02 Oct	6.0	0.2	PP	E35	UNIT SECONDARY LOAD CONTROL FUNCTIONING TEST
06 Oct	4.0	0.1	PP	E35	UNIT SECONDARY LOAD CONTROL FUNCTIONING TEST
07 Oct	7.0	0.3	PP	E35	UNIT SECONDARY LOAD CONTROL FUNCTIONING TEST
08 Oct	171.0	5.4	PP	E35	UNIT SECONDARY LOAD CONTROL FUNCTIONING TEST
16 Nov	16.0	3.0	PP	E35	UNIT SECONDARY LOAD CONTROL FUNCTIONING TEST
21 Nov	1.0	0.1	UP	A12	POWER UNIT REDUCTION FROM 93% TO 85% DUE TO CONTROL ROD 03-46 FALL DOWN. THE CAUSE OF THE DROP WAS INVALID LOW FREQUENCY CONVERTER.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					77	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	1852			1167		
D. Inspection, maintenance or repair without refuelling				172		
J. Grid failure or grid unavailability						9
Subtotal	1852	0	0	1339	77	9
Total		1852			1425	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		3
13. Reactor Auxiliary System:		7
14. Safety Systems		1
15. Reactor Cooling System:		19
16. Steam generation system:		19
17. Safety I&C Systems (excluding reactor I&C)		1
32. Feedwater and Main Steam System		13
33. Circulating Water System		1
41. Main Generator System:		0
42. Electrical Power Supply System:		8
Total	0	72

# SK-14 BOHUNICE-4

**Operator:** EBO (ELECTROSTATION BOHUNICE)  
**Contractor:** SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 408.0 MW(e)  
**Design Net Capacity:** 398.0 MW(e)  
**Design Discharge Burnup:** —

## 2. Production Summary 2003

**Energy Production:** 2814.9 GW(e).h  
**Energy Availability Factor:** 84.4%  
**Load Factor:** 78.8%  
**Operating Factor:** 88.3%  
**Energy Unavailability Factor:** 15.6%  
**Total Off-line Time:** 1023 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	288.9	262.9	288.1	224.4	0.0	192.1	268.5	277.4	257.7	262.0	244.8	248.2	2814.9
<b>EAF (%)</b>	98.7	98.9	97.1	77.0	0.0	71.6	92.0	94.1	94.2	96.9	94.6	98.4	84.4
<b>UCF (%)</b>	100.0	100.0	100.0	83.8	0.0	76.1	97.1	100.0	100.0	100.0	97.6	100.0	87.8
<b>LF (%)</b>	95.2	95.9	94.9	76.5	0.0	65.4	88.5	91.4	87.7	86.2	83.3	81.8	78.8
<b>OF (%)</b>	100.0	100.0	99.9	84.4	0.0	76.9	100.0	100.0	100.0	100.0	100.0	100.0	88.3
<b>EUf (%)</b>	1.3	1.1	2.9	23.0	100.0	28.4	8.0	5.9	5.8	3.1	5.4	1.6	15.6
<b>PUF (%)</b>	0.0	0.0	0.0	16.2	100.0	21.8	2.0	0.0	0.0	0.0	1.1	0.0	11.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	2.1	1.0	0.0	0.0	0.0	1.3	0.0	0.4
<b>XUF (%)</b>	1.3	1.1	2.9	6.8	0.0	4.4	5.1	5.8	5.8	3.1	3.0	1.6	3.4

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

THE UNIT OPERATION STARTED WITH UNIT SECONDARY LOAD CONTROL EXPLOITATION IN THIS YEAR

## 5. Historical Summary

**Date of Construction Start:** 01 Dec 1976  
**Date of First Criticality:** 02 Aug 1985  
**Date of Grid Connection:** 09 Aug 1985  
**Date of Commercial Operation:** 18 Dec 1985

**Lifetime Generation:** 51699.7 GW(e).h  
**Cumulative Energy Availability Factor:** 79.1%  
**Cumulative Load Factor:** 78.0%  
**Cumulative Unit Capability Factor:** 77.8%  
**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	1083.5	408.0	0.0	0.0	99.4	100.0	31.0	0.0	3177	37.1
1986	2887.9	408.0	81.0	81.0	81.0	81.0	80.8	80.8	7294	83.3
1987	3084.7	408.0	86.6	83.8	86.1	83.5	86.3	83.6	7783	88.8
1988	2786.5	408.0	78.0	81.9	77.8	81.6	77.7	81.6	7248	82.5
1989	2827.7	408.0	80.0	81.4	79.2	81.0	79.1	81.0	7548	86.2
1990	2873.8	408.0	82.0	81.5	80.7	81.0	80.4	80.9	7427	84.8
1991	2850.5	408.0	82.9	81.7	80.4	80.9	79.8	80.7	7438	84.9
1992	2711.9	408.0	73.3	80.5	70.4	79.4	75.7	80.0	6714	76.4
1993	2847.6	408.0	82.6	80.8	79.7	79.4	79.7	79.9	7341	83.8
1994	2791.4	405.0	83.9	81.1	78.7	79.3	78.7	79.8	7389	84.3
1995	2823.7	408.0	88.5	81.9	79.3	79.3	79.0	79.7	7211	82.3
1996	2834.9	436.0	79.2	81.6	76.1	79.0	74.0	79.2	6953	79.2
1997	2953.5	440.0	84.7	81.9	80.2	79.1	76.6	78.9	7469	85.3
1998	2822.4	408.0	85.7	82.2	82.4	79.4	79.0	78.9	7525	85.9
1999	2656.5	408.0	81.7	82.1	75.1	79.1	74.3	78.6	7283	83.1
2000	2431.9	408.0	76.3	81.8	68.9	78.4	67.9	77.9	6791	77.3
2001	2793.3	408.0	86.7	82.1	79.2	78.4	78.2	77.9	7721	88.1
2002	2823.2	408.0	87.9	82.4	85.0	78.8	79.0	78.0	7742	88.4
2003	2814.9	408.0	87.8	82.7	84.4	79.1	78.8	78.0	7737	88.3

# SK-14 BOHUNICE-4

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	2767.0	24.4	XP	N	TG POWER REDUCTION DUE TO CIRCULATING WATER TEMPERATURE
08 Apr	423.0	11.4	XP	S	FUEL COAST-DOWN OPERATION
26 Apr	1011.0	412.5	PF	C	ANNUAL MAINTENANCE AND REFUELLING
26 Apr	7.0	1.2	PP	E	REACTOR POWER REDUCTION BEFORE ANNUAL MAINTENANCE AND REFUELLING
07 Jun	2.0	0.6	PP	E	START-UP OPERATION
07 Jun	3528.0	72.5	XP	N	TG POWER REDUCTION DUE TO CIRCULATING WATER TEMPERATURE
12 Jun	12.0	0.6	PP	E	UNIT SECONDARY LOAD CONTROL FUNCTIONING TEST
26 Jun	6.0	1.4	UP	Z	RUMP-UP AFTER FULL REACTOR SCRAM
26 Jun	12.0	4.9	UF4	L	AUTOMATIC REACTOR TRIP FOLLOWING HIGH LEVEL IN STEAM GENERATOR DUE TO PERSONNEL ERROR. I & C WORKER SWITCHED THE LEVEL SENSOR POWER SUPPLY OF THE STEAM GENERATOR (SG) NO. 46 OFF BY MISTAKE ON THE WORKING REACTOR UNIT NO. 4 INSTEAD OF THE STEAM GENERATOR NO. 36 ON THE REACTOR UNIT NO. 3., WHICH WAS IN REFUELLING AND MAINTENANCE OUTAGE.
30 Jun	2.0	0.1	PP	E	UNIT SECONDARY LOAD CONTROL FUNCTIONING TEST
01 Jul	8.0	1.4	UP	A35	TG 41 TRIP DUE TO SPURIOUS ACTUATION. THE CAUSE WAS SPURIOUS ACTUATION OF CONDENSER LEVEL MEASUREMENT. THE ELECTRONIC BLOCK WHICH MADE THE SPURIOUS SIGNAL WAS IDENTIFIED AND EXCHANGED.
04 Jul	9.0	1.6	UP	A41	TG TRIP DUE TO ACTUATION OF GENERATOR ELECTRICAL PROTECTION EARTH CONNECTION
14 Jul	38.0	1.5	PP	E35	UNIT SECONDARY LOAD CONTROL FUNCTIONING TEST
22 Jul	221.0	4.5	PP	E35	UNIT SECONDARY LOAD CONTROL FUNCTIONING TEST
12 Aug	2.0	0.1	PP	E12	IN CORE MEASUREMENT SYSTEM TEST BY CONTROL ROD FALL DOWN
01 Nov	1464.0	13.5	XP	N	TG POWER REDUCTION DUE TO CIRCULATING WATER TEMPERATURE
08 Nov	52.0	3.1	PP	E35	UNIT SECONDARY LOAD CONTROL FUNCTIONING TEST
16 Nov	9.0	1.6	UP1	A31	TG21 SHUTDOWN DUE TO LEAK REPAIR ON 6TH STEAM EXTRACTION LINE
16 Nov	9.0	1.6	UP1	A31	TG21 SHUTDOWN DUE TO LEAK REPAIR ON 6TH STEAM EXTRACTION LINE
29 Nov	12.0	2.3	UP1	A31	TG21 SHUTDOWN DUE TO LEAK REPAIR ON 8TH STEAM EXTRACTION LINE

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					52	
C. Inspection, maintenance or repair combined with refuelling	1011			1100		
D. Inspection, maintenance or repair without refuelling				77		
E. Testing of plant systems or component				1		
J. Grid failure or grid unavailability						0
L. Human factor related		12				
Subtotal	1011	12	0	1178	52	0
Total		1023			1230	

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

System	2003 Hours Lost	1985 to 2003 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)		5
32. Feedwater and Main Steam System		5
33. Circulating Water System		0
42. Electrical Power Supply System:		0
XX. Miscellaneous Systems		1
Total	0	48

**SK-6 MOCHOVCE-1****Operator:** EMO (ELECTROSTATION MOCHOVCE)**Contractor:** SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)**1. Station Details**

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 405.0 MW(e)  
**Design Net Capacity:** 420.0 MW(e)  
**Design Discharge Burnup:** —

**2. Production Summary 2003**

**Energy Production:** 2796.6 GW(e).h  
**Energy Availability Factor:** 82.3%  
**Load Factor:** 78.8%  
**Operating Factor:** 83.6%  
**Energy Unavailability Factor:** 17.7%  
**Total Off-line Time:** 1436 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	270.6	279.5	121.6	0.0	178.2	267.5	258.8	274.3	280.0	291.6	280.9	293.6	2796.6
<b>EAF (%)</b>	97.3	100.0	41.5	0.0	62.3	97.4	99.7	97.3	99.9	96.1	96.2	100.0	82.3
<b>UCF (%)</b>	100.0	100.0	44.8	0.0	62.4	97.9	100.0	98.4	100.0	96.1	96.2	100.0	83.0
<b>LF (%)</b>	89.8	102.7	40.4	0.0	59.1	91.7	85.9	91.0	96.0	96.7	96.3	97.4	78.8
<b>OF (%)</b>	96.5	100.0	44.1	0.0	65.2	100.0	100.0	99.1	100.0	98.8	100.0	100.0	83.6
<b>EUJ (%)</b>	2.7	0.0	58.5	100.0	37.7	2.6	0.3	2.7	0.1	3.9	3.8	0.0	17.7
<b>PUF (%)</b>	0.0	0.0	55.2	83.2	2.4	1.2	0.0	0.0	0.0	0.0	0.0	0.0	11.8
<b>UCLF (%)</b>	0.0	0.0	0.0	16.8	35.1	0.9	0.0	1.6	0.0	3.9	3.8	0.0	5.2
<b>XUF (%)</b>	2.7	0.0	3.3	0.0	0.1	0.5	0.3	1.1	0.1	0.0	0.0	0.0	0.7

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation**

THE GENERAL PERFORMANCE AND OPERATIONAL MODE OF THE PLANT - LOAD FOLLOWING FOR A PERIOD AND RE SHUT-DOWN FOR 30 H (2X ACTUATION OF PROTECTION AO-1 DUE TO WATER LEVEL IN SG). THE SIGNIFICANT FACTORS AFFECTING ENERGY GENERATION - EQUIPMENT PERFORMANCE /UNPLANNED LOSS DUE TO PRESSURE INCREASE IN INNER O RING OF REACTOR VESSEL MAIN FLANGE AND REPAIR OF VALVE IN CONTROLLED AREA/.

**5. Historical Summary**

**Date of Construction Start:** 01 Oct 1983      **Lifetime Generation:** 14264.3 GW(e).h  
**Date of First Criticality:** 09 Jun 1998      **Cumulative Energy Availability Factor:** 75.8%  
**Date of Grid Connection:** 04 Jul 1998      **Cumulative Load Factor:** 75.2%  
**Date of Commercial Operation:** 13 Oct 1998      **Cumulative Unit Capability Factor:** 83.1%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1998	936.3	408.0	0.0	0.0	98.3	100.0	52.0	0.0	3343	75.7
1999	2376.1	404.0	70.4	70.4	65.8	65.8	67.1	67.1	6397	73.0
2000	2816.9	404.0	90.0	80.2	79.4	72.6	79.4	73.3	8311	94.6
2001	2423.6	404.0	75.0	78.5	68.1	71.1	68.5	71.7	6648	75.9
2002	2914.8	405.0	86.3	80.4	83.3	74.2	82.2	74.3	7628	87.1
2003	2796.6	405.0	83.0	80.9	82.3	75.8	78.8	75.2	7324	83.6

# SK-6 MOCHOVCE-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	36.0	7.0	XP	K	TG12 TURBINE RESERVE SHUTDOWN (LOAD FOLLOWING)CONTINUATION FROM 30.12.2002
03 Jan	81.0	15.8	XP	K	TG12 TURBINE RESERVE SHUTDOWN (LOAD FOLLOWING)
03 Jan	20.0	8.1	XF	J	FAILURE OF 400 KV DISTRIBUTION LINE, REACTOR POWER DROP TO 10% NNOM
28 Feb	360.0	10.0	XP	S	COAST-DOWN OPERATION
14 Mar	1009.0	408.9	PF	C	ANNUAL REFUELLING WITH GENERAL OVERHAUL
25 Apr	380.0	154.2	UF	A11	PRESSURE INCREASE IN INNER O RING OF REACTOR VESSEL MAIN FLANGE - WITHOUT REACH OF LIMITATION 1,96 MPA. INES 0
11 May	69.0	7.4	PP	E	START-UP AFTER GO
04 Jul	318.0	11.4	XP	K	LOAD FOLLOWING
27 Jul	85.0	16.4	XP	K	TG11 RESERVE SHUTDOWN (LOAD FOLLOWING)
31 Jul	92.0	18.1	XP	K	LOAD FOLLOWING - RESERVE SHUT-DOWN TG11
19 Aug	11.0	4.6	UF4	L32	AUTOM. ACTUATION OF RE PROTECTION AO-1 DUE TO LOW FEEDWATER LEVEL IN 2 STEAMGENERATORS - DURING THE MAINTENANCE OF FEEDWATER FLOW MEASUREMENT VALVE. INES 0.
03 Oct	63.0	5.4	UP	A15	PLANNED POWER DECREASING TO 81% N RE - RESEALING /FURMANITE/ OF MAIN COOLANT PIPE VALVE
29 Oct	12.0	5.0	UF	A16	BOTH TURBINES TRIP DUE TO HIGH WATER LEVEL +200MM IN SG
22 Nov	32.0	6.3	UP	A15	POWER DECREASED (DECREASING OF RAD.EXPOSURE) - REPAIR OF VALVE IN CONTROLLED AREA
17 Dec	180.0	6.5	XP	K	LOAD FOLLOWING

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1998 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		392			32	
B. Refuelling without a maintenanc					6	
C. Inspection, maintenance or repai combined with refuelling	1009			845		
D. Inspection, maintenance or repai without refuelling				69		
H. Nuclear regulatory requirement				46		
J. Grid failure or grid unavailabilit			20			
K. Load-following (frequency contro reserve shutdown due to reduced energ demand)					12	
L. Human factor relatetc		11				
Subtotal	1009	403	20	960	50	0
Total		1432			1010	

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

System	2003 Hours Lost	1998 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	380	
12. Reactor I&C Systems		10
16. Steam generation system:	12	
17. Safety I&C Systems (excluding reactor I&C		8
42. Electrical Power Supply System:		13
Total	392	31

**SK-7 MOCHOVCE-2**

Operator: EMO (ELECTROSTATION MOCHOVCE)

Contractor: SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

**1. Station Details**

Type: WWER  
 Maximum Net Capacity  
 at the beginning of 2003: 405.0 MW(e)  
 Design Net Capacity: 420.0 MW(e)  
 Design Discharge Burnup: —

**2. Production Summary 2003**

Energy Production: 2964.9 GW(e).h  
 Energy Availability Factor: 87.4%  
 Load Factor: 83.6%  
 Operating Factor: 88.2%  
 Energy Unavailability Factor: 12.6%  
 Total Off-line Time: 1031 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	246.0	272.3	295.2	285.2	294.7	115.3	42.2	281.6	269.9	293.2	290.8	278.4	2964.9
EAF (%)	99.5	100.0	100.0	99.6	98.5	40.5	17.2	99.0	99.7	99.8	100.0	95.7	87.4
UCF (%)	100.0	100.0	100.0	99.6	99.2	42.7	17.3	100.0	100.0	100.0	100.0	95.7	87.8
LF (%)	81.6	100.0	98.0	98.0	97.8	39.6	14.0	93.5	92.6	97.2	99.7	92.4	83.6
OF (%)	99.9	100.0	99.9	100.1	100.0	41.7	21.5	100.0	100.0	100.0	100.0	96.5	88.2
EUf (%)	0.5	0.0	0.0	0.4	1.5	59.5	82.8	1.0	0.3	0.2	0.0	4.3	12.6
PUF (%)	0.0	0.0	0.0	0.0	0.0	57.3	82.7	0.0	0.0	0.0	0.0	0.0	11.7
UCLF (%)	0.0	0.0	0.0	0.4	0.8	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.5
XUF (%)	0.5	0.0	0.0	0.0	0.7	2.3	0.0	1.0	0.3	0.2	0.0	0.0	0.4

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation**

THE GENERAL PERFORMANCE AND OPERATIONAL MODE OF THE PLANT - LOAD FOLLOWING FOR A PERIOD AND RE SHUT-DOWN FOR 33 H (ACTUATION AO-1).THE SIGNIFICANT FACTORS AFFECTING ENERGY GENERATION - EQUIPMENT PERFORMANCE /FALSE SIGNAL FROM GENERATOR PROTECTION/.

**5. Historical Summary**

Date of Construction Start: 01 Oct 1983      Lifetime Generation: 10645.5 GW(e).h  
 Date of First Criticality: 01 Dec 1999      Cumulative Energy Availability Factor: 77.1%  
 Date of Grid Connection: 20 Dec 1999      Cumulative Load Factor: 75.3%  
 Date of Commercial Operation: 11 Apr 2000      Cumulative Unit Capability Factor: 83.5%  
    Cumulative Energy Unavailability Factor: 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 (%)
2000	2641.4	404.0	0.0	0.0	90.9	100.0	74.4	0.0	7513	85.5
2001	2540.9	404.0	78.2	78.2	72.1	72.1	71.8	71.8	6967	79.5
2002	2498.4	405.0	76.0	77.1	71.7	71.9	70.4	71.1	6862	78.3
2003	2964.9	405.0	87.8	80.7	87.4	77.1	83.6	75.3	7729	88.2

**SK-7 MOCHOVCE-2****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
04 Jan	243.0	48.4	XP	K	TG21 RESERVE SHUTDOWN (LOAD FOLLOWING)
27 Mar	146.0	5.4	XP	K	LOAD FOLLOWING
05 Jun	203.0	6.0	XP	S	FUEL COAST DOWN
13 Jun	998.0	404.5	PF	C	GENERAL OVERHAUL (GO)
25 Jul	77.0	11.7	PP	E	RAMP-UP AFTER GO
30 Jul	24.0	4.1	XP	K	TG21 TURBINE RESERVE SHUTDOWN (LOAD FOLLOWING)
06 Aug	128.0	5.0	XP	K	LOAD FOLLOWING - POWER CONTROL.
24 Aug	183.0	7.2	XP	K	LOAD FOLLOWING - GRID POWER CONTROL DUE TO REDUCED ENERGY DEMAND.
02 Sep	126.0	4.7	XP	K	LOAD FOLLOWING
13 Sep	125.0	4.7	XP	K	LOAD FOLLOWING
24 Sep	204.0	7.7	XP	K	LOAD FOLLOWING
25 Dec	33.0	12.3	UF4	A41	PROTECTION AUTOMATIC ACTUATION - FALSE SIGNAL FROM PROTECTION SYSTEM OF GENERATOR 2MKZ02 - 2.UNIT EMO

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

Outage Cause	2003 Hours Lost			2000 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		33			93	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	998			820		
D. Inspection, maintenance or repair without refuelling				114		
L. Human factor related					8	
Subtotal	998	33	0	934	102	0
Total		1031			1036	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	2000 to 2003 Average Hours Lost Per Year
15. Reactor Cooling System:		82
16. Steam generation system:		11
41. Main Generator System:	33	
Total	33	93

# SI-1 KRSKO

**Operator:** NEK (NUKLEARNA ELEKTRARNA KRSKO)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 676.0 MW(e)  
**Design Net Capacity:** 632.0 MW(e)  
**Design Discharge Burnup:** 38-40000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4963.3 GW(e).h  
**Energy Availability Factor:** 86.2%  
**Load Factor:** 83.8%  
**Operating Factor:** 92.3%  
**Energy Unavailability Factor:** 13.8%  
**Total Off-line Time:** 676 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	488.8	449.3	491.7	468.4	120.7	287.7	423.2	362.3	452.7	488.5	437.5	492.6	4963.3
<b>EAF (%)</b>	100.0	100.0	99.4	99.2	27.0	62.1	87.1	75.0	94.2	100.0	92.9	99.0	86.2
<b>UCF (%)</b>	100.0	100.0	99.4	100.0	31.2	82.4	100.0	96.5	98.2	100.0	93.7	99.0	91.6
<b>LF (%)</b>	97.2	98.9	97.8	96.4	24.0	59.1	84.1	72.0	93.0	97.0	89.9	97.9	83.8
<b>OF (%)</b>	100.0	100.0	99.9	100.1	28.2	89.0	100.0	97.4	100.0	100.0	93.9	100.0	92.3
<b>EUf (%)</b>	0.0	0.0	0.6	0.8	73.0	37.9	12.9	25.0	5.8	0.0	7.1	1.0	13.8
<b>PUF (%)</b>	0.0	0.0	0.6	0.0	68.8	17.6	0.0	1.1	1.8	0.0	0.0	0.0	7.6
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.0	6.3	1.0	0.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.8	4.2	20.3	12.9	21.5	4.0	0.0	0.8	0.0	5.4

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 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:** 94824.1 GW(e).h  
**Cumulative Energy Availability Factor:** 81.0%  
**Cumulative Load Factor:** 79.3%  
**Cumulative Unit Capability Factor:** 77.6%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	2387.8	632.0	0.0	0.0	49.7	100.0	43.1	0.0	5104	58.3
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	80.8	75.2	80.8	75.2	75.8	71.5	7073	80.5
1985	3845.3	632.0	72.1	74.2	72.1	74.2	69.5	70.8	6421	73.3
1986	3822.0	620.0	74.8	74.3	73.7	74.1	70.4	70.7	6561	74.9
1987	4278.8	620.0	83.5	76.2	83.5	75.9	78.8	72.3	7287	83.2
1988	3935.8	620.0	77.0	76.3	76.9	76.1	72.3	72.3	6866	78.2
1989	4453.9	620.0	85.5	77.6	85.2	77.4	82.0	73.7	7500	85.6
1990	4386.8	620.0	87.1	78.8	85.4	78.4	80.8	74.6	7592	86.7
1991	4718.2	632.0	94.6	80.5	88.7	79.5	85.2	75.8	8133	92.8
1992	3767.2	632.0	73.9	79.9	68.5	78.4	68.0	75.0	6699	76.5
1993	3762.8	620.0	72.5	79.2	69.3	77.6	69.3	74.5	6493	74.1
1994	4403.5	620.0	82.1	79.5	81.1	77.9	81.1	75.0	7402	84.5
1995	4568.5	620.0	85.1	79.9	84.1	78.4	84.1	75.7	7606	86.8
1996	4361.6	620.0	79.6	79.9	79.6	78.4	80.1	76.0	7143	81.3
1997	4794.0	620.0	88.3	80.4	87.8	79.1	88.3	76.8	7824	89.3
1998	4793.6	620.0	89.5	81.0	88.0	79.6	88.3	77.5	7913	90.3
1999	4492.4	620.0	84.7	81.2	82.4	79.8	82.7	77.8	7480	85.4
2000	4548.8	646.0	82.6	81.3	80.5	79.8	80.2	78.0	7295	83.0
2001	5036.3	656.0	88.5	81.7	86.2	80.2	87.6	78.5	7790	88.9
2002	5308.8	676.0	92.0	82.2	91.1	80.8	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



# SI-1 KRSKO

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
09 Mar	29.0	3.2	PP	D33	CONDENSER TAPROGGE FILTERS MAINTANENACE.
18 Apr	522.3	25.1	XP	S	COAST DOWN OPERATION
10 May	615.9	431.9	PF	C	ANNUAL OUTAGE WITH REFUELING
08 Jun	1980.0	272.1	XP2	N	REDUCED PWER OPERATION DUE TO SAVA RIVER HEATUP RESTRICTION
10 Aug	29.0	5.6	PP	D33	CONDENSER CLEAN-UP
27 Aug	19.0	11.9	UF4	A32	REACTOR TRIP WITH SAFETY INJECTION ACTUATION
01 Sep	261.0	19.6	XP2	N	REDUCED POWER OPERATION DUE TO SAVA RIVIR HEATUP RESTRICTION.
01 Sep	54.0	8.7	PP	D33	CONDENSER CLEAN-UP.
27 Nov	42.3	30.7	UF4	N33	REACTOR TRIP DUE TO LOSS OF CONDENSER VACUUM.
29 Nov	46.0	4.1	XP	K	DEMAND OF DISPATCHER
19 Dec	35.0	5.1	PP	D32	LOW PRESSURE FEEDWATER HEATERS REPAIR.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		19			149	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	615			1015		
D. Inspection, maintenance or repair without refuelling				209		
E. Testing of plant systems or components				65	2	
J. Grid failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						0
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)		42				
Subtotal	615	61	0	1289	151	0
Total		676			1440	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		2
14. Safety Systems		2
15. Reactor Cooling Systems		19
16. Steam generation systems		15
31. Turbine and auxiliaries		32
32. Feedwater and Main Steam System	19	50
33. Circulating Water System		1
35. All other I&C Systems		0
41. Main Generator Systems		6
42. Electrical Power Supply Systems		18
Total	19	145

# ZA-1 KOEBERG-1

Operator: ESKOM (ESKOM)  
 Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Maximum Net Capacity at the beginning of 2003: 900.0 MW(e)  
 Design Net Capacity: 921.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

## 2. Production Summary 2003

Energy Production: 6413.4 GW(e).h  
 Energy Availability Factor: 81.9%  
 Load Factor: 81.3%  
 Operating Factor: 84.5%  
 Energy Unavailability Factor: 18.1%  
 Total Off-line Time: 1362 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	230.8	0.0	485.6	644.0	666.4	645.3	594.3	666.2	640.9	542.2	642.0	655.6	6413.4
EAF (%)	34.9	0.0	73.6	100.0	99.9	100.0	89.4	100.0	99.4	82.2	99.7	98.5	81.9
UCF (%)	53.5	0.0	78.7	100.0	99.9	100.0	89.4	100.0	99.5	82.3	100.0	100.0	84.1
LF (%)	34.5	0.0	72.5	99.5	99.5	99.6	88.8	99.5	98.9	80.9	99.1	97.9	81.3
OF (%)	53.5	0.0	79.2	100.1	100.0	100.0	91.3	100.0	100.0	83.2	100.0	100.0	84.5
EUf (%)	65.1	100.0	26.4	0.0	0.1	0.0	10.6	0.0	0.6	17.8	0.3	1.5	18.1
PUf (%)	46.5	100.0	20.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.4
UCLF (%)	0.0	0.0	0.4	0.0	0.1	0.0	10.6	0.0	0.6	17.7	0.0	0.0	2.5
XUF (%)	18.7	0.0	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	1.5	2.2

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Jul 1976      Lifetime Generation: 105127.1 GW(e).h  
 Date of First Criticality: 14 Mar 1984      Cumulative Energy Availability Factor: 69.2%  
 Date of Grid Connection: 04 Apr 1984      Cumulative Load Factor: 66.2%  
 Date of Commercial Operation: 21 Jul 1984      Cumulative Unit Capability Factor: 77.8%  
    Cumulative Energy Unavailability Factor: 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 (%)
1984	3949.5	920.0	0.0	0.0	86.2	100.0	49.3	0.0	5063	58.1
1985	4004.3	920.0	53.5	53.5	53.5	53.5	49.7	49.7	4986	56.9
1986	3419.0	922.0	53.6	53.5	53.6	53.5	42.3	46.0	4575	52.2
1987	2864.5	920.0	61.6	56.2	61.6	56.2	35.5	42.5	4337	49.5
1988	5964.4	920.0	76.0	61.2	76.0	61.2	73.8	50.4	6791	77.3
1989	4498.1	922.0	63.2	61.6	63.2	61.6	55.2	51.3	5655	64.0
1990	3852.1	920.0	61.7	61.6	52.7	60.1	47.8	50.7	5360	61.2
1991	5976.8	920.0	76.3	63.7	74.6	62.2	74.2	54.1	6886	78.6
1992	3992.5	920.0	63.6	63.7	50.3	60.7	49.4	53.5	5697	64.9
1993	4097.9	920.0	66.4	64.0	50.5	59.6	50.8	53.2	6010	68.6
1994	5933.9	920.0	95.6	67.2	74.9	61.1	73.6	55.2	8422	96.1
1995	4576.9	920.0	65.7	67.0	56.8	60.7	56.8	55.4	5853	66.8
1996	5672.8	920.0	81.8	68.3	70.4	61.5	70.2	56.6	7260	82.7
1997	6610.7	920.0	87.4	69.7	82.3	63.1	82.0	58.6	7676	87.6
1998	7248.3	920.0	97.6	71.7	90.1	65.0	89.9	60.8	8552	97.6
1999	7051.7	920.0	88.1	72.8	83.3	66.2	87.5	62.6	7848	89.6
2000	5629.2	920.0	73.4	72.8	70.2	66.5	69.8	63.0	7250	82.7
2001	6042.5	920.0	83.0	73.4	77.1	67.1	75.0	63.7	7303	83.4
2002	7328.6	900.0	95.2	74.6	93.1	68.5	93.0	65.3	8417	96.1
2003	6413.4	900.0	84.1	75.1	81.9	69.2	81.3	66.2	7398	84.5

# ZA-1 KOEBERG-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
17 Jan	1173.0	1055.5	PF	C21	REFUELLING
19 Jul	65.0	58.8	UF2	A41	GENERATOR PROTECTION SYSTEM RELAY FAILURE
15 Oct	124.0	11.1	UF2	A42	LOSS OF SUPPLY TO 24 KV BREAKER COOLING FANS

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		189			246	
B. Refuelling without a maintenance					11	
C. Inspection, maintenance or repair combined with refuelling	1173			1194	15	
D. Inspection, maintenance or repair without refuelling				203		
E. Testing of plant systems or components				5	0	18
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				80	39	
Subtotal	1173	189	0	1482	311	18
Total		1362			1811	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		5
13. Reactor Auxiliary Systems		1
14. Safety Systems		4
15. Reactor Cooling Systems		70
16. Steam generation systems		0
31. Turbine and auxiliaries		47
32. Feedwater and Main Steam System		29
33. Circulating Water System		2
41. Main Generator Systems	65	28
42. Electrical Power Supply Systems	124	53
Total	189	239

## ZA-2 KOEBERG-2

Operator: ESKOM (ESKOM)  
 Contractor: AA (ALSTHOM ATLANTIQUE)

### 1. Station Details

Type: PWR  
 Maximum Net Capacity at the beginning of 2003: 900.0 MW(e)  
 Design Net Capacity: 921.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

### 2. Production Summary 2003

Energy Production: 6255.5 GW(e).h  
 Energy Availability Factor: 79.4%  
 Load Factor: 79.3%  
 Operating Factor: 81.6%  
 Energy Unavailability Factor: 20.6%  
 Total Off-line Time: 1610 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	672.2	606.0	671.3	488.6	671.3	650.2	658.6	654.7	597.9	153.8	0.0	430.8	6255.5
EAF (%)	100.0	100.0	100.0	76.4	100.0	100.0	98.3	97.9	86.0	29.3	0.0	65.4	79.4
UCF (%)	100.0	100.0	100.0	76.4	100.0	100.0	98.3	97.9	100.0	29.3	21.8	72.0	82.9
LF (%)	100.4	100.2	100.2	75.5	100.3	100.3	98.3	97.8	92.3	22.9	0.0	64.3	79.3
OF (%)	100.0	100.0	100.0	77.3	100.0	100.0	100.0	100.0	100.0	29.1	0.0	73.3	81.6
EUf (%)	0.0	0.0	0.0	23.6	0.0	0.0	1.7	2.1	14.0	70.7	100.0	34.6	20.6
PUF (%)	0.0	0.0	0.0	4.8	0.0	0.0	0.0	0.0	0.0	69.0	78.2	16.7	14.1
UCLF (%)	0.0	0.0	0.0	18.8	0.0	0.0	1.7	2.1	0.0	1.8	0.0	11.3	3.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0	21.8	6.6	3.5

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Jul 1976      Lifetime Generation: 95938.8 GW(e).h  
 Date of First Criticality: 07 Jul 1985      Cumulative Energy Availability Factor: 66.8%  
 Date of Grid Connection: 25 Jul 1985      Cumulative Load Factor: 65.2%  
 Date of Commercial Operation: 09 Nov 1985      Cumulative Unit Capability Factor: 77.8%  
    Cumulative Energy Unavailability Factor: 33.2%

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	1389.8	920.0	0.0	0.0	76.8	100.0	18.5	0.0	2006	24.5
1986	5409.0	922.0	67.4	67.4	67.3	67.3	67.0	67.0	5969	68.1
1987	3352.8	920.0	48.6	58.0	48.6	58.0	41.6	54.3	4193	47.9
1988	4552.7	920.0	63.1	59.7	63.1	59.7	56.3	55.0	5626	64.0
1989	6620.2	922.0	89.2	67.1	89.2	67.1	81.3	61.6	8115	91.9
1990	4614.3	920.0	64.8	66.7	58.4	65.4	57.3	60.7	5933	67.7
1991	3191.9	920.0	56.3	64.9	40.3	61.2	39.6	57.2	5067	57.8
1992	5308.1	920.0	94.9	69.2	66.3	61.9	65.7	58.4	8439	96.1
1993	3212.3	920.0	52.6	67.2	40.4	59.2	39.9	56.1	4654	53.1
1994	3755.9	920.0	69.2	67.4	49.5	58.2	46.6	55.1	5944	67.9
1995	6710.5	920.0	98.6	70.5	83.2	60.7	83.3	57.9	8640	98.6
1996	6084.9	920.0	81.5	71.5	75.8	62.0	75.3	59.5	7177	81.7
1997	6016.4	920.0	83.8	72.5	75.2	63.1	74.7	60.7	7409	84.6
1998	6333.0	920.0	81.3	73.2	79.0	64.3	78.6	62.1	7194	82.1
1999	6413.9	920.0	86.2	74.1	75.7	65.2	79.6	63.3	7509	85.7
2000	7365.9	920.0	98.1	75.7	91.2	66.9	91.1	65.2	8687	98.9
2001	4662.8	920.0	66.5	75.1	60.1	66.5	57.9	64.7	5461	62.3
2002	4688.8	900.0	60.6	74.3	59.6	66.1	59.5	64.4	5439	62.1
2003	6255.5	900.0	82.9	74.8	79.4	66.8	79.3	65.2	7150	81.6

## ZA-2 KOEBERG-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
18 Apr	34.0	30.2	PF	D31	TURBINE LUBRICATION OIL MOTOR REPLACE
20 Apr	135.0	121.7	UF2	A31	AUTOMATIC TURBINE TRIP DUE TP SEIZED TURBINE LUBRICATION OIL MOTOR
05 Jul	35.0	11.5	UP1	A31	CONDENSER TUBE LEAK REPAIR
08 Aug	38.0	13.9	UP1	A31	CONDENSER TUBE LEAK REPAIR
10 Oct	1200.0	1080.8	PF	C	REFUELLING
07 Dec	64.0	57.6	UF	A12	REACTOR SCRAM DUE TO A FAULTY STARTER CARD ON THE CONTROL ROD SYSTEM

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1978 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		199			370	16
B. Refuelling without a maintenance					8	
C. Inspection, maintenance or repair combined with refuelling	1200			842	26	
D. Inspection, maintenance or repair without refuelling	34			40		
E. Testing of plant systems or components				51	1	
G. Major back-fitting, refurbishment or upgrading activities without refuelling						0
H. Nuclear regulatory requirements					1	
J. Grid failure or grid unavailability					0	1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					93	3
Subtotal	1234	199	0	933	499	20
Total		1433			1452	

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

System	2003 Hours Lost	1978 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	64	9
14. Safety Systems		56
15. Reactor Cooling Systems		14
16. Steam generation systems		55
31. Turbine and auxiliaries	135	15
32. Feedwater and Main Steam System		21
33. Circulating Water System		3
41. Main Generator Systems		15
42. Electrical Power Supply Systems		195
Total	199	383

# ES-6 ALMARAZ-1

**Operator:** CNAT (CENTRALES NUCLEARES ALMARAZ-TRILLO(ID/UFG/ENDESA/HC/NUCLENOR ))  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 944.0 MW(e)  
**Design Net Capacity:** 900.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7499.1 GW(e).h  
**Energy Availability Factor:** 91.6%  
**Load Factor:** 90.7%  
**Operating Factor:** 94.0%  
**Energy Unavailability Factor:** 8.4%  
**Total Off-line Time:** 527 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	701.6	633.5	698.2	676.0	695.7	662.2	683.0	675.9	557.3	140.2	673.9	701.5	7499.1
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	99.9	98.7	98.5	97.6	83.8	22.3	99.7	100.0	91.6
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	26.9	99.7	100.0	93.8
<b>LF (%)</b>	99.9	99.9	99.4	99.6	99.1	97.4	97.3	96.2	82.0	19.9	99.1	99.9	90.7
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	29.3	100.0	100.0	94.0
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.1	1.3	1.5	2.4	16.2	77.7	0.3	0.0	8.4
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	0.3	0.0	6.2
<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	0.1	1.3	1.5	2.4	16.2	4.6	0.0	0.0	2.2

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 02 Jul 1973      **Lifetime Generation:** 141639.2 GW(e).h  
**Date of First Criticality:** 05 Apr 1981      **Cumulative Energy Availability Factor:** 83.7%  
**Date of Grid Connection:** 01 May 1981      **Cumulative Load Factor:** 84.0%  
**Date of Commercial Operation:** 01 Sep 1983      **Cumulative Unit Capability Factor:** 77.7%  
**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 (%)
1982	2322.6	930.0	0.0	0.0	86.9	100.0	28.5	0.0	5864	66.9
1983	3713.9	930.0	0.0	0.0	45.6	100.0	45.6	0.0	5925	67.6
1984	4820.5	893.0	65.0	65.0	65.0	65.0	61.5	61.5	6062	69.0
1985	4825.2	900.0	61.6	63.3	61.6	63.3	61.2	61.3	5705	65.1
1986	5425.0	900.0	69.3	65.3	69.3	65.3	68.8	63.8	6418	73.3
1987	7193.7	900.0	92.5	72.1	92.5	72.1	91.2	70.7	8346	95.3
1988	5879.6	900.0	74.6	72.6	74.6	72.6	74.4	71.4	6899	78.5
1989	6562.2	895.0	83.2	74.4	83.2	74.4	83.7	73.5	7640	87.2
1990	6460.7	895.0	82.2	75.5	82.2	75.5	82.4	74.7	7451	85.1
1991	7481.7	895.0	96.2	78.1	96.2	78.1	95.4	77.3	8589	98.0
1992	6379.1	895.0	80.8	78.4	80.8	78.4	81.1	77.7	7387	84.1
1993	6530.9	895.0	85.0	79.0	83.2	78.9	83.3	78.3	7663	87.5
1994	7448.6	895.0	95.9	80.6	95.1	80.3	95.0	79.8	8495	97.0
1995	6588.5	895.0	86.2	81.0	83.7	80.6	84.0	80.2	7709	88.0
1996	5904.3	895.0	73.8	80.5	72.5	80.0	75.1	79.8	6789	77.3
1997	6642.8	895.0	83.0	80.7	79.6	80.0	84.7	80.1	7371	84.1
1998	8032.5	944.0	98.8	81.9	97.1	81.2	97.1	81.3	8760	100.0
1999	6988.6	927.0	85.4	82.2	84.7	81.4	86.1	81.6	7613	86.9
2000	7471.6	927.0	91.1	82.7	90.3	81.9	91.8	82.2	8014	91.2
2001	8151.4	927.0	99.6	83.7	99.0	82.9	100.4	83.3	8749	99.9
2002	7428.0	944.0	92.2	84.1	90.4	83.3	89.8	83.6	8100	92.5
2003	7499.1	944.0	93.8	84.6	91.6	83.7	90.7	84.0	8233	94.0

# ES-6 ALMARAZ-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
27 Aug	955.5	147.3	XP	S21	POWER REDUCTION DUE TO STRETCH OUT
06 Oct	527.0	514.6	PF	C21	REFUELLING

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1982 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure				5	146	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	527			792		
D. Inspection, maintenance or repair without refuelling				257		
E. Testing of plant systems or components				76	0	
H. Nuclear regulatory requirements					2	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					1	
L. Human factor related					2	
Subtotal	527	0	0	1130	153	0
Total		527			1283	

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

System	2003 Hours Lost	1982 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		16
13. Reactor Auxiliary Systems		42
15. Reactor Cooling Systems		21
16. Steam generation systems		0
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		6
32. Feedwater and Main Steam System		28
33. Circulating Water System		1
41. Main Generator Systems		4
42. Electrical Power Supply Systems		29
Total	0	147

# ES-7 ALMARAZ-2

**Operator:** CNAT (CENTRALES NUCLEARES ALMARAZ-TRILLO(ID/UFG/ENDESA/HC/NUCLENOR ))  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 953.0 MW(e)  
**Design Net Capacity:** 900.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6627.9 GW(e).h  
**Energy Availability Factor:** 79.9%  
**Load Factor:** 79.4%  
**Operating Factor:** 84.4%  
**Energy Unavailability Factor:** 20.1%  
**Total Off-line Time:** 1369 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	640.3	566.5	643.6	357.0	0.0	456.1	628.4	616.9	658.5	691.3	667.2	702.2	6627.9
<b>EAF (%)</b>	90.8	88.9	91.4	53.0	0.0	67.2	89.3	87.6	96.4	97.8	97.7	99.4	79.9
<b>UCF (%)</b>	90.8	88.9	95.3	66.7	0.0	68.4	91.0	89.6	97.7	98.0	97.7	99.4	81.9
<b>LF (%)</b>	90.3	88.5	90.8	52.1	0.0	66.5	88.6	87.0	96.0	97.4	97.2	99.0	79.4
<b>OF (%)</b>	91.9	92.9	98.9	62.9	0.0	76.0	98.0	92.7	100.0	100.0	100.0	100.0	84.4
<b>EUf (%)</b>	9.2	11.1	8.6	47.0	100.0	32.8	10.7	12.4	3.6	2.2	2.3	0.6	20.1
<b>PUF (%)</b>	0.0	0.0	0.0	33.3	35.6	15.3	3.6	0.0	0.0	0.0	0.0	0.0	7.3
<b>UCLF (%)</b>	9.2	11.1	4.8	0.0	64.5	16.4	5.4	10.4	2.3	2.0	2.3	0.6	10.8
<b>XUF (%)</b>	0.0	0.0	3.8	13.7	0.0	1.1	1.7	2.0	1.3	0.1	0.0	0.0	2.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 02 Jul 1973      **Lifetime Generation:** 137929.3 GW(e).h  
**Date of First Criticality:** 19 Sep 1983      **Cumulative Energy Availability Factor:** 85.9%  
**Date of Grid Connection:** 08 Oct 1983      **Cumulative Load Factor:** 86.4%  
**Date of Commercial Operation:** 01 Jul 1984      **Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1983	712.8	969.0	0.0	0.0	85.8	100.0	8.6	0.0	1320	15.4
1984	6012.9	893.0	0.0	0.0	82.0	100.0	76.7	0.0	7502	85.4
1985	6236.1	900.0	79.8	79.8	79.8	79.8	79.1	79.1	7297	83.3
1986	5825.2	900.0	75.2	77.5	75.2	77.5	73.9	76.5	7136	81.5
1987	6402.5	900.0	81.8	79.0	81.8	78.9	81.2	78.1	7351	83.9
1988	6809.4	900.0	86.3	80.8	86.3	80.8	86.1	80.1	7838	89.2
1989	6545.7	895.0	82.8	81.2	82.8	81.2	83.5	80.8	7638	87.2
1990	7649.3	895.0	97.4	83.9	97.4	83.9	97.6	83.6	8652	98.8
1991	6812.9	895.0	85.3	84.1	85.4	84.1	86.9	84.0	7712	88.0
1992	6892.7	895.0	87.3	84.5	87.3	84.5	87.7	84.5	7997	91.0
1993	7710.1	895.0	99.0	86.1	98.5	86.0	98.3	86.0	8760	100.0
1994	6384.6	895.0	84.3	85.9	80.9	85.5	81.4	85.6	7562	86.3
1995	6814.7	895.0	89.0	86.2	86.2	85.6	86.9	85.7	7952	90.8
1996	7273.3	895.0	91.6	86.7	91.5	86.1	92.5	86.3	8108	92.3
1997	6042.5	895.0	76.6	85.9	72.6	85.0	77.1	85.5	6811	77.8
1998	5892.4	953.0	75.9	85.1	70.2	83.9	70.6	84.4	6810	77.7
1999	8126.6	936.0	98.0	86.0	97.4	84.9	99.1	85.4	8743	99.8
2000	7401.8	936.0	90.6	86.3	88.5	85.1	90.0	85.7	8160	92.9
2001	7601.5	936.0	92.1	86.7	91.3	85.5	92.7	86.2	8189	93.5
2002	8154.9	953.0	98.8	87.4	98.1	86.2	97.7	86.8	8760	100.0
2003	6627.9	953.0	81.9	87.1	79.9	85.9	79.4	86.4	7391	84.4



## ES-7 ALMARAZ-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
29 Jan	125.0	119.8	UF4	A12	DURING QUARTERLY MONITORING OF NUCLEAR INSTRUMENTATION IN LINE WITH THE TECHNICAL OPERATING SPECIFICATIONS, A REACTOR TRIP OCCURRED CAUSED BY A SPURIOUS SIGNAL IN THE N-43 POWER RANGE CHANNEL AS A RESULT OF A SIGNAL FOR A HIGH RATE OF POSITIVE CHANGE IN THE NEUTRON FLUX. ON STARTUP, HIGH VIBRATIONS WERE DETECTED IN REACTOR COOLANT PUMP RCP-3 CAUSED BY A PROBLEM IN THE MOTOR BEARING; IT WAS PUT INTO COLD SHUTDOWN AND REPAIRED.
01 Mar	7.5	28.9	UF4	L42	MAIN TRANSFORMATOR PHASE-R FAILURE, REACTOR TRIP
16 Mar	840.5	120.9	XP	S21	COAST DOWN
20 Apr	498.0	475.3	PF	C21	REFUELLING
11 May	585.0	558.3	UF3	A42	ANNUAL MAINTENANCE EXTENTION DUE TO DIESEL GENERATOR PROBLEM
05 Jun	97.0	42.3	PP	E21	START-UP ACTIVITIES
28 Jun	80.0	88.1	PF	D42	DIESEL GENERATOR REPAIR
02 Jul	26.0	25.0	UF4	A42	TURBINE TRIP AND REACTOR SCRAM DUE TO ACTUATION SAFETY RELAY
17 Aug	44.0	50.7	UF4	A32	REACTOR TRIP OWING TO LOW LEVEL IN STEAM GENERATOR NO. 1 CAUSED BY CLOSURE OF MAIN STEAM ISOLATION VALVE MS2-4797A
19 Aug	4.0	6.4	UF4	A12	REACTOR TRIP CAUSED BY HIGH INTERMEDIATE-RANGE NUCLEAR FLUX

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		784			105	
B. Refuelling without a maintenance					9	
C. Inspection, maintenance or repair combined with refuelling	498			657		
D. Inspection, maintenance or repair without refuelling	80			26		
E. Testing of plant systems or components				40		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					9	
L. Human factor related		7				
Subtotal	578	791	0	723	123	0
Total		1369			846	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	129	6
13. Reactor Auxiliary Systems		4
14. Safety Systems		2
15. Reactor Cooling Systems		5
16. Steam generation systems		27
31. Turbine and auxiliaries		39
32. Feedwater and Main Steam System	44	7
35. All other I&C Systems		0
41. Main Generator Systems		1
42. Electrical Power Supply Systems	611	9
Total	784	100

# ES-8 ASCO-1

**Operator:** ANAV (ASOCIACION NUCLEAR ASCO-VANDELLOS A.I.E. (ENDESA/ID))

**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 998.0 MW(e)  
**Design Net Capacity:** 888.0 MW(e)  
**Design Discharge Burnup:** 45000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7581.1 GW(e).h  
**Energy Availability Factor:** 87.3%  
**Load Factor:** 86.9%  
**Operating Factor:** 90.2%  
**Energy Unavailability Factor:** 12.7%  
**Total Off-line Time:** 860 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	734.7	599.8	122.8	389.9	734.8	698.9	720.1	717.0	689.3	727.5	710.1	736.3	7581.1
<b>EAF (%)</b>	99.9	90.1	15.0	53.9	99.6	98.5	98.3	97.9	97.1	98.9	99.5	99.7	87.3
<b>UCF (%)</b>	99.9	90.2	15.0	54.2	99.9	99.8	99.9	99.9	98.7	99.8	99.8	99.9	88.0
<b>LF (%)</b>	98.9	89.4	16.5	54.3	99.3	97.6	97.3	96.9	96.2	98.1	99.1	99.5	86.9
<b>OF (%)</b>	100.0	100.0	22.6	60.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.2
<b>EUf (%)</b>	0.1	9.9	85.0	46.1	0.4	1.5	1.7	2.1	2.9	1.1	0.5	0.3	12.7
<b>PUF (%)</b>	0.1	9.8	85.0	45.8	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	11.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.1	0.0	0.1
<b>XUF (%)</b>	0.0	0.1	0.0	0.4	0.3	1.3	1.6	2.0	1.5	0.9	0.3	0.1	0.7

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 16 May 1974      **Lifetime Generation:** 134632.7 GW(e).h  
**Date of First Criticality:** 16 Jun 1983      **Cumulative Energy Availability Factor:** 84.9%  
**Date of Grid Connection:** 13 Aug 1983      **Cumulative Load Factor:** 83.7%  
**Date of Commercial Operation:** 10 Dec 1984      **Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1983	360.8	919.0	0.0	0.0	69.0	100.0	4.9	0.0	1294	16.0
1984	4038.4	887.0	0.0	0.0	72.9	100.0	51.8	0.0	5771	65.7
1985	4429.4	898.0	60.3	60.3	60.3	60.3	56.3	56.3	5342	61.0
1986	5129.0	898.0	68.2	64.2	68.2	64.2	65.2	60.8	6208	70.9
1987	6392.0	898.0	84.3	70.9	83.7	70.7	81.3	67.6	7569	86.4
1988	6669.0	898.0	84.1	74.2	84.1	74.1	84.5	71.8	7599	86.5
1989	6750.0	930.0	86.0	76.7	86.0	76.5	82.9	74.1	7771	88.7
1990	6642.0	930.0	84.5	78.0	84.5	77.9	81.5	75.4	7699	87.9
1991	6836.0	930.0	87.2	79.3	87.0	79.2	83.9	76.6	7810	89.2
1992	6875.0	887.0	86.5	80.2	86.5	80.1	88.2	78.0	7898	89.9
1993	6599.0	930.0	83.3	80.6	83.2	80.5	81.0	78.4	7401	84.5
1994	6868.0	930.0	87.1	81.2	86.8	81.1	84.3	79.0	7758	88.6
1995	5708.0	900.0	70.8	80.3	70.4	80.2	72.4	78.4	6387	72.9
1996	7972.0	947.0	99.0	81.9	99.0	81.8	95.8	79.9	8755	99.7
1997	6411.0	915.0	80.5	81.8	77.6	81.5	80.0	79.9	7198	82.2
1998	7349.0	949.0	89.3	82.4	89.1	82.0	88.4	80.5	7943	90.7
1999	8147.0	945.0	99.0	83.5	98.7	83.2	98.4	81.8	8741	99.8
2000	7681.0	979.0	89.8	83.9	89.5	83.6	89.3	82.3	8008	91.2
2001	7798.0	991.0	90.3	84.3	89.8	84.0	89.8	82.7	8056	92.0
2002	8397.0	998.0	98.2	85.2	97.6	84.8	96.0	83.5	8737	99.7
2003	7581.1	996.0	88.0	85.3	87.3	84.9	86.9	83.7	7900	90.2

## ES-8 ASCO-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
13 Jan	3.4	0.1	UP2	A32	LOAD REDUCTION OWING TO FAILURE IN IP-3421
02 Feb	797.7	99.1	XP	S11	GRADUAL POWER REDUCTION TO COORDINATE THE CORE CYCLE WITH THE SCHEDULED REFUELLING DATE
07 Mar	8.5	5.2	PP	C31	LOAD REDUCTION TO DISCONNECT FROM THE GRID AND START THE SCHEDULED REFUELLING OUTAGE
08 Mar	683.0	702.1	PF	C21	SCHEDULED REFUELLING OUTAGE
05 Apr	176.6	181.6	PF	L21	PRODUCTION LOSS OWING TO STAFF STRIKE
12 Apr	72.8	35.0	PP	E31	LOAD INCREASE AFTER REFUELLING
12 Jun	3.5	0.2	PP	D33	LOAD REDUCTION TO PERFORM TREATMENT AGAINST ZEBRA MUSSELS
09 Sep	39.6	8.6	UP2	A12	LOAD REDUCTION OWING TO DROP OF CONTROL ROD E5 FROM SHUTDOWN BANK B
14 Oct	4.5	0.2	PP	E31	TESTING OPERATIONAL STATUS OF AP AND VP VALVES
03 Nov	6.4	0.4	XP2	N33	LOAD REDUCTION OWING TO DIRT IN THE CIRCULATING WATER INLET

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					252	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	683			855		
D. Inspection, maintenance or repair without refuelling				22		
E. Testing of plant systems or components				80	6	
J. Grid failure or grid unavailability						6
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					9	0
L. Human factor related	176					
Subtotal	859	0	0	957	271	6
Total		859			1234	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		0
15. Reactor Cooling Systems		15
16. Steam generation systems		13
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		8
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System		15
35. All other I&C Systems		1
41. Main Generator Systems		108
42. Electrical Power Supply Systems		66
XX. Miscellaneous Systems		3
Total	0	246

# ES-9 ASCO-2

**Operator:** ANAV (ASOCIACION NUCLEAR ASCO-VANDELLOS A.I.E. (ENDESA/ID))  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 997.0 MW(e)  
**Design Net Capacity:** 888.0 MW(e)  
**Design Discharge Burnup:** 45000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8521.2 GW(e).h  
**Energy Availability Factor:** 98.7%  
**Load Factor:** 97.6%  
**Operating Factor:** 99.7%  
**Energy Unavailability Factor:** 1.3%  
**Total Off-line Time:** 22 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	734.6	663.8	733.7	687.6	732.2	694.6	715.0	709.0	690.9	721.5	706.5	731.8	8521.2
<b>EAF (%)</b>	99.8	99.8	99.6	96.5	99.7	98.4	98.1	97.3	97.8	98.7	99.4	99.7	98.7
<b>UCF (%)</b>	99.9	99.9	99.9	96.8	99.9	99.8	99.9	99.7	99.9	99.9	99.9	99.9	99.6
<b>LF (%)</b>	99.0	99.1	98.9	95.9	98.7	96.8	96.4	95.6	96.3	97.1	98.4	98.7	97.6
<b>OF (%)</b>	100.0	100.0	99.9	97.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7
<b>EUf (%)</b>	0.2	0.2	0.4	3.5	0.3	1.6	1.9	2.7	2.2	1.3	0.6	0.3	1.3
<b>PUF (%)</b>	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<b>UCLF (%)</b>	0.0	0.0	0.0	3.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
<b>XUF (%)</b>	0.1	0.1	0.2	0.3	0.2	1.4	1.8	2.4	2.0	1.2	0.4	0.2	0.9

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 07 Mar 1975      **Lifetime Generation:** 128247.0 GW(e).h  
**Date of First Criticality:** 11 Sep 1985      **Cumulative Energy Availability Factor:** 88.7%  
**Date of Grid Connection:** 23 Oct 1985      **Cumulative Load Factor:** 87.4%  
**Date of Commercial Operation:** 31 Mar 1986      **Cumulative Unit Capability Factor:** 78.1%  
**Cumulative Energy Unavailability Factor:** 11.3%

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	261.8	926.0	0.0	0.0	95.1	100.0	3.4	0.0	991	12.0
1986	5368.0	898.0	0.0	0.0	74.2	100.0	68.2	0.0	6639	75.8
1987	5954.0	898.0	78.1	78.1	77.3	77.3	75.7	75.7	7035	80.3
1988	6865.0	898.0	88.2	83.2	86.8	82.0	87.0	81.4	7874	89.6
1989	6732.0	930.0	86.3	84.3	85.7	83.3	82.6	81.8	7729	88.2
1990	6933.0	930.0	90.4	85.8	90.4	85.1	85.1	82.6	7916	90.4
1991	6820.0	930.0	86.7	86.0	86.5	85.4	83.7	82.9	7799	89.0
1992	7077.0	953.0	89.9	86.7	89.9	86.2	84.5	83.1	8042	91.6
1993	7052.0	930.0	90.0	87.2	88.6	86.5	86.6	83.6	7897	90.1
1994	7085.0	930.0	89.8	87.5	89.5	86.9	87.0	84.1	7962	90.9
1995	6977.0	900.0	86.4	87.4	86.3	86.8	88.5	84.5	7674	87.6
1996	6011.0	963.0	75.6	86.1	75.1	85.6	71.1	83.1	6825	77.7
1997	7916.0	900.0	98.2	87.2	96.2	86.5	100.4	84.7	8725	99.6
1998	7399.0	946.0	90.6	87.5	89.9	86.8	89.3	85.1	8050	91.9
1999	7215.0	946.0	87.2	87.5	86.4	86.8	87.1	85.2	7854	89.7
2000	8451.0	983.0	98.6	88.3	98.6	87.7	97.9	86.2	8734	99.4
2001	7829.0	983.0	91.0	88.5	90.6	87.9	90.9	86.5	8102	92.5
2002	7780.0	997.0	90.8	88.7	89.4	88.0	89.1	86.7	8127	92.8
2003	8521.2	997.0	99.6	89.3	98.7	88.7	97.6	87.4	8738	99.7

## ES-9 ASCO-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
03 Apr	22.0	22.1	UF2	A31	TURBINE SHUTDOWN OWING TO A BREAK IN A SECONDARY STEAM LINE
12 Jun	3.5	0.2	PP	D33	LOAD REDUCTION TO PERFORM TREATMENT AGAINST ZEBRA MUSSELS
17 Jun	3.2	0.1	UP2	A31	FAILURE OF A DEH COMMUNICATION CARD
09 Aug	7.1	1.0	XP2	N33	LOAD REDUCTION DUE TO CONDENSER VACUUM CHANGE
28 Oct	3.2	0.0	PP	E31	TURBINE TEST

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		22			141	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling				659		
D. Inspection, maintenance or repair without refuelling				39		
E. Testing of plant systems or components				27	5	
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling				26		
J. Grid failure or grid unavailability					3	6
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				19	6	4
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)						3
Subtotal	0	22	0	770	156	13
Total		22			939	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		4
12. Reactor I&C Systems		1
15. Reactor Cooling Systems		1
16. Steam generation systems		11
31. Turbine and auxiliaries	22	16
32. Feedwater and Main Steam System		79
33. Circulating Water System		4
41. Main Generator Systems		0
42. Electrical Power Supply Systems		10
XX. Miscellaneous Systems		10
Total	22	136

# ES-10 COFRENTES

**Operator:** ID (IBERDROLA, S.A.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1055.0 MW(e)  
**Design Net Capacity:** 930.0 MW(e)  
**Design Discharge Burnup:** 28750 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8002.5 GW(e).h  
**Energy Availability Factor:** 88.2%  
**Load Factor:** 86.5%  
**Operating Factor:** 88.4%  
**Energy Unavailability Factor:** 11.8%  
**Total Off-line Time:** 1018 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	787.2	708.6	785.2	758.9	772.0	561.9	754.1	713.6	280.4	365.5	721.4	793.7	8002.5
<b>EAF (%)</b>	100.0	99.7	100.0	100.0	98.7	75.0	99.8	100.0	43.4	47.2	94.3	100.0	88.2
<b>UCF (%)</b>	100.0	99.7	100.0	100.0	98.7	75.0	99.8	100.0	43.4	47.2	94.3	100.0	88.2
<b>LF (%)</b>	100.3	100.0	100.0	100.0	98.4	74.0	96.2	90.9	36.9	46.2	94.3	100.4	86.5
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	76.1	100.0	100.0	45.0	50.3	88.9	100.0	88.4
<b>EUf (%)</b>	0.0	0.3	0.0	0.0	1.3	25.0	0.2	0.0	56.6	52.8	5.7	0.0	11.8
<b>PUF (%)</b>	0.0	0.3	0.0	0.0	1.3	0.0	0.0	0.0	56.6	30.8	0.1	0.0	7.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	25.1	0.2	0.0	0.0	22.0	5.6	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 09 Sep 1975  
**Date of First Criticality:** 23 Aug 1984  
**Date of Grid Connection:** 14 Oct 1984  
**Date of Commercial Operation:** 11 Mar 1985

**Lifetime Generation:** 140008.3 GW(e).h  
**Cumulative Energy Availability Factor:** 87.5%  
**Cumulative Load Factor:** 87.6%  
**Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1984	350.2	948.0	0.0	0.0	91.3	100.0	4.2	0.0	1190	13.5
1985	6142.5	939.0	0.0	0.0	75.1	100.0	74.7	0.0	7300	83.3
1986	6668.3	939.0	82.0	82.0	81.1	81.1	81.1	81.1	7487	85.5
1987	6883.1	930.0	83.4	82.7	83.4	82.2	84.5	82.8	7615	86.9
1988	7142.2	930.0	85.7	83.7	85.5	83.3	87.4	84.3	7850	89.4
1989	7052.2	939.0	83.9	83.8	83.9	83.5	85.7	84.7	7732	88.3
1990	7070.3	939.0	85.1	84.0	85.1	83.8	86.0	84.9	7560	86.3
1991	6999.6	953.0	83.7	84.0	83.7	83.8	83.8	84.7	7660	87.4
1992	7712.1	939.0	91.9	85.1	91.9	84.9	93.5	86.0	8376	95.4
1993	7016.2	953.0	84.8	85.1	83.6	84.8	84.0	85.8	7579	86.5
1994	6990.9	953.0	85.1	85.1	83.5	84.6	83.7	85.5	7553	86.2
1995	8187.0	953.0	97.8	86.3	97.5	85.9	98.1	86.8	8683	99.1
1996	7687.5	953.0	91.9	86.8	90.9	86.4	91.8	87.3	8215	93.5
1997	6893.7	953.0	86.2	86.8	83.7	86.2	82.6	86.9	7668	87.5
1998	8174.1	993.0	96.6	87.6	96.6	87.0	94.0	87.4	8546	97.6
1999	7491.6	989.0	89.8	87.8	86.4	87.0	86.5	87.4	8004	91.4
2000	7348.1	989.0	86.9	87.7	84.6	86.8	84.6	87.2	7808	88.9
2001	8278.1	989.0	95.5	88.2	95.5	87.4	95.6	87.7	8424	96.2
2002	7918.1	1043.0	89.2	88.3	88.2	87.4	86.7	87.6	7875	89.9
2003	8002.5	1056.0	88.2	88.3	88.2	87.5	86.5	87.6	7742	88.4

# ES-10 COFRENTES

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
09 Jun	180.0	189.9	UF4	A41	REACTOR SCRAM OWING TO GENERATOR TRIP CAUSED BY FAULT IN PHASE C OF OUTPUT BREAKER
09 Jun	165.2	174.1	XP	N	REDUCTION DUE TO REACTOR FEEDWATER TEMPERATURE
09 Oct	636.0	671.9	PF	C	REFUELLING
09 Oct	165.2	174.1	UF3	Z	OUTAGE EXTENTION
05 Nov	37.0	39.6	UF4	A31	REACTOR SCRAM MOVING TO LEVEL 8 CAUSED BY TURBINE TRIP AS A RESULT OF OPENING OF FCVS

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		217			202	
B. Refuelling without a maintenance					5	
C. Inspection, maintenance or repair combined with refuelling	636			581	3	
D. Inspection, maintenance or repair without refuelling				21		
E. Testing of plant systems or components				28		
J. Grid failure or grid unavailability						4
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					9	1
Z. Others		165				
Subtotal	636	382	0	630	219	5
Total		1018			854	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		17
13. Reactor Auxiliary Systems		5
15. Reactor Cooling Systems		11
21. Fuel Handling and Storage Facilities		32
31. Turbine and auxiliaries	37	87
32. Feedwater and Main Steam System		7
41. Main Generator Systems	180	26
42. Electrical Power Supply Systems		10
Total	217	195

# ES-1 JOSE CABRERA-1(ZORITA)

**Operator:** UFG (UNION FENOSA GENERATION S.A.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 153.0 MW(e)  
**Design Net Capacity:** 153.0 MW(e)  
**Design Discharge Burnup:** 32000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 1071.0 GW(e).h  
**Energy Availability Factor:** 84.5%  
**Load Factor:** 79.9%  
**Operating Factor:** 87.1%  
**Energy Unavailability Factor:** 15.5%  
**Total Off-line Time:** 1128 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	105.2	95.0	104.8	100.8	104.8	101.5	103.6	104.0	101.1	104.0	46.2	0.0	1071.0
<b>EAF (%)</b>	94.4	94.8	94.2	93.8	94.2	94.2	93.4	93.8	93.8	93.4	76.0	0.0	84.5
<b>UCF (%)</b>	94.4	94.8	94.2	93.8	94.2	94.2	93.4	93.8	93.8	93.4	76.0	0.0	84.5
<b>LF (%)</b>	92.4	92.4	92.0	91.6	92.1	92.1	91.1	91.3	91.7	91.2	42.0	0.0	79.9
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	100.0	100.0	100.0	100.0	100.0	46.7	0.0	87.1
<b>EUf (%)</b>	5.6	5.2	5.8	6.2	5.8	5.8	6.6	6.2	6.2	6.6	24.0	100.0	15.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.1	0.9	0.3	0.1	0.3	22.7	100.0	10.5
<b>UCLF (%)</b>	5.5	5.2	5.7	6.2	5.8	5.8	5.8	5.9	6.1	6.3	1.3	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 24 Jun 1964      **Lifetime Generation:** 32147.7 GW(e).h  
**Date of First Criticality:** 30 Jun 1968      **Cumulative Energy Availability Factor:** 71.0%  
**Date of Grid Connection:** 14 Jul 1968      **Cumulative Load Factor:** 68.2%  
**Date of Commercial Operation:** 13 Aug 1969      **Cumulative Unit Capability Factor:** 77.3%  
**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 (%)		
1982	865.9	153.0	63.4	80.8	63.4	73.2	64.6	72.7	6891	78.7		
1983	14.8	153.0	1.0	75.2	1.0	68.1	1.1	67.6	163	1.9		
1984	1106.9	153.0	85.4	75.9	85.2	69.2	82.4	68.6	8379	95.4		
1985	276.7	153.0	20.5	72.4	20.5	66.2	20.6	65.6	2272	25.9		
1986	1049.6	153.0	80.3	72.9	80.3	67.0	78.3	66.4	7586	86.6		
1987	1097.1	153.0	82.8	73.4	82.8	67.9	81.9	67.2	7834	89.4		
1988	1142.2	153.0	85.2	74.0	85.2	68.8	85.0	68.2	7839	89.2		
1989	1132.9	153.0	84.8	74.6	84.8	69.6	84.8	69.0	8059	92.3		
1990	957.4	153.0	72.3	74.5	72.3	69.7	71.4	69.1	7281	83.1		
1991	1048.4	153.0	79.1	74.7	79.1	70.1	78.2	69.5	7230	82.5		
1992	1123.8	153.0	84.7	75.1	84.0	70.7	83.6	70.1	7743	88.1		
1993	913.0	153.0	93.5	75.9	81.7	71.2	68.1	70.0	8496	97.0		
1994	21.0	153.0	2.4	73.0	2.4	68.5	1.6	67.3	216	2.5		
1995	348.7	153.0	51.2	72.1	51.2	67.8	26.0	65.7	4853	55.4		
1996	979.8	153.0	90.1	72.8	90.1	68.6	72.9	66.0	8099	92.2		
1997	815.6	153.0	63.3	72.5	63.3	68.4	60.9	65.8	6088	69.5		
1998	1100.3	153.0	84.0	72.8	84.0	69.0	82.1	66.4	8004	91.4		
1999	1109.6	153.0	84.2	73.2	84.2	69.5	82.8	66.9	7969	91.0		
2000	1098.7	153.0	83.8	73.6	83.8	69.9	81.8	67.4	7898	89.9		
2001	1057.9	153.0	82.1	73.8	82.1	70.3	78.9	67.8	7698	87.9		
2002	947.4	153.0	79.1	74.0	79.1	70.6	70.7	67.8	6912	78.9		
2003	1071.0	153.0	84.5	74.3	84.5	71.0	79.9	68.2	7632	87.1		



## ES-1 JOSE CABRERA-1(ZORITA)

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
15 Nov	1128.0	172.6	PF	C21	REFUELLING

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					407	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1128			1112		
D. Inspection, maintenance or repair without refuelling				281		
E. Testing of plant systems or components				7	1	
H. Nuclear regulatory requirements				13		
J. Grid failure or grid unavailability						3
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					0	2
Z. Others					9	
Subtotal	1128	0	0	1413	418	5
Total		1128			1836	

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		279
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		3
14. Safety Systems		1
15. Reactor Cooling Systems		12
16. Steam generation systems		29
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		10
32. Feedwater and Main Steam System		4
41. Main Generator Systems		54
42. Electrical Power Supply Systems		6
Total	0	402

# ES-2 SANTA MARIA DE GARONA

**Operator:** NUCLENOR (NUCLENOR, S.A.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 446.0 MW(e)  
**Design Net Capacity:** 440.0 MW(e)  
**Design Discharge Burnup:** 30-35000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3577.7 GW(e).h  
**Energy Availability Factor:** 91.6%  
**Load Factor:** 91.6%  
**Operating Factor:** 92.3%  
**Energy Unavailability Factor:** 8.4%  
**Total Off-line Time:** 675 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	292.3	298.8	65.3	321.4	331.3	313.2	329.7	328.2	315.5	328.9	321.1	332.2	3577.7
<b>EAF (%)</b>	88.1	99.7	19.8	100.0	99.8	97.5	99.4	98.9	98.3	99.0	100.0	100.0	91.6
<b>UCF (%)</b>	88.3	99.9	19.8	100.0	100.0	98.6	100.0	100.0	99.6	100.0	100.0	100.0	92.0
<b>LF (%)</b>	88.1	99.7	19.7	100.2	99.8	97.5	99.4	98.9	98.3	99.0	100.0	100.1	91.6
<b>OF (%)</b>	91.3	100.0	17.9	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.3
<b>EUf (%)</b>	11.9	0.3	80.2	0.0	0.2	2.5	0.6	1.1	1.7	1.0	0.0	0.0	8.4
<b>PUF (%)</b>	0.1	0.1	70.8	0.0	0.0	0.3	0.0	0.0	0.4	0.0	0.0	0.0	6.1
<b>UCLF (%)</b>	11.6	0.0	9.4	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	1.9
<b>XUF (%)</b>	0.2	0.2	0.0	0.0	0.2	1.1	0.6	1.1	1.3	1.0	0.0	0.0	0.5

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 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:** 94411.0 GW(e).h  
**Cumulative Energy Availability Factor:** 75.6%  
**Cumulative Load Factor:** 75.0%  
**Cumulative Unit Capability Factor:** 77.2%  
**Cumulative Energy Unavailability Factor:** 24.4%

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	2044.1	440.0	53.3	65.7	53.3	62.3	53.0	61.3	5132	58.6
1983	2322.1	440.0	60.2	65.3	60.2	62.1	60.2	61.2	5630	64.3
1984	2873.5	440.0	85.6	66.8	74.2	63.1	74.3	62.3	6853	78.0
1985	1731.0	440.0	46.6	65.4	44.1	61.7	44.9	61.0	4285	48.9
1986	3413.6	440.0	91.8	67.2	88.6	63.5	88.6	62.9	8173	93.3
1987	2565.1	440.0	67.6	67.2	66.6	63.7	66.6	63.1	6205	70.8
1988	2693.3	440.0	70.0	67.3	70.0	64.1	69.7	63.5	6639	75.6
1989	3515.8	440.0	92.2	68.7	91.3	65.6	91.2	65.0	8324	95.0
1990	2558.6	440.0	66.4	68.6	66.4	65.6	66.4	65.1	6297	71.9
1991	3678.3	440.0	95.4	69.9	95.4	67.1	95.4	66.6	8528	97.4
1992	2377.3	440.0	69.7	69.9	69.2	67.2	61.5	66.3	6360	72.4
1993	3671.9	440.0	95.1	71.1	95.1	68.5	95.3	67.7	8444	96.4
1994	3134.1	440.0	82.0	71.5	81.2	69.0	81.3	68.3	7271	83.0
1995	3826.0	440.0	99.3	72.7	99.1	70.3	99.3	69.5	8760	100.0
1996	3203.8	440.0	83.2	73.1	82.5	70.8	82.9	70.1	7450	84.8
1997	3363.7	440.0	89.2	73.7	89.1	71.5	87.3	70.7	7853	89.7
1998	3792.5	446.0	98.0	74.6	97.5	72.4	97.1	71.7	8735	99.7
1999	3330.8	448.0	86.1	75.0	84.9	72.9	84.9	72.2	7639	87.2
2000	3854.6	446.0	98.8	75.9	98.4	73.8	98.4	73.1	8699	99.0
2001	3435.0	446.0	88.0	76.3	87.9	74.3	87.9	73.6	7737	88.3
2002	3841.4	446.0	98.8	77.0	98.3	75.0	98.3	74.4	8679	99.1
2003	3577.7	446.0	92.0	77.5	91.6	75.6	91.6	75.0	8085	92.3

## ES-2 SANTA MARIA DE GARONA

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
12 Jan	65.0	29.2	UF1	A14	PLANT OUTAGE TO COLD SHUTDOWN TO REPAIR THE VALVE MOV-2301-4 OF THE HPCI (HIGH PRESSURE COOLANT INJECTION) SYSTEM.
16 Jan	20.0	9.1	UF4	A31	AUTOMATIC REACTOR SCRAM DUE TO HIGH NEUTRON FLUX SIGNAL (APRM) CAUSED BY A MPR (MECHANICAL PRESSURE REGULATOR) MALFUNCTION DURING A TEST.
01 Mar	526.0	235.0	PF	C	REFUELING AND MAINTENANCE OUTAGE. IT IS INCLUDED THE POWER DECREASE AND POWER RISE PERIODS.
23 Mar	64.0	28.7	UF3	Z	UNPLANNED EXTENSION OF REFUELING AND MAINTENANCE OUTAGE.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		85			478	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling	526			1119		
D. Inspection, maintenance or repair without refuelling				48	2	
E. Testing of plant systems or components				2	5	
H. Nuclear regulatory requirements				23	41	19
J. Grid failure or grid unavailability					2	11
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				7	16	23
Z. Others		64				
Subtotal	526	149	0	1199	558	53
Total		675			1810	

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		33
12. Reactor I&C Systems		42
13. Reactor Auxiliary Systems		11
14. Safety Systems	65	36
15. Reactor Cooling Systems		206
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries	20	21
32. Feedwater and Main Steam System		28
35. All other I&C Systems		0
41. Main Generator Systems		4
42. Electrical Power Supply Systems		44
Total	85	425

# 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  
**Maximum Net Capacity at the beginning of 2003:** 1003.0 MW(e)  
**Design Net Capacity:** 990.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8114.7 GW(e).h  
**Energy Availability Factor:** 92.5%  
**Load Factor:** 92.4%  
**Operating Factor:** 93.7%  
**Energy Unavailability Factor:** 7.5%  
**Total Off-line Time:** 550 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	745.6	672.9	743.8	624.2	716.9	227.2	738.2	733.1	713.7	739.5	717.8	741.7	8114.7
<b>EAF (%)</b>	100.0	99.9	100.0	87.0	96.5	32.5	98.9	98.2	98.8	98.9	99.4	99.3	92.5
<b>UCF (%)</b>	100.0	99.9	100.0	87.0	96.7	33.2	100.0	100.0	100.0	99.5	100.0	100.0	93.1
<b>LF (%)</b>	99.9	99.8	99.7	86.6	96.1	31.5	98.9	98.2	98.8	99.0	99.4	99.4	92.4
<b>OF (%)</b>	100.0	100.0	99.9	90.4	96.9	36.5	100.0	100.0	100.0	100.0	100.0	100.0	93.7
<b>EUf (%)</b>	0.0	0.1	0.0	13.0	3.5	67.5	1.1	1.8	1.2	1.1	0.6	0.7	7.5
<b>PUF (%)</b>	0.0	0.1	0.0	0.0	3.3	58.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1
<b>UCLF (%)</b>	0.0	0.0	0.0	13.0	0.0	8.8	0.0	0.0	0.0	0.5	0.0	0.0	1.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.2	0.6	1.1	1.8	1.2	0.6	0.6	0.6	0.6

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 17 Aug 1979      **Lifetime Generation:** 109372.0 GW(e).h  
**Date of First Criticality:** 14 May 1988      **Cumulative Energy Availability Factor:** 87.2%  
**Date of Grid Connection:** 23 May 1988      **Cumulative Load Factor:** 82.2%  
**Date of Commercial Operation:** 06 Aug 1988      **Cumulative Unit Capability Factor:** 78.4%  
**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 (%)
1988	1571.7	997.0	0.0	0.0	93.3	100.0	17.9	0.0	1704	19.4
1989	7147.8	990.0	83.7	83.7	83.7	83.7	82.4	82.4	7665	87.5
1990	6372.2	990.0	75.0	79.3	75.0	79.3	73.5	77.9	7596	86.7
1991	6410.8	972.0	79.7	79.4	79.7	79.4	75.3	77.1	6929	79.1
1992	6408.0	1000.0	98.3	84.2	98.3	84.2	73.0	76.0	6467	73.6
1993	7395.9	1001.0	85.5	84.5	85.5	84.5	84.3	77.7	7513	85.8
1994	7927.8	1001.0	91.0	85.6	91.0	85.6	90.4	79.8	8010	91.4
1995	7472.6	1001.0	86.4	85.7	86.4	85.7	85.2	80.6	7570	86.4
1996	7626.3	1001.0	87.4	85.9	87.4	85.9	86.7	81.4	7707	87.7
1997	7765.5	1001.0	91.9	86.6	91.1	86.5	88.6	82.2	8066	92.1
1998	4389.0	1000.0	84.7	86.4	84.6	86.3	50.1	79.0	4477	51.1
1999	6828.8	1001.0	78.0	85.6	78.0	85.5	77.9	78.9	6853	78.2
2000	8206.5	1001.0	93.7	86.3	93.7	86.2	93.3	80.1	8251	93.9
2001	7907.4	1001.0	90.7	86.6	90.7	86.6	90.2	80.9	7958	90.8
2002	7827.0	1000.0	89.6	86.8	89.6	86.8	89.3	81.5	7852	89.6
2003	8114.7	1003.0	93.1	87.3	92.5	87.2	92.4	82.2	8210	93.7

# ES-11 TRILLO-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
17 Feb	2.0	0.4	PP	E31	TESTING OF TURBINE VALVES
18 Apr	70.5	93.8	UF2	A12	PLANT SHUTDOWN OWING TO A LEAK IN REACTOR COOLING SYSTEM INSTRUMENTATION LINES
24 May	155.0	1.3	XP1	S11	COASTDOWN OPERATION
31 May	416.0	443.7	PF	C	REFUELLING
18 Jun	49.0	48.6	UF3	A15	OUTAGE EXTENTION
20 Jun	15.0	15.0	UF	A31	TURBINE CONTROL SYSTEM FAILURE
15 Sep	2.0	0.4	PP	E31	TESTING OF TURBINE VALVES
06 Oct	70.0	2.2	UP1	A31	INSULATION OF CONDENSER WATER BOXES
13 Oct	63.0	1.4	UP1	A31	INSULATION OF CONDENSER WATER BOXES
15 Dec	1.5	0.4	PP	E31	TESTING OF TURBINE VALVES

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1990 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		134		1	130	
C. Inspection, maintenance or repair combined with refuelling	416			736		
Subtotal	416	134	0	737	130	0
Total		550			867	

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

System	2003 Hours Lost	1990 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	70	1
15. Reactor Cooling Systems	49	3
16. Steam generation systems		39
31. Turbine and auxiliaries	15	25
32. Feedwater and Main Steam System		8
33. Circulating Water System		5
41. Main Generator Systems		9
42. Electrical Power Supply Systems		10
Total	134	100

# ES-16 VANDELLOS-2

**Operator:** ANAV (ASOCIACION NUCLEAR ASCO-VANDELLOS A.I.E. (ENDESA/ID))

**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1040.0 MW(e)  
**Design Net Capacity:** 930.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8219.3 GW(e).h  
**Energy Availability Factor:** 89.5%  
**Load Factor:** 90.2%  
**Operating Factor:** 92.1%  
**Energy Unavailability Factor:** 10.5%  
**Total Off-line Time:** 693 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	775.6	700.2	774.5	748.8	697.8	734.6	725.3	717.4	99.0	726.8	746.0	773.2	8219.3
<b>EAF (%)</b>	99.8	99.6	99.7	99.6	89.6	97.7	93.3	92.3	9.3	93.3	99.2	99.5	89.5
<b>UCF (%)</b>	100.0	99.9	100.0	100.0	90.5	100.0	97.6	97.0	10.2	94.7	100.0	100.0	90.9
<b>LF (%)</b>	100.2	100.2	100.1	100.1	90.2	98.1	93.7	92.7	13.2	93.8	99.6	99.9	90.2
<b>OF (%)</b>	100.0	100.0	99.9	100.1	96.6	100.0	100.0	97.0	10.3	100.0	100.0	100.0	92.1
<b>EUf (%)</b>	0.2	0.4	0.3	0.4	10.4	2.3	6.7	7.7	90.7	6.7	0.8	0.5	10.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	9.5	0.0	0.0	3.0	89.8	5.3	0.0	0.0	8.9
<b>UCLF (%)</b>	0.0	0.1	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.2
<b>XUF (%)</b>	0.2	0.2	0.3	0.4	1.0	2.3	4.3	4.7	0.9	1.3	0.8	0.5	1.4

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 29 Dec 1980      **Lifetime Generation:** 117523.0 GW(e).h  
**Date of First Criticality:** 14 Nov 1987      **Cumulative Energy Availability Factor:** 86.9%  
**Date of Grid Connection:** 12 Dec 1987      **Cumulative Load Factor:** 86.9%  
**Date of Commercial Operation:** 08 Mar 1988      **Cumulative Unit Capability Factor:** 78.4%  
**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 (%)		
1987	40.3	963.0	0.0	0.0	0.5	100.0	0.5	0.0	0.5	0.0	318	3.7
1988	5101.9	930.0	0.0	0.0	72.7	100.0	62.5	0.0	62.5	0.0	6262	71.3
1989	5868.8	943.0	70.6	70.6	70.6	70.6	71.0	71.0	71.0	71.0	6357	72.6
1990	7334.3	943.0	87.8	79.2	87.8	79.2	88.8	79.9	88.8	79.9	7925	90.5
1991	7214.9	953.0	88.5	82.3	86.3	81.6	86.4	82.1	86.4	82.1	7825	89.3
1992	6718.2	953.0	79.6	81.7	79.6	81.1	80.3	81.6	80.3	81.6	7249	82.5
1993	6910.4	961.0	84.3	82.2	82.4	81.4	82.1	81.7	82.1	81.7	7377	84.2
1994	7208.4	961.0	85.6	82.8	85.6	82.1	85.6	82.4	85.6	82.4	7676	87.6
1995	7571.3	961.0	89.5	83.7	89.5	83.1	89.9	83.5	89.9	83.5	7957	90.8
1996	7511.4	961.0	89.1	84.4	89.0	83.9	89.0	84.2	89.0	84.2	7942	90.4
1997	7243.1	961.0	88.7	84.9	85.5	84.1	86.0	84.4	86.0	84.4	7961	90.9
1998	8359.0	966.0	99.3	86.3	99.0	85.6	98.8	85.8	98.8	85.8	8760	100.0
1999	7224.4	1024.0	83.4	86.0	82.5	85.3	80.5	85.3	80.5	85.3	7430	84.8
2000	7976.9	1043.0	87.9	86.2	87.6	85.5	87.1	85.5	87.1	85.5	7852	89.4
2001	9010.3	1043.0	99.4	87.3	99.4	86.6	98.6	86.6	98.6	86.6	8727	99.6
2002	8010.1	1040.0	89.3	87.5	88.1	86.7	87.9	86.7	87.9	86.7	7881	90.0
2003	8219.3	1040.0	90.9	87.7	89.5	86.9	90.2	86.9	90.2	86.9	8067	92.1

## ES-16 VANDELLOS-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
30 Aug	668.0	695.5	PF	C	REFUELLING

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					190	
B. Refuelling without a maintenance					12	
C. Inspection, maintenance or repair combined with refuelling	668			575	1	
D. Inspection, maintenance or repair without refuelling				32		
E. Testing of plant systems or components				6	2	
J. Grid failure or grid unavailability					5	17
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						8
Subtotal	668	0	0	613	210	25
Total		668			848	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		18
13. Reactor Auxiliary Systems		1
15. Reactor Cooling Systems		41
31. Turbine and auxiliaries		8
32. Feedwater and Main Steam System		12
41. Main Generator Systems		13
42. Electrical Power Supply Systems		88
XX. Miscellaneous Systems		6
Total	0	187

**SE-9 FORSMARK-1**

**Operator:** FKA (FORSMARK KRAFTGRUPP AB)  
**Contractor:** ABBATOM (ABBATOM (formerly ASEA-ATOM))

**1. Station Details**

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 961.0 MW(e)  
**Design Net Capacity:** 890.0 MW(e)  
**Design Discharge Burnup:** 30000 MW.d/t

**2. Production Summary 2003**

**Energy Production:** 7456.0 GW(e).h  
**Energy Availability Factor:** 88.5%  
**Load Factor:** 88.6%  
**Operating Factor:** 92.4%  
**Energy Unavailability Factor:** 11.5%  
**Total Off-line Time:** 667 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	713.4	646.7	715.0	675.2	709.1	603.2	431.6	193.9	672.8	690.6	689.9	714.6	7456.0
<b>EAF (%)</b>	99.7	100.0	100.0	97.4	99.1	87.2	60.4	27.1	97.1	96.4	99.7	99.9	88.5
<b>UCF (%)</b>	99.7	100.0	100.0	97.4	99.1	87.2	60.4	27.1	97.1	96.4	99.7	99.9	88.5
<b>LF (%)</b>	99.8	100.1	100.0	97.7	99.2	87.2	60.4	27.1	97.2	96.5	99.7	99.9	88.6
<b>OF (%)</b>	100.0	100.0	99.9	98.5	100.0	100.0	83.1	30.2	100.0	98.7	100.0	100.0	92.4
<b>EUf (%)</b>	0.3	0.0	0.0	2.6	0.9	12.8	39.6	72.9	2.9	3.6	0.3	0.1	11.5
<b>PUF (%)</b>	0.3	0.0	0.0	0.0	0.3	10.7	36.7	71.8	0.0	0.0	0.0	0.0	10.1
<b>UCLF (%)</b>	0.0	0.0	0.0	2.6	0.6	2.1	2.9	1.1	2.9	3.6	0.3	0.1	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. 2003 Summary of Operation**

OPERATION AT FULL POWER IN BASE-LOAD MODE

**5. Historical Summary**

**Date of Construction Start:** 01 Jun 1973  
**Date of First Criticality:** 23 Apr 1980  
**Date of Grid Connection:** 06 Jun 1980  
**Date of Commercial Operation:** 10 Dec 1980

**Lifetime Generation:** 135836.6 GW(e).h  
**Cumulative Energy Availability Factor:** 83.7%  
**Cumulative Load Factor:** 80.2%  
**Cumulative Unit Capability Factor:** 77.4%  
**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 (%)
1982	5548.1	900.0	70.4	73.6	70.4	73.6	70.4	73.6	7131	81.4
1983	5926.0	900.0	75.2	74.2	75.1	74.2	75.2	74.1	8095	92.4
1984	6461.8	900.0	91.9	78.6	91.9	78.6	81.7	76.1	8207	93.4
1985	5587.6	900.0	79.4	78.8	79.4	78.8	70.9	75.0	7773	88.7
1986	7317.2	954.0	89.8	80.7	89.8	80.7	87.6	77.2	8303	94.8
1987	6493.4	970.0	79.5	80.5	79.5	80.5	76.4	77.1	8291	94.6
1988	6852.8	970.0	81.8	80.7	81.8	80.7	80.4	77.5	7739	88.1
1989	6138.6	969.0	85.5	81.2	85.5	81.2	72.3	76.9	7907	90.3
1990	6257.5	967.0	85.8	81.7	85.8	81.7	73.9	76.6	7885	90.0
1991	7486.6	968.0	90.6	82.5	88.3	82.3	88.3	77.7	8122	92.7
1992	6833.6	968.0	85.2	82.8	80.3	82.1	80.4	77.9	8174	93.1
1993	7022.8	968.0	91.9	83.5	82.7	82.2	82.8	78.3	8009	91.4
1994	7393.4	968.0	91.3	84.1	87.0	82.5	87.2	79.0	8109	92.6
1995	7325.2	968.0	91.3	84.6	86.2	82.8	86.4	79.5	8173	93.3
1996	7311.4	968.0	95.3	85.3	86.4	83.0	86.0	79.9	8412	95.8
1997	5403.0	968.0	64.6	84.0	64.6	81.9	63.5	78.9	6255	71.2
1998	7307.0	968.0	93.6	84.5	93.6	82.6	86.2	79.3	8265	94.3
1999	7583.0	968.0	96.7	85.2	96.3	83.3	89.4	79.9	8420	96.1
2000	5731.0	968.0	86.0	85.2	80.2	83.2	67.4	79.2	7203	82.0
2001	7286.0	968.0	94.8	85.7	86.3	83.3	85.9	79.6	8482	96.8
2002	7143.0	961.0	90.0	85.9	86.0	83.4	84.9	79.8	7978	91.1
2003	7456.0	961.0	88.5	86.0	88.5	83.7	88.6	80.2	8093	92.4



## SE-9 FORSMARK-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
08 Apr	17.0	16.7	UF4	A32	AUTOMATIC REACTOR SCRAM
27 Jul	650.0	624.7	PF	D	YEARLY PLANNED MAINTENANCE
17 Oct	20.0	19.2	PP	D	LEAKING IN THE PS CONTAINMENT

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		17			106	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling				667		
D. Inspection, maintenance or repair without refuelling	650					
E. Testing of plant systems or components				5		
J. Grid failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						18
Subtotal	650	17	0	672	109	19
Total		667			800	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		15
12. Reactor I&C Systems		9
13. Reactor Auxiliary Systems		7
15. Reactor Cooling Systems		14
17. Safety I&C Systems (excluding reactor I&C)		3
21. Fuel Handling and Storage Facilities		35
31. Turbine and auxiliaries		9
32. Feedwater and Main Steam System	17	2
41. Main Generator Systems		6
XX. Miscellaneous Systems		2
Total	17	102

# SE-11 FORSMARK-2

**Operator:** FKA (FORSMARK KRAFTGRUPP AB)  
**Contractor:** ABBATOM (ABBATOM (formerly ASEA-ATOM))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 959.0 MW(e)  
**Design Net Capacity:** 890.0 MW(e)  
**Design Discharge Burnup:** 30000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7303.9 GW(e).h  
**Energy Availability Factor:** 87.1%  
**Load Factor:** 86.9%  
**Operating Factor:** 90.4%  
**Energy Unavailability Factor:** 12.9%  
**Total Off-line Time:** 844 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	709.4	640.9	706.0	638.7	179.8	322.9	680.6	682.7	666.3	704.9	664.8	706.9	7303.9
<b>EAF (%)</b>	99.4	99.5	99.1	92.5	25.2	46.8	95.4	95.7	96.5	99.2	96.8	99.6	87.1
<b>UCF (%)</b>	99.4	99.5	99.1	92.5	25.2	46.8	95.4	95.7	96.5	99.2	96.8	99.6	87.1
<b>LF (%)</b>	99.4	99.5	99.0	92.6	25.2	46.8	95.4	95.7	96.5	98.7	96.3	99.1	86.9
<b>OF (%)</b>	100.0	100.0	99.9	100.1	31.9	53.3	100.0	100.0	100.0	99.9	100.0	100.0	90.4
<b>EUf (%)</b>	0.6	0.5	0.9	7.5	74.8	53.2	4.6	4.3	3.5	0.8	3.2	0.4	12.9
<b>PUF (%)</b>	0.0	0.0	0.2	6.0	72.9	52.0	0.0	0.0	0.3	0.0	0.2	0.0	11.0
<b>UCLF (%)</b>	0.6	0.5	0.7	1.5	1.9	1.2	4.6	4.3	3.2	0.8	3.0	0.4	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. 2003 Summary of Operation

OPERATION AT FULL POWER IN BASE-LOAD MODE

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1975  
**Date of First Criticality:** 16 Nov 1980  
**Date of Grid Connection:** 26 Jan 1981  
**Date of Commercial Operation:** 07 Jul 1981

**Lifetime Generation:** 129855.5 GW(e).h  
**Cumulative Energy Availability Factor:** 84.0%  
**Cumulative Load Factor:** 80.0%  
**Cumulative Unit Capability Factor:** 77.4%  
**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 (%)
1982	5316.4	900.0	67.4	67.4	67.4	67.4	67.4	67.4	6076	69.4
1983	5484.4	900.0	69.6	68.5	69.6	68.5	69.6	68.5	7879	89.9
1984	5911.7	900.0	82.6	73.2	82.6	73.2	74.8	70.6	7442	84.7
1985	5735.4	900.0	83.8	75.8	83.8	75.8	72.7	71.1	8048	91.9
1986	6987.9	938.0	86.5	78.0	86.5	78.0	85.0	74.0	8231	94.0
1987	6553.8	949.0	85.5	79.3	85.5	79.3	78.8	74.8	8190	93.5
1988	6976.2	963.0	83.2	79.9	83.2	79.9	82.5	76.0	8032	91.4
1989	5943.4	964.0	90.0	81.2	90.0	81.2	70.4	75.3	8222	93.9
1990	6426.2	970.0	88.6	82.1	88.6	82.1	75.6	75.3	8119	92.7
1991	7155.2	969.0	85.8	82.5	84.2	82.3	84.3	76.2	8083	92.3
1992	6748.9	969.0	86.2	82.8	79.2	82.0	79.3	76.5	8293	94.4
1993	6715.5	969.0	88.8	83.3	79.1	81.8	79.2	76.7	7683	87.8
1994	7679.5	969.0	92.5	84.1	90.4	82.4	90.5	77.8	8194	93.6
1995	7149.2	969.0	91.6	84.6	84.1	82.6	84.2	78.3	8143	93.0
1996	7348.2	969.0	91.2	85.1	86.2	82.8	86.3	78.9	8134	92.6
1997	7325.0	969.0	87.4	85.2	87.4	83.1	86.1	79.3	7927	90.2
1998	7199.0	969.0	92.1	85.6	91.9	83.6	84.8	79.6	8240	94.1
1999	7292.0	968.0	91.8	86.0	91.8	84.1	86.0	80.0	8117	92.7
2000	5429.0	964.0	80.8	85.7	76.7	83.7	64.1	79.2	6946	79.1
2001	7400.0	964.0	92.3	86.0	88.8	84.0	87.6	79.6	8321	95.0
2002	6824.0	964.0	89.9	86.2	82.2	83.9	80.8	79.6	8155	93.1
2003	7303.9	959.0	87.1	86.3	87.1	84.0	86.9	80.0	7916	90.4

## SE-11 FORSMARK-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
10 May	11.0	10.4	UF4	L31	AUTOMATIC REACTOR SCRAM
10 May	833.0	844.2	PF	D	YEARLY PLANNED MAINTENANCE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					174	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling				590		
D. Inspection, maintenance or repair without refuelling	833			25		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						21
L. Human factor related		11				
Subtotal	833	11	0	615	177	21
Total		844			813	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		1
13. Reactor Auxiliary Systems		2
14. Safety Systems		2
15. Reactor Cooling Systems		13
21. Fuel Handling and Storage Facilities		90
31. Turbine and auxiliaries		29
32. Feedwater and Main Steam System		7
42. Electrical Power Supply Systems		1
Total	0	145

# SE-14 FORSMARK-3

**Operator:** FKA (FORSMARK KRAFTGRUPP AB)  
**Contractor:** ABBATOM (ABBATOM (formerly ASEA-ATOM))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1155.0 MW(e)  
**Design Net Capacity:** 1050.0 MW(e)  
**Design Discharge Burnup:** 28400 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9100.3 GW(e).h  
**Energy Availability Factor:** 89.9%  
**Load Factor:** 89.9%  
**Operating Factor:** 97.1%  
**Energy Unavailability Factor:** 10.1%  
**Total Off-line Time:** 253 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	860.0	777.0	857.6	752.9	621.7	375.5	708.5	815.5	800.8	847.8	826.0	857.2	9100.3
<b>EAF (%)</b>	100.0	100.0	99.9	90.5	72.3	45.2	82.4	94.9	96.3	98.5	99.3	99.8	89.9
<b>UCF (%)</b>	100.0	100.0	99.9	90.5	72.4	45.2	82.5	94.9	96.3	98.5	99.3	99.8	89.9
<b>LF (%)</b>	100.1	100.1	99.8	90.7	72.3	45.2	82.5	94.9	96.3	98.5	99.3	99.8	89.9
<b>OF (%)</b>	100.0	100.0	99.9	100.0	100.0	75.8	89.5	100.0	100.0	100.0	100.0	100.0	97.1
<b>EUf (%)</b>	0.0	0.0	0.1	9.5	27.7	54.8	17.6	5.1	3.7	1.5	0.7	0.2	10.1
<b>PUF (%)</b>	0.0	0.0	0.1	9.3	27.0	53.8	12.8	0.0	0.1	0.0	0.1	0.0	8.6
<b>UCLF (%)</b>	0.0	0.0	0.0	0.2	0.7	1.1	4.8	5.1	3.6	1.5	0.6	0.2	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. 2003 Summary of Operation

OPERATION AT FULL POWER IN BASE-LOAD MODE

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1979      **Lifetime Generation:** 129645.5 GW(e).h  
**Date of First Criticality:** 28 Oct 1984      **Cumulative Energy Availability Factor:** 87.0%  
**Date of Grid Connection:** 05 Mar 1985      **Cumulative Load Factor:** 84.0%  
**Date of Commercial Operation:** 18 Aug 1985      **Cumulative Unit Capability Factor:** 77.8%  
**Cumulative Energy Unavailability Factor:** 13.0%

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	4155.5	1068.0	0.0	0.0	97.4	100.0	44.9	0.0	4803	55.4
1986	8069.6	1060.0	88.4	88.4	88.4	88.4	86.9	86.9	7983	91.1
1987	7038.9	1063.0	77.9	83.1	77.9	83.1	75.6	81.2	7866	89.8
1988	7462.9	1068.0	80.4	82.2	80.4	82.2	79.6	80.7	7807	88.9
1989	7367.2	1118.0	85.8	83.1	85.8	83.1	75.2	79.3	7792	88.9
1990	7942.1	1150.0	90.6	84.7	90.6	84.7	78.8	79.2	8165	93.2
1991	8665.1	1155.0	87.5	85.2	85.6	84.9	85.6	80.3	8324	95.0
1992	8176.2	1197.0	89.5	85.8	81.2	84.3	77.8	79.9	7954	90.6
1993	8457.9	1158.0	93.2	86.8	83.4	84.2	83.4	80.4	8244	94.2
1994	9228.8	1158.0	93.4	87.5	90.9	84.9	91.1	81.6	8277	94.6
1995	8945.9	1158.0	92.8	88.1	88.2	85.3	88.2	82.3	8250	94.2
1996	8819.2	1158.0	89.1	88.2	86.7	85.4	86.7	82.7	8008	91.2
1997	8955.0	1158.0	89.9	88.3	89.9	85.8	88.0	83.1	8004	91.1
1998	8961.0	1158.0	93.9	88.8	93.8	86.4	88.3	83.5	8227	93.9
1999	8825.0	1157.0	91.1	88.9	91.0	86.7	87.1	83.8	8005	91.4
2000	7934.0	1157.0	94.9	89.3	87.7	86.8	78.1	83.4	8038	91.5
2001	8182.0	1155.0	86.2	89.1	81.8	86.5	80.9	83.2	7585	86.6
2002	9079.0	1158.0	95.0	89.5	91.2	86.8	89.5	83.6	8450	96.5
2003	9100.3	1155.0	89.9	89.5	89.9	87.0	89.9	84.0	8507	97.1

## SE-14 FORSMARK-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
23 Jun	253.0	310.7	PF	D99	YEARLY PLANNED OUTAGE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					53	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling				565		
D. Inspection, maintenance or repair without refuelling	253			2		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)						11
Subtotal	253	0	0	567	55	11
Total	253			633		

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		5
15. Reactor Cooling Systems		12
21. Fuel Handling and Storage Facilities		6
31. Turbine and auxiliaries		12
41. Main Generator Systems		0
42. Electrical Power Supply Systems		14
Total	0	50

**SE-2 OSKARSHAMN-1**

Operator: OKG (OKG AKTIEBOLAG)

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

**1. Station Details**

Type: BWR  
 Maximum Net Capacity  
 at the beginning of 2003: 470.0 MW(e)  
 Design Net Capacity: 440.0 MW(e)  
 Design Discharge Burnup: 25000 MW.d/t

**2. Production Summary 2003**

Energy Production: 3058.4 GW(e).h  
 Energy Availability Factor: 75.3%  
 Load Factor: 74.3%  
 Operating Factor: 80.8%  
 Energy Unavailability Factor: 24.7%  
 Total Off-line Time: 1685 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	152.5	193.9	254.7	339.6	339.7	314.2	308.1	212.6	0.0	276.2	334.4	332.3	3058.4
EAF (%)	43.6	61.3	73.0	100.0	97.0	93.8	89.1	67.4	0.0	81.3	100.0	95.4	75.3
UCF (%)	43.6	61.3	73.0	100.0	97.2	94.3	93.8	69.7	0.0	81.3	100.0	95.4	75.9
LF (%)	43.6	61.4	72.8	100.5	97.1	92.9	88.1	60.8	0.0	78.9	98.8	95.0	74.3
OF (%)	55.0	88.1	84.7	100.1	100.0	95.7	96.1	70.2	0.0	83.8	100.0	95.4	80.8
EUf (%)	56.4	38.7	27.0	0.0	3.0	6.2	10.9	32.6	100.0	18.7	0.0	4.6	24.7
PUF (%)	0.0	0.0	9.3	0.0	0.4	0.0	0.0	26.9	47.1	0.0	0.0	0.0	7.0
UCLF (%)	56.4	38.7	17.7	0.0	2.4	5.7	6.3	3.4	52.9	18.7	0.0	4.6	17.1
XUF (%)	0.0	0.0	0.0	0.0	0.2	0.5	4.7	2.3	0.0	0.0	0.0	0.0	0.6

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Aug 1966      Lifetime Generation: 75150.8 GW(e).h  
 Date of First Criticality: 12 Dec 1970      Cumulative Energy Availability Factor: 62.7%  
 Date of Grid Connection: 19 Aug 1971      Cumulative Load Factor: 61.2%  
 Date of Commercial Operation: 06 Feb 1972      Cumulative Unit Capability Factor: 77.1%  
    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 (%)
1982	2937.7	440.0	76.2	68.3	76.2	68.0	76.2	66.5	6967	79.5
1983	3133.3	440.0	81.3	69.4	81.3	69.2	81.3	67.8	7694	87.8
1984	2959.7	440.0	81.1	70.4	81.1	70.2	76.6	68.5	7249	82.5
1985	2753.2	440.0	71.8	70.5	71.8	70.3	71.4	68.8	6491	74.1
1986	3134.4	440.0	81.9	71.3	81.9	71.2	81.3	69.7	7359	84.0
1987	3232.5	440.0	86.6	72.3	86.6	72.2	83.9	70.6	7809	89.1
1988	2863.1	442.0	73.6	72.4	73.6	72.3	73.7	70.8	6827	77.7
1989	3175.6	442.0	87.0	73.3	87.0	73.1	82.0	71.5	7788	88.9
1990	2493.8	442.0	64.0	72.8	64.1	72.6	64.4	71.1	5794	66.1
1991	3349.2	442.0	86.1	73.5	86.1	73.4	86.5	71.9	7856	89.7
1992	1784.8	442.0	45.9	72.1	45.9	72.0	46.0	70.6	4362	49.7
1993	0.0	442.0	-0.1	68.7	0.0	68.5	0.0	67.2	0	0.0
1994	0.0	445.0	0.0	65.5	0.0	65.4	0.0	64.1	0	0.0
1995	0.0	445.0	0.0	62.6	0.0	62.5	0.0	61.3	0	0.0
1996	2380.0	442.0	61.1	62.6	61.1	62.5	61.3	61.3	5564	63.3
1997	2925.9	442.0	75.8	63.1	75.8	63.0	75.6	61.9	6716	76.7
1998	1297.7	445.0	32.6	61.9	32.6	61.8	33.3	60.8	2968	33.9
1999	3298.9	445.0	86.7	62.8	86.7	62.8	84.6	61.7	7647	87.3
2000	3060.2	445.0	88.8	63.8	88.8	63.7	78.3	62.3	7765	88.4
2001	3080.9	445.0	83.7	64.5	83.7	64.4	79.0	62.9	7462	85.2
2002	0.0	445.0	0.0	62.3	0.0	62.2	0.0	60.7	0	0.0
2003	3058.4	470.0	75.9	62.8	75.3	62.7	74.3	61.2	7075	80.8

## SE-2 OSKARSHAMN-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	335.0	197.3	UF3	F14	MAJOR BACK FITTING AND UPGRADING HAS BEEN PERFORMED DURING 2002 AND WAS COMPLETED DURING JANUARY 2003.
01 Feb	672.0	90.9	UP3	A31	POWER REDUCTION DUE TO TURBINE VIBRATIONS
10 Feb	57.0	27.2	UF	E31	DURING THE POWER REDUCTION AN AUTOMATIC SCRAM WAS EXPERIENCED.
27 Feb	14.0	5.1	UF	A31	TURBINE VIBRATIONS
01 Mar	232.0	58.2	UP3	A31	POWER REDUCTION DUE TO TURBINE VIBRATIONS
10 Mar	102.0	32.5	PP	D31	TURBINE MAINTENANCE
15 Mar	11.0	5.2	UF3	A31	TURBINE VIBRATIONS
07 May	143.0	8.4	UP	A14	HIGH COOLING WATER TEMPERATURE FOR SAFETY SYSTEMS
08 Jun	31.0	16.9	UF4	A14	HIGH COOLING WATER TEMPERATURE FOR SAFETY SYSTEMS
09 Jul	528.0	7.8	UP	H14	RESTRICTIOPN IN POWER LEVEL CAUSED BY HIGHT COOLING WATER TEMPERATURE FOR SAFETY SYSTEMS
15 Jul	23.0	5.6	UP	L33	BECAUSE OF HUMAN ERROR A PRESSURE SWICH WAS TRIGGERED AND A MAIN COOLING PUMP BECAME STOPPED.
22 Jul	29.0	15.6	UF4	A12	BECAUSE OF FAILURE IN PROCESS COMPUTER POWER SUPPLY A REACTOR SCRAM WAS FOLLOWED.
13 Aug	23.0	11.1	UF4	A31	BECAUSE OF AN OIL LEAKE FROM THE TURBINE FOLLOWED BY HIGH PRESSURE IN MAIN CONDENSOR A REACTOR SCRAM OCCURED.
23 Aug	535.0	250.6	PF	C	ANNAL OUTAGE
15 Sep	505.0	237.1	UF3	A11	OUTAGE EXTENSION
25 Dec	34.0	16.1	UF4	A31	AUTOMATIC REACTOR SCRAM EXPERIENCED DURING MANUAL SHUTDOWN.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		647			708	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	535			802	67	
D. Inspection, maintenance or repair without refuelling				786		
E. Testing of plant systems or components		57		3	0	
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling		335		259		
H. Nuclear regulatory requirements					242	
J. Grid failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					128	
Z. Others					5	
Subtotal	535	1039	0	1850	1154	1
Total		1574			3005	

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	505	119
12. Reactor I&C Systems	29	108
13. Reactor Auxiliary Systems		15
14. Safety Systems	31	26
15. Reactor Cooling Systems		27
21. Fuel Handling and Storage Facilities		22
31. Turbine and auxiliaries	82	259
32. Feedwater and Main Steam System		28
35. All other I&C Systems		4
41. Main Generator Systems		66
42. Electrical Power Supply Systems		27
XX. Miscellaneous Systems		2
Total	647	703

# SE-3 OSKARSHAMN-2

**Operator:** OKG (OKG AKTIEBOLAG)  
**Contractor:** ABBATOM (ABBATOM (formerly ASEA-ATOM))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 602.0 MW(e)  
**Design Net Capacity:** 580.0 MW(e)  
**Design Discharge Burnup:** 35000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3055.3 GW(e).h  
**Energy Availability Factor:** 58.2%  
**Load Factor:** 57.9%  
**Operating Factor:** 60.4%  
**Energy Unavailability Factor:** 41.8%  
**Total Off-line Time:** 3471 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	441.9	400.1	440.3	412.4	122.1	0.0	0.0	0.0	4.2	368.5	422.2	443.7	3055.3
<b>EAF (%)</b>	99.0	99.0	98.5	95.1	27.3	0.0	0.0	0.0	1.1	84.4	98.1	98.9	58.2
<b>UCF (%)</b>	99.6	99.7	99.3	99.6	30.5	0.0	0.0	0.0	1.2	86.3	99.7	100.0	59.4
<b>LF (%)</b>	98.7	98.9	98.3	95.3	27.3	0.0	0.0	0.0	1.0	82.2	97.4	99.1	57.9
<b>OF (%)</b>	100.0	100.0	99.9	100.1	33.6	0.0	0.0	0.0	3.3	90.2	100.0	100.0	60.4
<b>EUF (%)</b>	1.0	1.0	1.5	4.9	72.7	100.0	100.0	100.0	98.9	15.6	1.9	1.1	41.8
<b>PUF (%)</b>	0.0	0.0	0.3	0.0	69.2	100.0	11.6	0.0	0.0	0.0	0.3	0.0	15.1
<b>UCLF (%)</b>	0.4	0.3	0.3	0.4	0.2	0.0	88.4	100.0	98.8	13.7	0.0	0.1	25.4
<b>XUF (%)</b>	0.6	0.6	0.8	4.5	3.3	0.0	0.0	0.0	0.1	1.9	1.6	1.0	1.2

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1969  
**Date of First Criticality:** 06 Mar 1974  
**Date of Grid Connection:** 02 Oct 1974  
**Date of Commercial Operation:** 01 Jan 1975

**Lifetime Generation:** 113160.6 GW(e).h  
**Cumulative Energy Availability Factor:** 78.4%  
**Cumulative Load Factor:** 74.6%  
**Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 21.6%

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	4248.7	570.0	85.3	73.8	85.3	73.8	85.1	71.5	7905	90.2
1983	4054.3	595.0	86.9	75.3	86.8	75.3	77.8	72.2	7703	87.9
1984	4797.6	595.0	92.2	77.0	92.2	77.0	91.8	74.2	8253	94.0
1985	3988.7	595.0	86.9	78.0	86.9	78.0	76.5	74.4	7739	88.3
1986	4277.8	595.0	83.8	78.5	83.9	78.5	82.1	75.1	7770	88.7
1987	4230.8	595.0	83.5	78.9	83.5	78.9	81.2	75.6	7789	88.9
1988	4417.4	605.0	86.0	79.4	85.9	79.4	83.1	76.1	7894	89.9
1989	3960.7	605.0	88.3	80.0	88.3	80.0	74.7	76.0	8065	92.1
1990	4050.3	605.0	84.1	80.3	84.1	80.3	76.4	76.0	7885	90.0
1991	4103.4	605.0	79.4	80.2	79.4	80.2	77.4	76.1	7467	85.2
1992	2851.5	605.0	55.3	78.8	55.3	78.8	53.7	74.8	5310	60.5
1993	2611.5	605.0	55.3	77.5	51.0	77.3	49.3	73.5	4924	56.2
1994	4460.8	605.0	88.6	78.1	86.8	77.8	84.2	74.0	7833	89.4
1995	4175.8	605.0	83.6	78.3	79.4	77.9	78.8	74.2	7452	85.1
1996	3760.4	605.0	73.1	78.1	71.7	77.6	70.8	74.1	6543	74.5
1997	4417.4	605.0	86.4	78.5	85.4	77.9	83.4	74.5	7707	88.0
1998	4457.8	605.0	90.3	79.0	90.3	78.4	84.1	74.9	7951	90.8
1999	3198.2	605.0	64.7	78.4	64.7	77.9	60.3	74.3	5667	64.7
2000	3898.5	605.0	85.3	78.7	85.3	78.2	73.4	74.3	7525	85.7
2001	4748.5	602.0	92.3	79.2	92.3	78.7	90.0	74.9	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	59.4	78.9	58.2	78.4	57.9	74.6	5289	60.4



## SE-3 OSKARSHAMN-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
08 Apr	744.0	27.2	XP	S	COAST-DOWN OPERATION
11 May	1334.0	792.7	PF	C	REFUELLING
04 Jul	2047.0	1257.4	UF3	Z	EXTENDED OUTAGE
27 Sep	26.0	33.5	UP	A32	STEAM LEAK IN THE MSIV SYSTEM
01 Oct	48.0	29.1	UF	A31	REBALANCING OF TURBINE
03 Oct	10.0	5.9	UF4	L	REACTOR SCRAM OCCURRED DURING START UP AFTER REBALANCING OF TURBINE
03 Oct	32.0	19.1	UF	A31	HIGH PRESSURE IN MAIN CONDENSER CAUSED BY FAILURE IN GLAND STEAM VALVE.
05 Oct	11.0	6.1	UP3	Z11	EXTENDED OUTAGE RAMP UP PHASE.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1975 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		80			218	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	1334			906	21	
D. Inspection, maintenance or repair without refuelling				50		
E. Testing of plant systems or components					3	
H. Nuclear regulatory requirements					146	
J. Grid failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					99	2
L. Human factor related		10				
Z. Others		2047			3	
Subtotal	1334	2137	0	956	493	3
Total		3471			1452	

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

System	2003 Hours Lost	1975 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		29
12. Reactor I&C Systems		11
13. Reactor Auxiliary Systems		0
14. Safety Systems		8
15. Reactor Cooling Systems		26
31. Turbine and auxiliaries	80	90
32. Feedwater and Main Steam System		20
33. Circulating Water System		0
35. All other I&C Systems		1
41. Main Generator Systems		5
42. Electrical Power Supply Systems		2
XX. Miscellaneous Systems		1
Total	80	193

# SE-12 OSKARSHAMN-3

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

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1160.0 MW(e)  
**Design Net Capacity:** 1050.0 MW(e)  
**Design Discharge Burnup:** 30000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7678.0 GW(e).h  
**Energy Availability Factor:** 76.2%  
**Load Factor:** 75.6%  
**Operating Factor:** 78.4%  
**Energy Unavailability Factor:** 23.8%  
**Total Off-line Time:** 1889 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	851.6	771.1	851.8	823.9	817.5	322.5	576.8	823.3	598.1	0.0	393.6	847.9	7678.0
<b>EAF (%)</b>	99.6	99.7	99.6	99.3	95.3	39.3	67.7	96.3	72.6	0.0	47.6	98.8	76.2
<b>UCF (%)</b>	99.6	99.7	99.7	99.5	99.6	47.0	70.2	99.4	75.0	0.0	48.0	99.2	78.0
<b>LF (%)</b>	98.7	98.9	98.7	98.8	94.7	38.6	66.8	95.4	71.6	0.0	47.1	98.2	75.6
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	46.7	72.0	100.0	75.0	0.0	48.3	100.0	78.4
<b>EUf (%)</b>	0.4	0.3	0.4	0.7	4.7	60.7	32.3	3.7	27.4	100.0	52.4	1.2	23.8
<b>PUF (%)</b>	0.1	0.1	0.1	0.2	0.1	52.9	24.2	0.2	0.0	0.0	0.0	0.1	6.5
<b>UCLF (%)</b>	0.2	0.2	0.2	0.2	0.2	0.1	5.6	0.4	25.0	100.0	52.1	0.7	15.5
<b>XUF (%)</b>	0.0	0.0	0.1	0.2	4.3	7.7	2.5	3.1	2.4	0.0	0.3	0.4	1.8

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

DURING RECOVERING AFTER LOSS OF OFF-SITE POWER THE UNIT EXPERIENCED MAXIMUM PERMISSIBLE LIMITING VALUE MPLV IN REGARDS TO HIGH SPEED IN CHANGE OF TEMPERATURE IN REACTOR COOLANT WATER.

## 5. Historical Summary

**Date of Construction Start:** 01 May 1980  
**Date of First Criticality:** 29 Dec 1984  
**Date of Grid Connection:** 03 Mar 1985  
**Date of Commercial Operation:** 15 Aug 1985

**Lifetime Generation:** 151758.7 GW(e).h  
**Cumulative Energy Availability Factor:** 86.8%  
**Cumulative Load Factor:** 82.3%  
**Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1985	3848.5	1068.0	0.0	0.0	73.3	100.0	41.4	0.0	4706	54.0
1986	8386.9	1070.0	90.1	90.1	90.1	90.1	89.5	89.5	8111	92.6
1987	7058.0	1070.0	79.6	84.9	79.6	84.9	75.3	82.4	7988	91.2
1988	7311.9	1065.0	82.1	84.0	82.1	83.9	78.2	81.0	7458	84.9
1989	7788.2	1160.0	91.3	85.8	91.3	86.0	82.0	79.8	8242	94.1
1990	7640.2	1065.0	82.2	85.1	82.2	85.2	80.1	80.2	7782	88.8
1991	8935.8	1160.0	89.3	85.8	89.3	85.9	87.9	81.6	8184	93.4
1992	8270.6	1160.0	82.6	85.3	82.5	85.4	81.2	81.5	7904	90.0
1993	8339.5	1160.0	91.6	86.2	83.8	85.2	82.1	81.6	8034	91.7
1994	8480.4	1160.0	85.0	86.0	84.9	85.2	83.5	81.8	7832	89.4
1995	8828.1	1160.0	89.8	86.4	87.5	85.4	86.9	82.3	7957	90.8
1996	8518.6	1160.0	85.2	86.3	85.0	85.4	83.6	82.5	7519	85.6
1997	8970.4	1160.0	91.1	86.7	91.1	85.9	88.3	83.0	8017	91.5
1998	8032.3	1160.0	89.4	86.9	89.4	86.2	79.0	82.6	7914	90.3
1999	8516.6	1160.0	89.2	87.1	89.2	86.4	83.8	82.7	7850	89.6
2000	7219.1	1160.0	91.2	87.4	91.2	86.7	70.8	81.9	8075	91.9
2001	9052.0	1160.0	92.6	87.7	92.6	87.1	89.1	82.4	8160	93.2
2002	8884.0	1160.0	92.3	88.0	92.3	87.4	87.4	82.7	8140	92.9
2003	7678.0	1160.0	78.0	87.4	76.2	86.8	75.6	82.3	6871	78.4

**SE-12 OSKARSHAMN-3****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
11 May	851.0	97.5	XP	S21	COAST DOWN OPERATION
15 Jun	1.0	1.2	UF4	A31	AUTOMATIC SCRAM CONNECTED TO OVERSPEED TEST ON MAIN TURBINE
15 Jun	552.0	651.0	PF	C	REFUELLING
08 Jul	30.0	34.5	UF	A41	OUTAGE EXTENSION
09 Jul	10.0	12.1	UF	A31	TURBINE SHUT DOWN DUE TO FAILURE IN CONTROL AND PROTECTION SYSTEMS
23 Sep	180.0	206.4	UF5	A31	PROBLEMS IN A VALVE IN THE CONDENSATE CLEANING SYSTEM LEAD TO A LOW LEVEL IN THE MAIN CONDENSER. A MANUAL SCRAM WAS TRIGGERED
01 Oct	1116.0	1298.1	UF	H11	DURING RESTART AFTER REACTOR SCRAM 23 SEPTEMBER AN ALARM SHOWING A MAXIMUM PERMISSIBLE LIMITING VALUE WAS EXCEEDED. AN EXTENSIVE REPORT TO THE INSPECTORATE WAS PERFORMED

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

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		221			95	
B. Refuelling without a maintenance					12	
C. Inspection, maintenance or repair combined with refuelling	552			575	20	
D. Inspection, maintenance or repair without refuelling				11		
H. Nuclear regulatory requirement		1116				
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					23	
Subtotal	552	1337	0	586	150	0
Total		1889			736	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		13
13. Reactor Auxiliary System:		1
14. Safety Systems		14
15. Reactor Cooling Systems:		27
21. Fuel Handling and Storage Facilities		14
31. Turbine and auxiliaries:	191	6
32. Feedwater and Main Steam System		9
35. All other I&C Systems:		0
41. Main Generator System:	30	
Total	221	90

# SE-4 RINGHALS-1

**Operator:** RAB (Ringhals AB)  
**Contractor:** ABBATOM (ABBATOM (formerly ASEA-ATOM))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 830.0 MW(e)  
**Design Net Capacity:** 760.0 MW(e)  
**Design Discharge Burnup:** 36000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5104.3 GW(e).h  
**Energy Availability Factor:** 70.2%  
**Load Factor:** 70.2%  
**Operating Factor:** 71.6%  
**Energy Unavailability Factor:** 29.8%  
**Total Off-line Time:** 2491 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	624.5	564.4	612.2	515.8	612.3	299.9	22.1	519.5	0.0	165.8	545.6	622.1	5104.3
<b>EAF (%)</b>	100.0	100.0	98.1	85.5	99.9	51.0	2.6	89.9	0.0	26.0	90.8	100.0	70.2
<b>UCF (%)</b>	100.0	100.0	98.6	85.6	100.0	51.0	2.6	91.8	0.0	26.0	90.8	100.0	70.4
<b>LF (%)</b>	101.1	101.2	99.1	86.4	99.2	50.2	3.6	84.1	0.0	26.8	91.3	100.7	70.2
<b>OF (%)</b>	100.0	100.0	100.0	85.7	100.0	50.0	3.4	90.3	0.0	30.6	100.0	100.0	71.6
<b>EUf (%)</b>	0.0	0.0	1.9	14.5	0.1	49.0	97.4	10.1	100.0	74.0	9.2	0.0	29.8
<b>PUF (%)</b>	0.0	0.0	0.4	0.0	0.0	0.0	0.0	7.4	100.0	71.7	0.0	0.0	15.0
<b>UCLF (%)</b>	0.0	0.0	1.0	14.5	0.1	49.1	97.4	0.8	0.0	2.3	9.2	0.0	14.6
<b>XUF (%)</b>	0.0	0.0	0.5	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1969      **Lifetime Generation:** 128141.9 GW(e).h  
**Date of First Criticality:** 20 Aug 1973      **Cumulative Energy Availability Factor:** 71.0%  
**Date of Grid Connection:** 14 Oct 1974      **Cumulative Load Factor:** 66.0%  
**Date of Commercial Operation:** 01 Jan 1976      **Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	4687.5	750.0	75.0	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	67.0	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	51.1	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	88.8	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	65.4	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

## SE-4 RINGHALS-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Mar	12.0	2.6	PP	E32	TEST
04 Mar	19.0	6.2	UP	A32	FEEDWATER SYSTEM PROBLEM
30 Mar	17.0	3.1	XP	J42	REDUSE OF POWER DUE TO TRANSFER PROBLEMS ON THE NATIONAL GRID, OUTSIDE RINGHALS.
19 Apr	103.0	86.2	UF	A14	SAFETY SYSTEM PROBLEM
14 May	4.0	0.1	UP	A31	LOAD REDUCTION DUE TO HIGH TEMP ON TURBINE REGULATION OIL SYSTEM.
19 May	7.0	0.2	UP	A31	LOAD REDUCTION DUE TO HIGH TEMP ON TURBINE REGULATION OIL SYSTEM.
16 Jun	1078.0	895.0	UF	A11	REACTOR SYSTEM FAILURE
13 Aug	16.0	3.3	XP	N33	DUE TO WARM SEA COOLING WATER MAIN COOLING WATER PUMPS TRIP, MANUAL TURBINE TRIP
15 Aug	333.0	11.7	XP	S11	COAST-DOWN OPERATION.
29 Aug	1017.0	848.6	PF	C11	YEARLY MAINTENANCE.
09 Oct	293.0	247.1	UF3	Z11	MAINTENANCE EXTENTION
30 Oct	182.0	68.9	UP	A32	

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		1181			554	
B. Refuelling without a maintenanc					2	
C. Inspection, maintenance or repai combined with refuelling	1017			993	45	
D. Inspection, maintenance or repai without refuelling				2		
E. Testing of plant systems or component					6	
H. Nuclear regulatory requirement						15
J. Grid failure or grid unavailabilit						3
K. Load-following (frequency contro reserve shutdown due to reduced energ demand)					33	11
L. Human factor relatetc					2	
Z. Others		293				
Subtotal	1017	1474	0	995	642	29
Total		2491			1666	

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

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	1078	161
12. Reactor I&C Systems		79
13. Reactor Auxiliary System:		1
14. Safety Systems	103	49
15. Reactor Cooling System:		126
31. Turbine and auxiliarie:		22
32. Feedwater and Main Steam Syster		35
35. All other I&C Systems		1
41. Main Generator System:		0
42. Electrical Power Supply System:		13
XX. Miscellaneous Systems		0
Total	1181	487

**SE-5 RINGHALS-2**

Operator: RAB (Ringhals AB)

Contractor: WEST (WESTINGHOUSE ELECTRIC CORPORATION)

**1. Station Details**

Type: PWR  
 Maximum Net Capacity  
 at the beginning of 2003: 875.0 MW(e)  
 Design Net Capacity: 820.0 MW(e)  
 Design Discharge Burnup: 44000 MW.d/t

**2. Production Summary 2003**

Energy Production: 6811.5 GW(e).h  
 Energy Availability Factor: 90.9%  
 Load Factor: 88.9%  
 Operating Factor: 92.4%  
 Energy Unavailability Factor: 9.1%  
 Total Off-line Time: 667 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	647.8	585.3	646.7	566.6	350.2	296.3	607.6	615.8	607.3	620.9	622.9	644.3	6811.5
EAF (%)	100.0	100.0	100.0	90.8	55.1	49.0	98.4	100.0	100.0	97.3	100.0	100.0	90.9
UCF (%)	100.0	100.0	100.0	94.7	71.2	49.0	98.4	100.0	100.0	97.3	100.0	100.0	92.6
LF (%)	99.5	99.5	99.3	90.1	53.8	47.0	93.3	94.6	96.4	95.3	98.9	99.0	88.9
OF (%)	100.0	100.0	100.0	91.5	71.2	49.0	100.0	100.0	100.0	96.6	100.0	100.0	92.4
EUf (%)	0.0	0.0	0.0	9.2	44.9	51.0	1.6	0.0	0.0	2.7	0.0	0.0	9.1
PUF (%)	0.0	0.0	0.0	0.0	28.8	51.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6
UCLF (%)	0.0	0.0	0.0	5.3	0.0	0.0	1.6	0.0	0.0	2.7	0.0	0.0	0.8
XUF (%)	0.0	0.0	0.0	3.9	16.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Oct 1970      Lifetime Generation: 137672.5 GW(e).h  
 Date of First Criticality: 19 Jun 1974      Cumulative Energy Availability Factor: 70.5%  
 Date of Grid Connection: 17 Aug 1974      Cumulative Load Factor: 65.6%  
 Date of Commercial Operation: 01 May 1975      Cumulative Unit Capability Factor: 77.1%  
    Cumulative Energy Unavailability Factor: 29.5%

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 (%)
1982	4548.0	800.0	66.3	58.9	66.3	58.9	64.9	58.6	5922	67.6
1983	3935.3	800.0	56.1	58.6	56.2	58.6	56.2	58.3	6107	69.7
1984	4178.7	800.0	68.3	59.7	68.2	59.6	59.5	58.4	6090	69.3
1985	4294.7	800.0	74.8	61.2	74.8	61.2	61.3	58.7	6680	76.3
1986	3969.1	800.0	59.4	61.0	59.4	61.0	56.6	58.5	6383	72.9
1987	4216.6	800.0	65.3	61.4	65.2	61.3	60.2	58.6	7397	84.4
1988	4216.1	800.0	68.5	61.9	68.5	61.9	60.0	58.8	7368	83.9
1989	3619.6	800.0	50.0	61.1	50.0	61.1	51.6	58.2	6002	68.5
1990	5064.8	800.0	66.7	61.4	66.7	61.4	72.3	59.2	6348	72.5
1991	6232.8	875.0	83.5	62.9	83.5	62.9	81.3	60.7	7909	90.3
1992	5193.4	875.0	72.1	63.5	72.1	63.5	67.6	61.1	6959	79.2
1993	2650.0	875.0	37.8	62.0	37.8	62.0	34.6	59.5	3307	37.8
1994	6258.7	875.0	84.7	63.3	83.0	63.2	81.7	60.8	7429	84.8
1995	6096.6	867.0	85.6	64.4	84.8	64.3	80.3	61.8	7676	87.6
1996	5723.3	864.0	84.6	65.5	76.8	64.9	75.4	62.5	7574	86.2
1997	2372.1	864.0	98.8	67.0	98.2	66.5	31.3	61.0	2748	31.4
1998	6096.4	875.0	90.5	68.1	82.2	67.2	79.5	61.9	7866	89.8
1999	6445.8	862.0	92.2	69.2	85.8	68.0	85.4	62.9	8075	92.2
2000	5143.5	862.0	84.8	69.8	77.0	68.4	67.9	63.1	7284	82.9
2001	6322.7	862.0	87.0	70.5	85.7	69.1	83.7	63.9	8004	91.4
2002	6540.3	875.0	89.2	71.2	84.3	69.7	85.3	64.7	8130	92.8
2003	6811.5	875.0	92.5	72.0	90.9	70.5	88.9	65.6	8093	92.4

**SE-5 RINGHALS-2****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
24 Jan	8.0	0.1	PP	E11	MODERATOR TEMPERATURE COEFFICIENT-TEST
08 Mar	3.0	0.2	PP	E31	TURBINE TEST
12 Apr	977.0	129.2	XP	S11	COAST DOWN OPERATION
22 Apr	61.0	33.6	UF4	A42	MAIN TRANSFORMER PROBLEM
23 May	581.0	508.7	PF	C	REFUELLING
02 Jul	27.0	10.1	UP	A41	STATOR AND ROTOR COOLING WATER SYSTEM.
04 Jul	3.0	0.3	UP	A41	STATOR AND ROTOR COOLING WATER SYSTEM.
21 Sep	7.0	0.3	PP	E31	TURBINE TEST
23 Oct	25.0	17.7	UF4	A12	REACTOR SCRAM DUE TO FAILURE ON MOTOR/GENERATOR-SET (MG-SET).

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

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		86			703	
B. Refuelling without a maintenanc					0	
C. Inspection, maintenance or repai combined with refuelling	581			1001		
D. Inspection, maintenance or repai without refuelling				92		
E. Testing of plant systems or component				3		
H. Nuclear regulatory requirement					4	
J. Grid failure or grid unavailabilit						5
K. Load-following (frequency contro reserve shutdown due to reduced energ demand)						9
Z. Others					1	
Subtotal	581	86	0	1096	708	14
Total		667			1818	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		191
12. Reactor I&C Systems	25	7
14. Safety Systems		39
15. Reactor Cooling System:		19
16. Steam generation system:		256
21. Fuel Handling and Storage Facilitie		53
31. Turbine and auxiliaries:		16
32. Feedwater and Main Steam Syster		40
33. Circulating Water System		0
35. All other I&C Systems:		0
41. Main Generator System:		36
42. Electrical Power Supply System:	61	31
Total	86	688

# SE-7 RINGHALS-3

**Operator:** RAB (Ringhals AB)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 915.0 MW(e)  
**Design Net Capacity:** 915.0 MW(e)  
**Design Discharge Burnup:** 44000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6714.6 GW(e).h  
**Energy Availability Factor:** 84.4%  
**Load Factor:** 83.8%  
**Operating Factor:** 85.3%  
**Energy Unavailability Factor:** 15.6%  
**Total Off-line Time:** 1285 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	680.1	617.4	689.4	609.1	0.0	187.6	655.2	653.8	597.0	678.2	661.6	685.1	6714.6
<b>EAF (%)</b>	100.0	100.0	100.0	92.2	0.0	28.8	100.0	100.0	92.9	100.0	100.0	100.0	84.4
<b>UCF (%)</b>	100.0	100.0	100.0	99.3	0.0	28.8	100.0	100.0	96.3	100.0	100.0	100.0	85.3
<b>LF (%)</b>	99.9	100.4	101.3	92.6	0.0	28.5	96.2	96.0	90.6	99.5	100.4	100.6	83.8
<b>OF (%)</b>	100.0	100.0	100.0	99.9	0.0	32.1	100.0	100.0	93.1	99.9	100.0	100.0	85.3
<b>EUf (%)</b>	0.0	0.0	0.0	7.8	100.0	71.2	0.0	0.0	7.1	0.0	0.0	0.0	15.6
<b>PUF (%)</b>	0.0	0.0	0.0	0.7	100.0	70.7	0.0	0.0	0.0	0.0	0.0	0.0	14.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	3.7	0.0	0.0	0.0	0.4
<b>XUF (%)</b>	0.0	0.0	0.0	7.1	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.9

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1972      **Lifetime Generation:** 127558.4 GW(e).h  
**Date of First Criticality:** 29 Jul 1980      **Cumulative Energy Availability Factor:** 77.2%  
**Date of Grid Connection:** 07 Sep 1980      **Cumulative Load Factor:** 70.7%  
**Date of Commercial Operation:** 09 Sep 1981      **Cumulative Unit Capability Factor:** 77.4%  
**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 (%)	
1982	1251.6	915.0	15.6	15.6	15.6	15.6	15.6	15.6	15.6	3680	42.0
1983	2909.9	867.0	38.3	26.6	38.1	26.6	38.3	26.7	5886	67.2	
1984	5346.6	915.0	72.4	42.2	72.4	42.2	66.5	40.2	6450	73.4	
1985	6090.3	915.0	84.8	53.0	84.8	53.0	76.0	49.3	7580	86.5	
1986	6233.9	915.0	78.8	58.2	78.8	58.2	77.8	55.0	7026	80.2	
1987	6169.2	915.0	83.1	62.4	83.1	62.4	77.0	58.7	7485	85.4	
1988	6151.2	915.0	77.1	64.5	77.1	64.5	76.5	61.3	7645	87.0	
1989	5829.7	915.0	82.6	66.8	82.6	66.8	72.7	62.7	7757	88.6	
1990	5871.3	915.0	74.2	67.6	74.0	67.6	73.2	63.9	7855	89.7	
1991	5923.6	915.0	75.7	68.4	75.7	68.4	73.9	64.9	8007	91.4	
1992	5622.1	915.0	82.3	69.7	82.3	69.7	69.9	65.4	7941	90.4	
1993	6685.8	915.0	89.8	71.4	89.8	71.3	83.4	66.9	7964	90.9	
1994	6873.4	918.0	86.1	72.5	86.1	72.5	85.5	68.3	8097	92.4	
1995	4873.6	918.0	60.7	71.7	60.7	71.6	60.6	67.8	6040	68.9	
1996	6816.8	910.0	92.5	73.0	87.3	72.7	85.3	68.9	8166	93.0	
1997	2284.3	910.0	95.5	74.5	95.5	74.1	28.7	66.4	2809	32.1	
1998	6382.6	915.0	90.2	75.4	81.3	74.5	79.6	67.2	8008	91.4	
1999	6976.0	911.0	90.0	76.2	88.0	75.3	87.4	68.3	7899	90.2	
2000	6165.8	911.0	92.3	77.0	89.5	76.0	77.1	68.8	7966	90.7	
2001	6285.3	911.0	88.6	77.6	79.4	76.2	78.8	69.3	7942	90.7	
2002	6890.6	915.0	90.8	78.2	88.8	76.8	86.0	70.1	7930	90.5	
2003	6714.6	915.0	85.3	78.6	84.4	77.2	83.8	70.7	7475	85.3	



**SE-7 RINGHALS-3****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
23 Mar	5.0	0.1	PP	E31	TURBINE TEST
31 Mar	720.0	46.5	XP	S11	COAST-DOWN OPERATION.
30 Apr	1235.0	1154.6	PF	C	REFUELLING
26 Jun	21.0	3.2	UP	L31	START-UP ACTIVITIES
30 Jun	30.0	0.4	UP	A32	START-UP ACTIVITIES
28 Aug	4.0	0.1	PP	E31	TEST
14 Sep	5.0	0.2	PP	E31	TEST
20 Sep	25.0	15.7	UF	Z13	CHANGE INCORRECT INSULATION ON VALVE IN RHR-SYSTEM.
23 Sep	25.0	22.1	XF4	J	GRID PROBLEMS
24 Sep	22.0	8.6	UP	A32	PROBLEMS WITH TURBINE MAIN STEAM BY-PASS VALVES
26 Oct	4.0	0.1	PP	E31	TEST
07 Dec	6.0	0.2	PP	E31	TEST

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

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					297	
C. Inspection, maintenance or repair combined with refuelling	1235			610	20	
D. Inspection, maintenance or repair without refuelling				326		
E. Testing of plant systems or component				6	1	
H. Nuclear regulatory requirement				3		
J. Grid failure or grid unavailability			25			2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						5
Z. Others		25			2	
Subtotal	1235	25	25	945	320	7
Total		1285			1272	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		10
12. Reactor I&C Systems		1
15. Reactor Cooling System:		63
16. Steam generation system:		199
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries:		1
32. Feedwater and Main Steam System		15
42. Electrical Power Supply System:		0
Total	0	289

# SE-10 RINGHALS-4

**Operator:** RAB (Ringhals AB)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 915.0 MW(e)  
**Design Net Capacity:** 915.0 MW(e)  
**Design Discharge Burnup:** 44000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6996.5 GW(e).h  
**Energy Availability Factor:** 88.9%  
**Load Factor:** 87.3%  
**Operating Factor:** 89.5%  
**Energy Unavailability Factor:** 11.1%  
**Total Off-line Time:** 917 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	680.6	615.2	680.3	649.1	670.0	631.7	611.1	0.0	487.7	668.9	652.0	649.9	6996.5
<b>EAF (%)</b>	100.0	100.0	99.9	98.8	100.0	100.0	95.7	0.0	77.1	100.0	100.0	96.5	88.9
<b>UCF (%)</b>	100.0	100.0	100.0	98.8	100.0	100.0	97.3	0.0	79.1	100.0	100.0	96.8	89.2
<b>LF (%)</b>	100.0	100.1	99.9	98.7	98.4	95.9	89.8	0.0	74.0	98.1	99.0	95.5	87.3
<b>OF (%)</b>	100.0	100.0	100.0	100.1	100.0	100.0	96.5	0.0	79.6	99.9	100.0	100.0	89.5
<b>EUf (%)</b>	0.0	0.0	0.1	1.2	0.0	0.0	4.3	100.0	22.9	0.0	0.0	3.5	11.1
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	2.7	81.5	2.3	0.0	0.0	0.0	7.3
<b>UCLF (%)</b>	0.0	0.0	0.0	1.2	0.0	0.0	0.0	18.5	18.7	0.0	0.0	3.2	3.5
<b>XUF (%)</b>	0.0	0.0	0.1	0.0	0.0	0.0	1.5	0.0	2.0	0.0	0.0	0.4	0.3

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1973      **Lifetime Generation:** 123270.3 GW(e).h  
**Date of First Criticality:** 19 May 1982      **Cumulative Energy Availability Factor:** 84.3%  
**Date of Grid Connection:** 23 Jun 1982      **Cumulative Load Factor:** 75.2%  
**Date of Commercial Operation:** 21 Nov 1983      **Cumulative Unit Capability Factor:** 77.7%  
**Cumulative Energy Unavailability Factor:** 15.7%

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 (%)
1982	190.6	915.0	0.0	0.0	46.6	100.0	2.5	0.0	1418	17.2
1983	2653.1	915.0	0.0	0.0	33.1	100.0	33.1	0.0	4122	47.1
1984	5987.7	915.0	82.3	82.3	82.2	82.2	74.5	74.5	7517	85.6
1985	5923.7	915.0	87.9	85.1	87.9	85.0	73.9	74.2	7755	88.5
1986	5619.3	915.0	70.7	80.3	70.7	80.3	70.1	72.8	6839	78.1
1987	5665.9	915.0	88.2	82.3	88.2	82.2	70.7	72.3	7827	89.3
1988	6641.7	915.0	83.4	82.5	83.4	82.5	82.6	74.4	7945	90.4
1989	5536.8	915.0	85.8	83.0	85.8	83.0	69.1	73.5	7624	87.0
1990	6467.3	915.0	89.1	83.9	89.1	83.9	80.7	74.5	8080	92.2
1991	6916.2	915.0	85.8	84.2	85.9	84.1	86.3	76.0	8041	91.8
1992	6432.4	915.0	90.1	84.8	90.0	84.8	80.0	76.4	8156	92.9
1993	6342.3	915.0	88.8	85.2	88.8	85.2	79.1	76.7	7906	90.3
1994	6234.7	914.0	84.8	85.2	84.8	85.2	77.9	76.8	7476	85.3
1995	6251.7	912.0	88.4	85.4	80.6	84.8	78.3	76.9	7684	87.7
1996	6426.8	912.0	91.8	85.9	79.6	84.4	80.2	77.2	8067	91.8
1997	2560.0	912.0	98.9	86.9	98.9	85.4	32.0	74.0	2783	31.8
1998	6809.8	915.0	92.5	87.2	86.5	85.5	85.0	74.7	8146	93.0
1999	6986.8	907.0	91.7	87.5	88.6	85.7	87.9	75.5	8042	91.8
2000	4060.7	907.0	66.5	86.3	63.4	84.4	51.0	74.1	5898	67.1
2001	6624.0	909.0	88.4	86.4	86.5	84.5	83.2	74.6	7758	88.6
2002	5942.2	915.0	80.3	86.1	75.5	84.0	74.1	74.6	7056	80.5
2003	6996.5	915.0	89.2	86.2	88.9	84.3	87.3	75.2	7843	89.5

## SE-10 RINGHALS-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
30 Mar	12.0	0.6	XP	J	TRANSFER PROBLEMS ON THE NATIONAL GRID, OUTSIDE RINGHALS.
22 May	12.0	0.1	PP	E11	MODERATOR-TEMPERATURE COEFFICIENT-TEST
21 Jul	236.0	10.5	XP	S11	COAST-DOWN
31 Jul	628.0	575.2	PF	C	REFUELLING
26 Aug	249.0	228.8	UF3	A11	EXTERNAL LEAKAGE IN PRZ-LEVEL NOZZLE.
05 Sep	40.0	14.8	PF	Z	BACK ON GRID AFTER UNPLANNED FULL OUTAGE EXTENSION INCREASE POWER (RAMP UP).
13 Sep	48.0	19.8	UP	A41	ROTOR COOLING WATER SYSTEM.
23 Sep	30.0	13.1	XP	J42	GRID UNAVAILABILITY
17 Oct	3.0	0.0	PP	E31	TEST
06 Dec	50.0	21.6	UP	A41	ROTOR COOLING WATER LEAKAGE.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1982 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		249			164	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	628			689	1	
D. Inspection, maintenance or repair without refuelling				273		
E. Testing of plant systems or component				48	21	
H. Nuclear regulatory requirement					3	
J. Grid failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					1	
Z. Others	40				18	
Subtotal	668	249	0	1010	209	0
Total		917			1219	

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

System	2003 Hours Lost	1982 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	249	3
12. Reactor I&C Systems		3
14. Safety Systems		1
15. Reactor Cooling System		96
16. Steam generation system		39
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		17
Total	249	160

# CH-1 BEZNAU-1

**Operator:** NOK (NORDOSTSCHWEIZERISCHE KRAFTWERKE)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 365.0 MW(e)  
**Design Net Capacity:** 350.0 MW(e)  
**Design Discharge Burnup:** 32000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3061.8 GW(e).h  
**Energy Availability Factor:** 96.2%  
**Load Factor:** 95.8%  
**Operating Factor:** 97.0%  
**Energy Unavailability Factor:** 3.8%  
**Total Off-line Time:** 266 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	272.4	247.0	273.0	264.1	271.6	160.5	262.0	242.2	258.7	272.1	264.4	273.7	3061.8
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	62.5	99.3	92.6	99.7	100.0	99.9	100.0	96.2
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	62.9	100.0	100.0	100.0	100.0	99.9	100.0	96.9
<b>LF (%)</b>	100.3	100.7	100.5	100.6	100.0	61.1	96.5	89.2	98.4	100.1	100.6	100.8	95.8
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	63.1	100.0	100.0	100.0	100.0	100.0	100.0	97.0
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	37.5	0.7	7.4	0.3	0.0	0.1	0.0	3.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	37.1	0.0	0.0	0.0	0.0	0.1	0.0	3.1
<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	0.4	0.7	7.4	0.3	0.0	0.0	0.0	0.7

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 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:** 86715.9 GW(e).h  
**Cumulative Energy Availability Factor:** 82.7%  
**Cumulative Load Factor:** 82.1%  
**Cumulative Unit Capability Factor:** 77.3%  
**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 (%)
1982	2566.9	350.0	83.5	87.1	83.5	77.8	83.7	75.7	7553	86.2
1983	2551.7	350.0	83.5	86.9	83.5	78.2	83.2	76.2	7546	86.1
1984	2732.9	350.0	88.8	87.0	88.8	78.9	88.9	77.1	8001	91.1
1985	2634.3	350.0	86.0	86.9	86.0	79.4	85.9	77.6	7906	90.3
1986	2496.3	350.0	81.6	86.6	81.6	79.5	81.4	77.8	7403	84.5
1987	2486.3	350.0	80.7	86.3	80.7	79.6	81.1	78.0	7256	82.8
1988	2566.5	350.0	83.0	86.1	83.0	79.7	83.5	78.3	7499	85.4
1989	2433.1	350.0	78.7	85.7	78.6	79.7	79.4	78.4	7062	80.6
1990	2562.5	350.0	84.4	85.7	84.4	79.9	83.6	78.6	7506	85.7
1991	2495.3	350.0	83.5	85.6	83.5	80.1	81.4	78.7	7430	84.8
1992	2477.4	350.0	81.7	85.4	81.7	80.1	80.6	78.8	7303	83.1
1993	2158.4	350.0	69.9	84.8	69.4	79.7	70.4	78.5	6241	71.2
1994	2686.9	350.0	86.2	84.8	85.1	79.9	87.6	78.8	7610	86.9
1995	2850.5	350.0	90.5	85.0	90.2	80.3	93.0	79.4	7993	91.2
1996	2753.2	353.0	87.5	85.1	86.8	80.5	88.8	79.7	7704	87.7
1997	2708.2	365.0	87.5	85.2	85.1	80.7	84.7	79.9	7731	88.3
1998	3183.1	365.0	99.9	85.7	99.8	81.4	99.6	80.6	8760	100.0
1999	2841.3	365.0	91.3	85.9	88.6	81.7	88.9	80.9	8074	92.2
2000	2539.2	365.0	79.2	85.7	78.3	81.5	79.2	80.9	7113	81.0
2001	3090.2	365.0	96.8	86.1	96.8	82.0	96.6	81.4	8504	97.1
2002	2908.8	365.0	91.3	86.2	91.0	82.3	91.0	81.7	8000	91.3
2003	3061.8	365.0	96.9	86.5	96.2	82.7	95.8	82.1	8494	97.0

# CH-1 BEZNAU-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
10 Jun	266.0	97.3	PF	B	PLANT SHUT-DOWN FOR REFUELLING WITHOUT MAINTENANCE
25 Jun	695.0	22.9	XP1	N	COOLING WATER TEMPERATURE LIMITS
28 Sep	12.0	0.9	XP2	J	SHORT POWER REDUCTION UPON THE GRID-DISPATCHER'S REQUEST (GRID-FAILURE IN ITALY)

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					266	
B. Refuelling without a maintenance	266			1012		
C. Inspection, maintenance or repair combined with refuelling				20		
D. Inspection, maintenance or repair without refuelling						
E. Testing of plant systems or components					0	
Subtotal	266	0	0	1032	266	0
Total		266			1298	

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		17
12. Reactor I&C Systems		107
13. Reactor Auxiliary Systems		3
14. Safety Systems		3
15. Reactor Cooling Systems		13
16. Steam generation systems		105
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		13
35. All other I&C Systems		0
Total	0	263

# CH-3 BEZNAU-2

**Operator:** NOK (NORDOSTSCHWEIZERISCHE KRAFTWERKE)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 365.0 MW(e)  
**Design Net Capacity:** 350.0 MW(e)  
**Design Discharge Burnup:** 32000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 2920.3 GW(e).h  
**Energy Availability Factor:** 91.8%  
**Load Factor:** 91.3%  
**Operating Factor:** 92.1%  
**Energy Unavailability Factor:** 8.2%  
**Total Off-line Time:** 690 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	253.3	246.2	269.8	263.2	270.9	255.2	204.8	91.5	258.4	270.7	263.7	272.6	2920.3
<b>EAF (%)</b>	93.1	100.0	99.1	100.0	100.0	99.5	78.0	35.1	99.7	99.6	100.0	100.0	91.8
<b>UCF (%)</b>	93.1	100.0	99.1	100.0	100.0	100.0	79.3	35.5	100.0	99.6	100.0	100.0	92.1
<b>LF (%)</b>	93.3	100.4	99.4	100.3	99.7	97.1	75.4	33.7	98.3	99.5	100.4	100.4	91.3
<b>OF (%)</b>	93.4	100.0	98.9	100.0	100.0	100.0	77.4	37.5	100.0	100.0	100.0	100.0	92.1
<b>EUf (%)</b>	6.9	0.0	0.9	0.0	0.0	0.5	22.0	64.9	0.3	0.4	0.0	0.0	8.2
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	20.7	63.9	0.0	0.0	0.0	0.0	7.2
<b>UCLF (%)</b>	6.8	0.0	0.8	0.0	0.0	0.0	0.0	0.7	0.0	0.4	0.0	0.0	0.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.5	1.3	0.3	0.3	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1968      **Lifetime Generation:** 85944.1 GW(e).h  
**Date of First Criticality:** 16 Oct 1971      **Cumulative Energy Availability Factor:** 86.1%  
**Date of Grid Connection:** 23 Oct 1971      **Cumulative Load Factor:** 86.6%  
**Date of Commercial Operation:** 01 Dec 1971      **Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1982	2722.1	350.0	87.6	86.5	87.6	84.6	88.8	84.9	7811	89.2
1983	2790.5	350.0	89.6	86.7	89.6	85.0	91.0	85.4	7977	91.1
1984	2724.2	350.0	87.5	86.8	87.5	85.2	88.6	85.7	7874	89.6
1985	2629.1	350.0	85.0	86.7	84.9	85.2	85.7	85.7	7647	87.3
1986	2769.8	350.0	90.2	86.9	90.2	85.5	90.3	86.0	7983	91.1
1987	2527.6	350.0	82.4	86.6	82.4	85.3	82.4	85.8	7535	86.0
1988	2630.2	350.0	84.5	86.5	84.5	85.3	85.6	85.7	7604	86.6
1989	2643.3	350.0	85.1	86.4	85.1	85.3	86.2	85.8	7614	86.9
1990	2636.1	350.0	85.3	86.4	85.3	85.3	86.0	85.8	7568	86.4
1991	2619.5	350.0	84.5	86.3	84.5	85.2	85.4	85.8	7551	86.2
1992	2375.9	350.0	76.3	85.8	76.3	84.8	77.3	85.4	6836	77.8
1993	2650.9	350.0	85.1	85.8	84.9	84.8	86.5	85.4	7517	85.8
1994	3062.8	350.0	98.9	86.3	98.8	85.4	99.9	86.0	8710	99.4
1995	2560.9	350.0	82.7	86.2	82.6	85.3	83.5	85.9	7247	82.7
1996	2754.1	351.0	88.5	86.3	87.9	85.4	89.3	86.1	7912	90.1
1997	3090.2	357.0	99.5	86.8	99.5	86.0	98.8	86.6	8732	99.7
1998	2717.8	357.0	87.8	86.8	87.3	86.0	86.9	86.6	7755	88.5
1999	2217.2	357.0	70.7	86.2	70.3	85.4	70.9	86.0	6322	72.2
2000	3071.0	365.0	96.2	86.6	96.2	85.8	95.8	86.4	8499	96.8
2001	2568.7	365.0	80.7	86.4	80.7	85.6	80.3	86.2	7107	81.1
2002	3012.0	365.0	94.6	86.7	94.6	85.9	94.2	86.4	8292	94.7
2003	2920.3	365.0	92.0	86.8	91.8	86.1	91.3	86.6	8070	92.1

## CH-3 BEZNAU-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
29 Jan	50.0	18.6	UF4	A17	REACTOR TRIP AUTOMATIC CAUSED BY A EQUIPMENT FAILURE (MALFUNCTION) IN STEAM DUMP VALVE CONTROL
19 Mar	6.0	2.2	UF4	L12	REACTOR SCRAM AUTOMATIC DUE TO HUMAN ERROR (OPERATOR MISTAKE) DURING TEST OF REACTOR TRIP-BREACKER
24 Jun	160.0	5.7	XP2	N	COLLING WATER TEMPERATURE LIMITS
25 Jul	629.0	229.8	PF	C	PLANNED PLANT SHUT-DOWN FOR MAINTENANCE AND REFUELLING
19 Aug	4.0	1.8	UF4	A32	REACTOR TRIP DURING START UP AT 12 % NUCLEAR POWER DUE TO EQUIPMENT FAILURE (MALFUNCTION) IN FEEDWATER SYSTEM.
28 Sep	12.0	0.9	XP2	K	SHORT UNPLANNED POWER REDUCTION UPON THE GRID DISPATCHER'S REQUEST (GRID-FAILURE IN ITALY)
06 Oct	7.0	1.0	UP	L31	ONE OUT OF TWO TURBINE TRIPPED DUE TO HUMAN ERROR (OPERATOR MISTAKE) DURING TEST OF TURBINE LUBRICATING OIL SYSTEM.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		54			93	
B. Refuelling without a maintenance				8	1	
C. Inspection, maintenance or repair combined with refuelling	629			874		
D. Inspection, maintenance or repair without refuelling				43		
J. Grid failure or grid unavailability						0
L. Human factor related		6				
Subtotal	629	60	0	925	94	0
Total		689			1019	

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		9
13. Reactor Auxiliary Systems		1
14. Safety Systems		0
15. Reactor Cooling Systems		11
16. Steam generation systems		29
17. Safety I&C Systems (excluding reactor I&C)	50	
31. Turbine and auxiliaries		16
32. Feedwater and Main Steam System	4	3
35. All other I&C Systems		1
42. Electrical Power Supply Systems		1
Total	54	77

# CH-4 GOESGEN

**Operator:** KKG (KERNKRAFTWERK GOESGEN-DAENIKEN AG)  
**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 970.0 MW(e)  
**Design Net Capacity:** 920.0 MW(e)  
**Design Discharge Burnup:** 23000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7988.7 GW(e).h  
**Energy Availability Factor:** 93.9%  
**Load Factor:** 94.0%  
**Operating Factor:** 94.6%  
**Energy Unavailability Factor:** 6.1%  
**Total Off-line Time:** 469 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	730.6	661.4	723.9	700.4	685.6	205.6	709.5	706.4	695.8	730.4	706.2	732.8	7988.7
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	95.7	30.3	100.0	100.0	100.0	100.0	100.0	99.9	93.9
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	32.9	100.0	100.0	100.0	100.0	100.0	99.9	94.5
<b>LF (%)</b>	101.2	101.5	100.3	100.4	95.0	29.4	98.3	97.9	99.6	101.1	101.1	101.5	94.0
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	34.9	100.0	100.0	100.0	100.0	100.0	100.0	94.6
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	4.3	69.7	0.0	0.0	0.0	0.0	0.0	0.1	6.1
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	67.1	0.0	0.0	0.0	0.0	0.0	0.0	5.5
<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	0.1	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	4.3	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.6

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Dec 1973      **Lifetime Generation:** 162156.9 GW(e).h  
**Date of First Criticality:** 20 Jan 1979      **Cumulative Energy Availability Factor:** 87.1%  
**Date of Grid Connection:** 02 Feb 1979      **Cumulative Load Factor:** 87.3%  
**Date of Commercial Operation:** 01 Nov 1979      **Cumulative Unit Capability Factor:** 77.3%  
**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 (%)
1980	5935.7	920.0	73.5	73.5	73.4	73.5	73.4	73.4	6819	77.6
1981	6527.6	920.0	80.7	77.1	80.7	77.1	81.0	77.2	7523	85.9
1982	6436.1	920.0	79.8	78.0	79.8	78.0	79.9	78.1	7665	87.5
1983	6891.6	920.0	86.2	80.0	86.1	80.0	85.5	80.0	7790	88.9
1984	7134.8	900.0	90.6	82.1	89.8	82.0	90.2	82.0	8015	91.2
1985	6747.7	909.0	85.7	82.7	84.6	82.4	84.7	82.4	7789	88.9
1986	6754.5	941.0	84.1	82.9	82.8	82.5	81.9	82.4	7386	84.3
1987	6910.3	935.0	85.2	83.2	84.4	82.7	84.4	82.6	7521	85.9
1988	6859.0	936.0	84.7	83.4	83.4	82.8	83.4	82.7	7476	85.1
1989	6878.7	931.0	85.4	83.6	84.3	82.9	84.3	82.9	7514	85.8
1990	7131.5	929.0	89.4	84.1	87.6	83.4	87.6	83.3	7983	91.1
1991	7141.9	925.0	89.7	84.6	88.1	83.7	88.1	83.7	7918	90.4
1992	7406.9	934.0	92.1	85.2	90.2	84.2	90.3	84.2	8107	92.3
1993	7408.1	950.0	89.3	85.5	88.9	84.6	89.0	84.6	8075	92.2
1994	7661.1	947.0	92.1	85.9	91.1	85.0	92.3	85.1	8102	92.5
1995	7820.9	971.0	91.8	86.3	91.1	85.4	91.9	85.5	8109	92.6
1996	7928.4	986.0	93.4	86.7	91.5	85.8	91.5	85.9	8204	93.4
1997	7967.8	986.0	93.5	87.1	91.6	86.1	92.2	86.3	8189	93.5
1998	7839.7	986.0	93.2	87.5	90.8	86.4	90.8	86.5	8179	93.4
1999	7533.9	970.0	89.9	87.6	88.7	86.5	88.7	86.6	7887	90.0
2002	7853.3	970.0	92.9	87.8	92.3	86.8	92.4	86.9	8154	93.1
2003	7988.7	970.0	94.5	88.2	93.9	87.1	94.0	87.3	8291	94.6



## CH-4 GOESGEN

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
08 Jun	468.5	468.6	PF	C	SHUTDOWN FOR REFUELLING

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1979 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					39	
C. Inspection, maintenance or repair combined with refuelling	468			748		
E. Testing of plant systems or components					0	
J. Grid failure or grid unavailability						0
Subtotal	468	0	0	748	39	0
Total	468			787		

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

System	2003 Hours Lost	1979 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		4
16. Steam generation systems		2
31. Turbine and auxiliaries		5
32. Feedwater and Main Steam System		22
41. Main Generator Systems		3
Total	0	36

# CH-5 LEIBSTADT

**Operator:** KKL (KERNKRAFTWERK LEIBSTADT)  
**Contractor:** GETSCO (GENERAL ELECTRIC TECHNICAL SERVICES CO.)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1165.0 MW(e)  
**Design Net Capacity:** 942.0 MW(e)  
**Design Discharge Burnup:** 36000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9309.3 GW(e).h  
**Energy Availability Factor:** 89.5%  
**Load Factor:** 91.2%  
**Operating Factor:** 93.7%  
**Energy Unavailability Factor:** 10.5%  
**Total Off-line Time:** 556 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	875.2	793.0	865.9	838.0	853.5	792.9	803.1	103.9	814.6	869.1	842.5	857.7	9309.3
<b>EAF (%)</b>	85.2	95.5	99.7	100.0	98.6	94.9	93.1	13.3	97.3	100.0	100.0	98.1	89.5
<b>UCF (%)</b>	85.2	95.5	99.7	100.0	99.7	99.9	95.8	13.6	98.3	100.0	100.0	98.1	90.4
<b>LF (%)</b>	101.0	101.3	99.9	100.0	98.5	94.5	92.7	12.0	97.1	100.1	100.4	99.0	91.2
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	100.0	100.0	25.3	100.0	100.0	100.0	100.0	93.7
<b>EUf (%)</b>	14.8	4.5	0.3	0.0	1.4	5.1	6.9	86.7	2.7	0.0	0.0	1.9	10.5
<b>PUf (%)</b>	14.8	4.5	0.3	0.0	0.3	0.1	4.2	83.0	0.2	0.0	0.0	0.1	9.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	1.5	0.0	0.0	1.8	0.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	1.1	5.0	2.7	0.2	0.9	0.0	0.0	0.0	0.8

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1974      **Lifetime Generation:** 132086.0 GW(e).h  
**Date of First Criticality:** 09 Mar 1984      **Cumulative Energy Availability Factor:** 85.1%  
**Date of Grid Connection:** 24 May 1984      **Cumulative Load Factor:** 85.5%  
**Date of Commercial Operation:** 15 Dec 1984      **Cumulative Unit Capability Factor:** 77.8%  
**Cumulative Energy Unavailability Factor:** 14.9%

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	0.0	1030.0	0.0	0.0	0.0	100.0	0.0	0.0	0	0.0
1985	6769.3	955.0	80.1	80.1	80.1	80.2	81.2	80.9	7233	82.6
1986	7209.2	957.0	83.2	81.7	83.2	81.7	86.0	83.5	7668	87.5
1987	7376.4	990.0	85.2	82.9	85.2	82.9	85.1	84.0	7917	90.4
1988	7003.5	990.0	80.0	82.2	80.0	82.2	80.5	83.1	7536	85.8
1989	7364.2	990.0	85.5	82.8	85.5	82.8	84.9	83.5	7671	87.6
1990	7596.2	990.0	89.8	84.0	89.9	84.0	87.6	84.2	7905	90.2
1991	7060.3	990.0	86.0	84.3	81.3	83.6	81.4	83.8	7580	86.5
1992	7537.6	990.0	90.5	85.1	86.4	84.0	86.7	84.1	7986	90.9
1993	7338.1	990.0	89.1	85.5	84.4	84.0	84.6	84.2	7898	90.2
1994	6988.2	1003.0	81.4	85.1	79.4	83.6	79.5	83.7	7108	81.1
1995	7673.8	1030.0	89.1	85.5	84.2	83.6	85.0	83.8	7819	89.3
1996	7705.1	1030.0	87.6	85.7	84.8	83.7	85.2	84.0	7734	88.0
1997	7762.5	1030.0	89.2	86.0	86.2	83.9	86.0	84.1	7830	89.4
1998	8046.2	1030.0	92.3	86.4	88.2	84.2	89.2	84.5	8102	92.5
1999	8320.0	1080.0	91.8	86.8	86.8	84.4	87.9	84.7	8126	92.8
2000	8823.2	1115.0	92.3	87.2	89.5	84.8	90.1	85.1	8159	92.9
2003	9309.3	1165.0	90.3	87.4	89.5	85.1	91.2	85.5	8204	93.7

# CH-5 LEIBSTADT

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
02 Aug	533.2	621.2	PF	C21	ANNUAL REFUELING OUTAGE.
31 Aug	22.7	26.4	UF	A11	CONTROL AIR LEAKAGE IN DRYWELL.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		22		0	46	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	533			789		
D. Inspection, maintenance or repair without refuelling				23		
E. Testing of plant systems or components				0	2	
H. Nuclear regulatory requirements						2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				3		
Subtotal	533	22	0	815	52	2
Total		555			869	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	22	
12. Reactor I&C Systems		3
15. Reactor Cooling Systems		6
31. Turbine and auxiliaries		18
32. Feedwater and Main Steam System		9
35. All other I&C Systems		4
41. Main Generator Systems		2
XX. Miscellaneous Systems		0
Total	22	42

# CH-2 MUEHLEBERG

**Operator:** BKW (BKW ENERGIE AG)

**Contractor:** GETSCO (GENERAL ELECTRIC TECHNICAL SERVICES CO.)

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 355.0 MW(e)  
**Design Net Capacity:** 306.0 MW(e)  
**Design Discharge Burnup:** 22000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 2744.2 GW(e).h  
**Energy Availability Factor:** 87.7%  
**Load Factor:** 88.2%  
**Operating Factor:** 91.7%  
**Energy Unavailability Factor:** 12.3%  
**Total Off-line Time:** 726 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	267.4	229.9	266.7	254.8	256.3	173.2	215.9	54.9	230.9	266.7	259.4	268.1	2744.2
<b>EAF (%)</b>	99.7	94.9	99.9	98.4	96.4	68.5	83.4	21.4	91.0	100.0	100.0	99.8	87.7
<b>UCF (%)</b>	99.7	95.0	99.9	98.4	96.4	76.7	93.1	25.9	91.5	100.0	100.0	99.8	89.6
<b>LF (%)</b>	101.2	96.3	101.0	99.8	97.0	67.8	81.8	20.8	90.4	100.9	101.5	101.5	88.2
<b>OF (%)</b>	100.0	97.0	99.9	100.0	98.5	78.5	100.0	30.4	97.1	100.0	100.0	100.0	91.7
<b>EUf (%)</b>	0.3	5.1	0.1	1.6	3.6	31.5	16.6	78.6	9.0	0.0	0.0	0.2	12.3
<b>PUF (%)</b>	0.3	0.3	0.1	1.6	3.6	23.3	6.9	74.1	8.5	0.0	0.0	0.2	10.0
<b>UCLF (%)</b>	0.0	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	8.2	9.7	4.5	0.4	0.0	0.0	0.0	1.9

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Mar 1967      **Lifetime Generation:** 75574.6 GW(e).h  
**Date of First Criticality:** 08 Mar 1971      **Cumulative Energy Availability Factor:** 85.5%  
**Date of Grid Connection:** 01 Jul 1971      **Cumulative Load Factor:** 85.8%  
**Date of Commercial Operation:** 06 Nov 1972      **Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1981	2539.0	324.0	89.1	86.2	89.1	85.0	89.5	84.5	8051	91.9
1982	2663.3	326.0	88.9	86.5	88.9	85.4	93.3	85.4	8017	91.5
1983	2564.3	326.0	89.6	86.8	89.6	85.8	89.8	85.8	8026	91.6
1984	2527.2	326.0	88.1	86.9	88.1	86.0	88.3	86.0	7989	90.9
1985	2500.7	323.0	87.3	87.0	87.2	86.1	88.4	86.2	7882	90.0
1986	2114.5	326.0	73.7	86.0	73.7	85.2	74.0	85.3	6645	75.9
1987	2465.0	326.0	85.5	86.0	85.5	85.2	86.3	85.4	7959	90.9
1988	2497.6	326.0	87.1	86.0	87.1	85.3	87.2	85.5	7968	90.7
1989	2297.5	323.0	81.3	85.7	81.3	85.1	81.2	85.3	7226	82.5
1990	2477.9	324.0	86.5	85.8	86.5	85.2	87.3	85.4	7910	90.3
1991	2415.1	323.0	87.3	85.9	84.8	85.2	85.4	85.4	7714	88.1
1992	2413.5	323.0	85.0	85.8	85.0	85.1	85.1	85.4	7755	88.3
1993	2568.5	338.0	88.5	86.0	86.8	85.2	86.7	85.4	7917	90.4
1994	2643.1	355.0	89.3	86.1	84.9	85.2	85.0	85.4	7952	90.8
1995	2669.0	355.0	87.8	86.2	85.4	85.2	85.8	85.4	7894	90.1
1996	2649.0	355.0	87.7	86.3	84.4	85.2	85.0	85.4	7847	89.3
1997	2549.2	355.0	86.9	86.3	81.8	85.0	82.0	85.2	7671	87.6
1998	2659.7	355.0	86.5	86.3	85.2	85.0	85.5	85.3	7886	90.0
1999	2702.8	355.0	87.2	86.3	86.6	85.1	86.9	85.3	8064	92.1
2000	2817.0	355.0	93.5	86.6	90.1	85.3	90.3	85.5	8290	94.4
2002	2828.2	355.0	91.4	86.8	87.7	85.4	90.9	85.7	8280	94.5
2003	2744.2	355.0	89.6	86.9	87.7	85.5	88.2	85.8	8034	91.7

## CH-2 MUEHLEBERG

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
06 Feb	20.0	11.3	UF3	A31	DUE TO A LEAKAGE IN INSTRUMENTATION HOUSING IN FEED WATER LINE-A REACTOR SHUTDOWN
31 May	166.0	68.0	PF	D15	EXCHANGE A MECHANICAL SEAL OF RECIRCULATING PUMP B
09 Jun	1488.0	59.6	XP	N	HIGH COOLING WATER TEMPERATURE
22 Jun	1176.0	28.0	XP	S	COAST-DOWN
10 Aug	539.0	184.4	PF	C	REFUELLING AND MAINTENANCE

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		20			197	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	539			768		
D. Inspection, maintenance or repair without refuelling	166			19		
E. Testing of plant systems or components				3		
J. Grid failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					2	0
Subtotal	705	20	0	790	200	1
Total		725			991	

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems		0
14. Safety Systems		2
15. Reactor Cooling Systems		1
31. Turbine and auxiliaries	20	181
32. Feedwater and Main Steam System		1
35. All other I&C Systems		0
42. Electrical Power Supply Systems		0
Total	20	193

**UA-40 KHMELNITSKI-1**

Operator: NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY &lt;ENERGOATOM&gt;)

Contractor: PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

**1. Station Details**

Type: WWER  
 Maximum Net Capacity  
 at the beginning of 2003: 950.0 MW(e)  
 Design Net Capacity: 950.0 MW(e)  
 Design Discharge Burnup: 40000 MW.d/t

**2. Production Summary 2003**

Energy Production: 7137.7 GW(e).h  
 Energy Availability Factor: 84.9%  
 Load Factor: 85.8%  
 Operating Factor: 85.8%  
 Energy Unavailability Factor: 15.1%  
 Total Off-line Time: 1248 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	716.8	632.9	705.0	167.9	0.0	667.5	714.6	713.6	692.5	716.6	693.6	716.7	7137.7
EAF (%)	99.7	97.7	99.9	24.4	0.0	97.6	100.0	100.0	100.0	100.0	100.0	100.0	84.9
UCF (%)	99.7	97.7	100.0	30.1	0.7	97.6	100.0	100.0	100.0	100.0	100.0	100.0	85.4
LF (%)	101.4	99.1	99.8	24.6	0.0	97.6	101.1	101.0	101.2	101.2	101.4	101.4	85.8
OF (%)	100.0	99.4	99.9	30.3	1.7	98.5	100.0	100.0	100.0	100.0	100.0	100.0	85.8
EUf (%)	0.3	2.3	0.1	75.6	100.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	15.1
PUF (%)	0.0	0.0	0.0	70.0	99.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	14.2
UCLF (%)	0.3	2.3	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.4
XUF (%)	0.0	0.0	0.1	5.6	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Nov 1981      Lifetime Generation: 92345.8 GW(e).h  
 Date of First Criticality: 10 Dec 1987      Cumulative Energy Availability Factor: 70.1%  
 Date of Grid Connection: 31 Dec 1987      Cumulative Load Factor: 71.0%  
 Date of Commercial Operation: 13 Aug 1988      Cumulative Unit Capability Factor: 78.5%  
    Cumulative Energy Unavailability Factor: 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 (%)
1987	46.8	954.0	0.0	0.0	0.6	100.0	0.6	0.0	0	0.0
1988	3578.2	950.0	0.0	0.0	86.2	100.0	42.9	0.0	5266	59.9
1989	5872.3	950.0	70.7	70.7	70.6	70.6	70.6	70.6	6295	71.9
1990	6498.6	950.0	77.3	74.0	77.4	74.0	78.1	74.3	6870	78.4
1991	5172.5	950.0	61.2	69.8	61.2	69.7	62.2	70.3	5551	63.4
1992	6075.1	950.0	67.6	69.2	66.5	68.9	72.8	70.9	6167	70.2
1993	5487.7	950.0	65.2	68.4	65.2	68.2	65.9	69.9	5782	66.0
1994	6303.4	950.0	76.0	69.7	75.5	69.4	75.7	70.9	6775	77.3
1995	5700.3	950.0	68.0	69.5	68.0	69.2	68.5	70.5	6014	68.7
1996	4497.9	950.0	54.3	67.5	53.9	67.3	53.9	68.5	4854	55.3
1997	6152.1	950.0	72.8	68.1	72.6	67.9	73.9	69.1	6415	73.2
1998	5499.2	950.0	67.1	68.0	65.8	67.7	66.1	68.8	5904	67.4
1999	5526.7	950.0	66.8	67.9	66.4	67.6	66.4	68.6	6506	74.3
2000	5899.6	950.0	74.3	68.4	70.4	67.8	70.7	68.7	6541	74.5
2001	6167.3	950.0	76.5	69.1	73.6	68.2	73.9	69.1	6781	77.2
2002	6730.5	950.0	80.3	69.9	79.9	69.1	80.9	70.0	7049	80.5
2003	7137.7	950.0	85.4	70.9	84.9	70.1	85.8	71.0	7512	85.8

**UA-40 KHMELNITSKI-1****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
22 Jan	919.0	8.0	UP1	A32	HIGH PRESSURE FEEDWATER HEATER REPAIR
06 Feb	4.0	9.0	UF2	A35	TG-1 DISCONNECTION FROM THE GRID DUE TO FALSE PROTECTION ON SG-4 LEVEL INCREASING
20 Mar	485.0	41.6	XP	S	COASTDOWN OPERATION.
10 Apr	1233.0	1183.9	PF	C	INTERMEDIATE OUTAGE: MAINTENANCE COMBINED WITH REFUELLING.
01 Jun	60.0	6.5	XP	K	REDUCED POWER UPON THE GRID DISPATCHER'S REQUEST
06 Jun	11.0	11.9	UF2	A41	FAILURE OF GENERATOR HYDROGEN SYSTEM LEAK TIGHTNESS

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

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		15			284	
B. Refuelling without a maintenance					7	
C. Inspection, maintenance or repair combined with refuelling	1233			1643		
D. Inspection, maintenance or repair without refuelling				276		
E. Testing of plant systems or components				23		
J. Grid failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					1	
Subtotal	1233	15	0	1942	292	0
Total		1248			2234	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		35
13. Reactor Auxiliary Systems		16
14. Safety Systems		1
15. Reactor Cooling Systems		29
16. Steam generation systems		1
17. Safety I&C Systems (excluding reactor I&C)		4
31. Turbine and auxiliaries		30
32. Feedwater and Main Steam System		18
35. All other I&C Systems	4	0
41. Main Generator Systems	11	138
42. Electrical Power Supply Systems		7
Total	15	279

**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:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 381.0 MW(e)  
**Design Net Capacity:** 361.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t

**2. Production Summary 2003**

**Energy Production:** 2816.1 GW(e).h  
**Energy Availability Factor:** 83.5%  
**Load Factor:** 84.4%  
**Operating Factor:** 86.3%  
**Energy Unavailability Factor:** 16.5%  
**Total Off-line Time:** 1200 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	289.6	255.5	285.0	28.0	103.4	200.1	274.7	273.3	269.6	278.2	269.4	289.4	2816.1
<b>EAF (%)</b>	99.1	96.5	99.1	9.9	33.0	85.5	94.1	93.6	96.2	97.1	99.2	97.8	83.5
<b>UCF (%)</b>	99.1	96.5	99.1	9.9	33.6	85.6	99.5	98.0	98.3	97.2	99.3	97.8	84.5
<b>LF (%)</b>	102.2	99.8	100.5	10.2	36.5	72.9	96.9	96.4	98.3	98.0	98.2	102.1	84.4
<b>OF (%)</b>	100.0	100.0	99.9	10.3	38.6	86.5	100.0	100.0	100.0	100.0	100.0	100.0	86.3
<b>EUf (%)</b>	0.9	3.5	0.9	90.1	67.0	14.5	5.9	6.4	3.8	2.9	0.8	2.2	16.5
<b>PUF (%)</b>	0.0	2.4	0.0	90.0	59.7	0.0	0.0	0.0	0.8	1.8	0.0	1.7	13.0
<b>UCLF (%)</b>	0.9	1.1	0.9	0.1	6.8	14.4	0.5	2.0	1.0	1.0	0.7	0.5	2.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.5	0.1	5.4	4.4	2.0	0.1	0.0	0.0	1.1

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 01 Aug 1973      **Lifetime Generation:** 59263.7 GW(e).h  
**Date of First Criticality:** 17 Dec 1980      **Cumulative Energy Availability Factor:** 80.1%  
**Date of Grid Connection:** 31 Dec 1980      **Cumulative Load Factor:** 80.7%  
**Date of Commercial Operation:** 21 Sep 1981      **Cumulative Unit Capability Factor:** 77.4%  
**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	1725.2	361.0	51.9	51.9	51.9	51.9	54.6	54.6	5498	62.8
1983	2036.6	361.0	61.6	56.8	61.6	56.8	64.4	59.5	6752	77.1
1984	2686.3	361.0	82.5	65.3	82.5	65.3	84.7	67.9	7782	88.6
1985	2664.8	365.0	81.4	69.4	81.4	69.4	83.3	71.8	7636	87.2
1986	2712.7	361.0	77.5	71.0	77.5	71.0	85.8	74.6	7606	86.8
1987	3040.8	402.0	86.6	73.9	86.6	73.9	86.3	76.7	7756	88.5
1988	2718.0	361.0	86.0	75.6	86.0	75.6	85.7	78.0	7877	89.7
1989	2823.8	361.0	89.2	77.2	89.2	77.2	89.3	79.4	7994	91.3
1990	2590.6	361.0	79.3	77.5	79.3	77.5	81.9	79.7	7265	82.9
1991	2640.1	361.0	81.4	77.8	81.4	77.8	83.5	80.0	7430	84.8
1992	3082.9	403.0	88.5	78.9	87.3	78.8	87.1	80.7	7989	90.9
1993	2584.4	406.0	83.0	79.3	81.4	79.0	72.7	80.0	7159	81.7
1994	2578.6	361.0	81.8	79.5	81.7	79.2	81.5	80.1	7378	84.2
1995	2747.4	361.0	88.4	80.1	86.1	79.7	86.9	80.6	7756	88.5
1996	2432.0	361.0	79.0	80.0	76.7	79.5	76.7	80.3	6960	79.2
1997	2701.1	361.0	82.2	80.1	81.6	79.6	85.4	80.6	7867	89.8
1998	2612.9	361.0	78.1	80.0	77.8	79.5	82.6	80.8	6912	78.9
1999	2240.5	361.0	82.8	80.2	82.8	79.7	70.8	80.2	6214	70.9
2000	2733.7	361.0	85.7	80.5	82.6	79.9	86.2	80.5	7580	86.3
2001	2753.8	381.0	82.6	80.6	81.4	79.9	82.3	80.6	7369	83.9
2002	2656.2	381.0	81.0	80.6	79.9	79.9	79.6	80.6	7242	82.7
2003	2816.1	381.0	84.5	80.8	83.5	80.1	84.4	80.7	7560	86.3



# UA-27 ROVNO-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Feb	33.0	6.4	PP	D31	ELIMINATE DEFECTS AT MOISTURE SEPARATOR
04 Feb	72.0	0.6	UP2	A32	HPH-7 FAILURE TO OPERATE TO ELIMINATE TUBE LEAKAGE AFTER TG-2 STARTUP
04 Apr	1080.0	415.7	PF	C	OUTAGE.
19 May	22.0	8.2	UF2	L	OUTAGE COMPLETION
20 May	12.0	2.2	UP2	A32	ELIMINATE LEAK AT 1PND-3 JOINT
03 Jun	97.0	37.7	UF2	A16	ELIMINATION OF PROCESS MANHOLE 1PG-5 SEALING DEFECT
07 Jun	239.0	30.9	XP2	J	LOAD FOLLOWING. GRID UNAVAILABILITY.
08 Jun	22.0	1.0	UP2	A32	ELECTRICAL POWER DECREASE TO ELIMINATE PROBLEMS WITH FW SUPPLY TO STEAM GENERATORS
11 Aug	20.0	3.6	UP2	A31	BLOWHOLE ELIMINATION AT THE 2ND EXTRACTION.
06 Sep	10.0	2.1	PP	D41	TG-2 SHUTDOWN FOR CONTROL SYSTEM OF A WORKING EXCITEMENT.
08 Oct	7.0	0.5	PP	D31	TSN-2B SHUTDOWN AND SSSH SCREENS CLEANUP.
24 Oct	24.0	4.7	PP	D31	ELIMINATION OF HP CYLINDER'S EXTRACTION DEFECT.
01 Nov	17.0	3.3	XP2	J	LOAD FOLLOWING.
06 Dec	22.0	4.9	PP	D31	ELIMINATION OF STEAMING UNDER THE HP CYLINDER AND TG-1 LOAD DECREASE .

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		97			50	
C. Inspection, maintenance or repair combined with refuelling	1080			983		
D. Inspection, maintenance or repair without refuelling				149	1	
L. Human factor related		22				
Subtotal	1080	119	0	1132	51	0
Total		1199			1183	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		4
14. Safety Systems		0
15. Reactor Cooling Systems		17
16. Steam generation systems	97	6
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	97	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:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 376.0 MW(e)  
**Design Net Capacity:** 384.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 2784.2 GW(e).h  
**Energy Availability Factor:** 81.6%  
**Load Factor:** 84.5%  
**Operating Factor:** 84.2%  
**Energy Unavailability Factor:** 18.4%  
**Total Off-line Time:** 1384 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	283.9	268.1	285.7	270.4	274.6	242.0	0.0	53.6	278.4	288.4	249.7	289.4	2784.2
<b>EAF (%)</b>	96.2	99.4	96.6	96.9	96.0	93.0	0.0	18.8	97.4	99.2	89.7	99.4	81.6
<b>UCF (%)</b>	96.2	99.5	96.6	97.1	99.1	95.5	0.0	22.7	99.5	99.6	89.9	99.4	82.7
<b>LF (%)</b>	101.5	106.1	102.1	100.0	98.2	89.4	0.0	19.2	102.8	102.9	92.2	103.5	84.5
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	96.7	0.0	26.1	100.0	100.0	90.8	100.0	84.2
<b>EUf (%)</b>	3.8	0.6	3.4	3.1	4.0	7.0	100.0	81.2	2.6	0.8	10.3	0.6	18.4
<b>PUF (%)</b>	3.0	0.0	2.9	2.2	0.0	3.7	100.0	77.3	0.0	0.1	0.0	0.0	16.1
<b>UCLF (%)</b>	0.8	0.6	0.5	0.7	0.9	0.8	0.0	0.1	0.5	0.3	10.1	0.6	1.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.2	3.1	2.5	0.0	3.9	2.1	0.4	0.2	0.0	1.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1973      **Lifetime Generation:** 58558.9 GW(e).h  
**Date of First Criticality:** 19 Dec 1981      **Cumulative Energy Availability Factor:** 79.8%  
**Date of Grid Connection:** 30 Dec 1981      **Cumulative Load Factor:** 79.3%  
**Date of Commercial Operation:** 30 Jul 1982      **Cumulative Unit Capability Factor:** 77.6%  
**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 (%)
1982	2062.2	384.0	0.0	0.0	95.4	100.0	61.3	0.0	8011	91.4
1983	1926.9	384.0	58.0	58.0	58.0	58.0	57.3	57.3	5572	63.6
1984	2808.2	384.0	83.0	70.5	83.1	70.5	83.3	70.3	7884	89.8
1985	2913.5	384.0	86.0	75.7	86.0	75.7	86.6	75.7	7994	91.3
1986	2891.8	384.0	83.0	77.5	83.0	77.5	86.0	78.3	7819	89.3
1987	3166.4	416.0	86.3	79.4	86.3	79.4	86.9	80.1	7649	87.3
1988	2778.3	384.0	85.8	80.4	85.8	80.4	82.4	80.5	7875	89.7
1989	2700.4	384.0	86.3	81.3	86.3	81.3	80.3	80.5	7989	91.2
1990	2799.0	384.0	83.1	81.5	83.1	81.5	83.2	80.8	7815	89.2
1991	2393.2	384.0	71.0	80.3	71.0	80.3	71.1	79.7	6560	74.9
1992	2983.7	416.0	83.8	80.7	82.9	80.6	81.7	79.9	7487	85.2
1993	2053.7	406.0	66.0	79.3	64.4	79.1	57.7	77.9	5981	68.3
1994	2690.7	384.0	83.1	79.6	83.1	79.4	80.0	78.0	7626	87.1
1995	2568.5	384.0	79.6	79.6	76.4	79.2	76.4	77.9	7215	82.4
1996	2783.1	384.0	87.8	80.2	82.5	79.4	82.5	78.2	7905	90.0
1997	2585.6	384.0	77.6	80.0	76.5	79.2	76.9	78.1	6847	78.2
1998	2739.6	384.0	83.2	80.2	81.2	79.3	81.4	78.3	7424	84.7
1999	2543.7	384.0	78.0	80.1	75.5	79.1	75.6	78.2	6958	79.4
2000	2718.2	384.0	84.0	80.3	80.3	79.2	80.6	78.3	7460	84.9
2001	2796.9	376.0	86.6	80.6	83.2	79.4	84.7	78.6	7691	87.6
2002	2861.8	376.0	86.5	80.9	85.7	79.7	86.9	79.0	7756	88.5
2003	2784.2	376.0	82.7	81.0	81.6	79.8	84.5	79.3	7376	84.2

## UA-28 ROVNO-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
05 Jan	46.0	8.3	PP	D31	DETERMINE AND ELIMINATE SPP-3B ASSEMBLIES' LEAK.
07 Jan	259.0	0.3	UP2	A32	HPH (PVD-3) FAILURE TO OPERATE AFTER TG-3 PLACING IN OPERATION: ELIMINATION OF DEFECTS
14 Mar	37.0	8.1	PP	D31	DETERMINE AND ELIMINATE SPP-3B ASSEMBLIES' LEAK.
09 Apr	30.0	5.8	PP	D31	DETERMINATION AND ELIMINATION UNTIGHTNESS IN TUBE PART OF CONDENSERS K-4A AND K-4B
10 Jun	159.0	10.3	XP2	J	LOAD FOLLOWING
30 Jun	1318.0	495.6	PF	D	UNIT MAINTENANCE
25 Aug	55.0	10.0	UP3	A31	TG-4 WAS FINALLY TAKEN OUT OF PPR
12 Oct	16.0	0.4	PP	D32	ELIMINATION OF THE LEAK AT FEED WATER VALVE FLANGE AT TG-3 HPH INLET.
05 Nov	66.0	26.0	UF2	A32	REPAIR OF FEED WATER PIPELINE TO 2SG-3.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1982 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		66			165	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling				942		
D. Inspection, maintenance or repair without refuelling	1318			93		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				49		
Subtotal	1318	66	0	1084	166	0
Total		1384			1250	

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

System	2003 Hours Lost	1982 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		21
13. Reactor Auxiliary Systems		3
15. Reactor Cooling Systems		7
16. Steam generation systems		105
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System	66	15
41. Main Generator Systems		3
42. Electrical Power Supply Systems		8
Total	66	162

# 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:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6250.5 GW(e).h  
**Energy Availability Factor:** 74.3%  
**Load Factor:** 75.1%  
**Operating Factor:** 77.8%  
**Energy Unavailability Factor:** 25.7%  
**Total Off-line Time:** 1945 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	613.7	628.8	699.2	668.9	597.2	665.4	671.5	666.4	564.8	0.0	0.0	474.6	6250.5
<b>EAF (%)</b>	85.5	95.5	96.9	96.5	82.1	96.2	95.4	94.4	82.2	0.0	0.0	68.3	74.3
<b>UCF (%)</b>	85.6	95.5	96.9	96.8	84.4	97.4	97.9	97.0	83.8	0.0	0.0	68.3	75.2
<b>LF (%)</b>	86.8	98.5	98.9	97.9	84.5	97.3	95.0	94.3	82.6	0.0	0.0	67.1	75.1
<b>OF (%)</b>	89.7	100.0	99.9	100.1	88.6	100.0	100.0	100.0	86.7	0.0	0.0	70.2	77.8
<b>EU (%)</b>	14.5	4.5	3.1	3.5	17.9	3.8	4.6	5.6	17.8	100.0	100.0	31.7	25.7
<b>PU (%)</b>	10.4	0.0	0.0	0.0	12.2	0.0	0.0	0.0	13.5	100.0	100.0	16.4	21.1
<b>UCLF (%)</b>	4.1	4.5	3.1	3.2	3.5	2.6	2.1	3.0	2.7	0.0	0.0	15.3	3.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.3	2.3	1.2	2.4	2.6	1.5	0.0	0.0	0.0	0.9

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1980      **Lifetime Generation:** 97942.7 GW(e).h  
**Date of First Criticality:** 11 Nov 1986      **Cumulative Energy Availability Factor:** 70.0%  
**Date of Grid Connection:** 21 Dec 1986      **Cumulative Load Factor:** 69.3%  
**Date of Commercial Operation:** 16 May 1987      **Cumulative Unit Capability Factor:** 78.2%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1987	5202.2	1000.0	0.0	0.0	87.5	100.0	59.4	0.0	6485	74.0
1988	5661.3	950.0	71.0	71.0	71.1	71.1	67.8	67.8	6357	72.4
1989	6046.1	950.0	75.1	73.1	75.1	73.1	72.7	70.2	6771	77.3
1990	6360.1	950.0	77.3	74.5	77.3	74.5	76.4	72.3	6981	79.7
1991	5454.8	950.0	66.0	72.4	66.0	72.4	65.5	70.6	5971	68.2
1992	7084.9	1000.0	82.2	74.4	82.2	74.4	80.7	72.7	7323	83.4
1993	6195.1	950.0	76.5	74.8	75.9	74.7	74.4	73.0	6861	78.3
1994	5574.7	950.0	67.7	73.8	67.7	73.7	67.0	72.1	6042	69.0
1995	5018.3	950.0	61.0	72.2	60.3	72.0	60.3	70.7	5500	62.8
1996	5550.9	950.0	66.8	71.6	66.5	71.4	66.5	70.2	6064	69.0
1997	6249.6	950.0	75.9	72.0	74.7	71.7	75.1	70.7	6730	76.8
1998	5603.5	950.0	68.2	71.7	67.3	71.3	67.3	70.4	6036	68.9
1999	5303.5	950.0	72.5	71.7	63.7	70.7	63.7	69.8	6342	72.4
2000	4991.3	950.0	72.4	71.8	59.8	69.9	59.8	69.1	5641	64.2
2001	5783.6	950.0	75.3	72.0	69.6	69.8	69.3	69.1	6387	72.7
2002	5562.6	950.0	69.8	71.9	68.4	69.7	66.8	68.9	6320	72.1
2003	6250.5	950.0	75.2	72.1	74.3	70.0	75.1	69.3	6815	77.8

## UA-29 ROVNO-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	77.0	73.4	PF	C	OUTAGE COMPLETION
01 May	85.0	86.3	PP	D31	ELIMINATE STEAMING AT THE FLANGE OF MAIN JOINT OF 4 RA14SO2 VALVE.
23 May	33.0	0.7	XP2	J	LOAD FOLLOWING
24 May	44.0	0.7	UP2	A11	NT DECREASE TO 98% DUE TO INCREASED PRIMARY ACTIVITY
27 Sep	1680.0	1598.0	PF	C	OUTAGE COMPLETION
13 Dec	54.0	50.4	UF2	A31	TG CONTROL SYSTEM TESTING.
15 Dec	49.0	51.6	UF2	A16	ELIMINATION OF 3SG-3 UNTIGHTNESS.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		103			301	
B. Refuelling without a maintenance					11	
C. Inspection, maintenance or repair combined with refuelling	1757			1635		
D. Inspection, maintenance or repair without refuelling				130		
E. Testing of plant systems or components				33		
G. Major back-fitting, refurbishment or upgrading activities without refuelling						11
J. Grid failure or grid unavailability						16
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					4	44
Subtotal	1757	103	0	1798	316	71
Total		1860			2185	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		34
13. Reactor Auxiliary Systems		17
15. Reactor Cooling Systems		1
16. Steam generation systems	49	34
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries	54	32
32. Feedwater and Main Steam System		4
33. Circulating Water System		2
35. All other I&C Systems		0
41. Main Generator Systems		126
42. Electrical Power Supply Systems		42
Total	103	295

# UA-44 SOUTH UKRAINE-1

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)  
**Contractor:** PAA (PRODUCTION AMALGAMATION 'ATOMMASH', VOLGODONSK)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6008.2 GW(e).h  
**Energy Availability Factor:** 72.6%  
**Load Factor:** 72.2%  
**Operating Factor:** 75.5%  
**Energy Unavailability Factor:** 27.4%  
**Total Off-line Time:** 2148 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	0.0	602.8	705.2	687.0	692.0	604.1	674.7	588.9	619.6	680.7	153.1	0.0	6008.2
<b>EAF (%)</b>	0.0	92.7	98.2	99.5	97.9	97.3	95.5	83.3	90.6	96.2	22.4	0.0	72.6
<b>UCF (%)</b>	0.0	92.7	98.2	99.5	98.4	99.0	98.7	92.0	91.6	98.0	25.0	0.0	74.2
<b>LF (%)</b>	0.0	94.4	99.8	100.6	97.9	88.3	95.5	83.3	90.6	96.2	22.4	0.0	72.2
<b>OF (%)</b>	0.0	96.0	99.5	100.1	100.0	100.0	100.0	93.8	93.3	100.0	25.6	0.0	75.5
<b>EUf (%)</b>	100.0	7.3	1.8	0.5	2.1	2.7	4.5	16.7	9.4	3.8	77.6	100.0	27.4
<b>PUF (%)</b>	100.0	3.7	0.0	0.0	0.0	0.0	0.0	6.3	7.3	0.5	74.6	100.0	24.6
<b>UCLF (%)</b>	0.0	3.6	1.8	0.5	1.7	1.0	1.3	1.7	1.1	1.5	0.5	0.0	1.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.4	1.8	3.3	8.7	1.0	1.8	2.6	0.0	1.6

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

ENERGY LOSSES DUE TO EXTERNAL CAUSES: HIGH TEMPERATURE OF COOLING WATER=207GW(E)H, LOAD FOLLOWING =61GW(E)H

## 5. Historical Summary

**Date of Construction Start:** 01 Mar 1977  
**Date of First Criticality:** 09 Dec 1982  
**Date of Grid Connection:** 31 Dec 1982  
**Date of Commercial Operation:** 18 Oct 1983

**Lifetime Generation:** 110676.0 GW(e).h  
**Cumulative Energy Availability Factor:** 64.4%  
**Cumulative Load Factor:** 64.8%  
**Cumulative Unit Capability Factor:** 77.7%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1983	2558.8	950.0	0.0	0.0	93.8	100.0	30.7	0.0	3708	42.3
1984	6075.1	950.0	71.7	71.7	71.7	71.7	72.8	72.8	6364	72.4
1985	6939.1	950.0	81.5	76.5	81.1	76.4	83.4	78.1	7148	81.6
1986	6176.1	950.0	74.0	75.7	73.5	75.4	74.2	76.8	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	73.7	65.9	73.6	65.5	73.7	6177	70.3
1989	2501.6	950.0	30.9	66.7	30.8	66.5	30.1	66.5	3321	37.9
1990	6174.4	950.0	75.3	67.9	75.0	67.7	74.2	67.6	7063	80.6
1991	3865.9	950.0	46.5	65.2	46.5	65.1	46.4	65.0	5532	63.1
1992	4946.8	1000.0	49.2	63.6	49.1	64.2	67.6	64.0	6142	69.9
1993	5277.8	950.0	62.3	63.5	61.4	63.9	63.4	63.9	5650	64.5
1994	5117.4	950.0	58.7	63.1	58.7	63.5	61.5	63.7	5667	64.7
1995	5438.6	950.0	66.1	63.3	65.4	63.6	65.4	63.8	6212	70.9
1996	5138.2	950.0	62.1	63.2	61.6	63.5	61.6	63.7	5549	63.2
1997	6196.1	950.0	73.0	63.9	72.5	64.1	74.5	64.4	6416	73.2
1998	6164.9	950.0	73.7	64.6	73.1	64.7	74.1	65.1	6477	73.9
1999	5558.9	950.0	67.1	64.7	66.5	64.8	66.8	65.2	5920	67.6
2000	5203.0	950.0	63.9	64.7	61.2	64.6	62.4	65.0	5677	64.6
2001	5563.7	950.0	68.3	64.9	66.6	64.7	66.7	65.1	6015	68.5
2002	4254.8	950.0	52.2	64.2	50.9	64.0	51.1	64.4	4625	52.8
2003	6008.2	950.0	74.2	64.7	72.6	64.4	72.2	64.8	6612	75.5

## UA-44 SOUTH UKRAINE-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	761.0	730.6	PF	C	OVERHAUL SINCE OCTOBER 25, 2002
01 Jan	6611.2	207.4	XP1	N	COOLING WATER TEMPERATURE LIMITS
01 Feb	6611.2	66.4	UP1	A31	CONDENSER PROBLEM
10 Feb	10.4	16.7	UF2	A12	PROTECTION ACTUATION ON PRESSURE DECREASING BEFORE MAIN STEAM GATE VALVE
18 Mar	3.0	10.0	UF2	A35	FALSE ACTUATION OF EMERGENCY CONTROL EQUIPMENT
01 Jun	55.8	2.3	XP	K	LOAD FOLLOWING DUE TO REDUCED ENERGY DEMAND
09 Jun	197.7	59.0	XP	K	LOAD FOLLOWING DUE TO REDUCED ENERGY DEMAND
04 Aug	601.1	35.6	XP1	N	COOLING WATER TEMPERATURE LIMITS
30 Aug	93.9	94.8	PF	D	PREVENTIVE MAINTENANCE.
26 Oct	315.5	22.5	XP	S	COASTDOWN OPERATION.
08 Nov	1280.5	1217.0	PF	C	INTERMEDIATE OUTAGE: MAINTENANCE COMBINED WITH REFUELLING.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1980 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		13			469	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	2041			1359		
D. Inspection, maintenance or repair without refuelling	93			371		
E. Testing of plant systems or components				12	0	
J. Grid failure or grid unavailability					1	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					42	0
Subtotal	2134	13	0	1742	514	0
Total		2147			2256	

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

System	2003 Hours Lost	1980 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	10	13
14. Safety Systems		1
15. Reactor Cooling Systems		6
16. Steam generation systems		232
31. Turbine and auxiliaries		64
32. Feedwater and Main Steam System		12
33. Circulating Water System		1
35. All other I&C Systems	3	1
41. Main Generator Systems		131
42. Electrical Power Supply Systems		2
XX. Miscellaneous Systems		1
Total	13	464

## UA-45 SOUTH UKRAINE-2

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)

**Contractor:** PAA (PRODUCTION AMALGAMATION 'ATOMMASH', VOLGODONSK)

### 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

### 2. Production Summary 2003

**Energy Production:** 5507.7 GW(e).h  
**Energy Availability Factor:** 65.8%  
**Load Factor:** 66.2%  
**Operating Factor:** 67.0%  
**Energy Unavailability Factor:** 34.2%  
**Total Off-line Time:** 2893 hours

### 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	675.9	642.7	704.5	387.6	0.0	0.0	0.0	338.3	684.0	694.2	681.0	699.5	5507.7
<b>EAF (%)</b>	94.0	99.0	99.0	56.3	0.0	0.0	0.0	47.9	100.0	98.1	99.5	99.0	65.8
<b>UCF (%)</b>	94.0	99.0	99.0	56.3	0.0	0.0	0.0	49.8	100.0	99.4	99.5	99.9	66.2
<b>LF (%)</b>	95.6	100.7	99.7	56.7	0.0	0.0	0.0	47.9	100.0	98.1	99.6	99.0	66.2
<b>OF (%)</b>	97.6	100.0	99.9	56.9	0.0	0.0	0.0	52.2	100.0	100.0	100.0	100.0	67.0
<b>EUf (%)</b>	6.0	1.0	1.0	43.7	100.0	100.0	100.0	52.1	0.0	1.9	0.5	1.0	34.2
<b>PUF (%)</b>	0.0	0.0	0.0	43.3	100.0	100.0	100.0	49.0	0.0	0.0	0.0	0.0	32.9
<b>UCLF (%)</b>	6.0	1.0	1.0	0.4	0.0	0.0	0.0	1.2	0.0	0.6	0.5	0.1	0.9
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	1.3	0.0	1.0	0.4

UCLF replaces previously used UUF.

### 4. 2003 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Oct 1979  
**Date of First Criticality:** 30 Dec 1984  
**Date of Grid Connection:** 06 Jan 1985  
**Date of Commercial Operation:** 06 Apr 1985

**Lifetime Generation:** 93957.1 GW(e).h  
**Cumulative Energy Availability Factor:** 58.4%  
**Cumulative Load Factor:** 58.6%  
**Cumulative Unit Capability Factor:** 77.8%  
**Cumulative Energy Unavailability Factor:** 41.6%

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	5603.6	950.0	0.0	0.0	79.9	100.0	67.3	0.0	6379	72.8
1986	5565.5	950.0	67.0	67.0	66.2	66.2	66.9	66.9	6315	72.1
1987	1641.7	1000.0	22.0	43.9	22.0	43.6	18.7	42.2	1941	22.2
1988	4850.6	950.0	57.4	48.4	57.4	48.1	58.1	47.4	5198	59.2
1989	4437.3	950.0	54.3	49.8	54.3	49.6	53.3	48.9	6674	76.2
1990	1769.0	950.0	21.9	44.3	21.9	44.1	21.3	43.4	4522	51.6
1991	6209.8	950.0	72.0	48.9	72.0	48.7	74.6	48.6	6722	76.7
1992	6412.1	1000.0	72.9	52.4	71.7	52.1	73.0	52.2	6574	74.8
1993	5204.0	950.0	64.0	53.9	61.7	53.3	62.5	53.5	6570	75.0
1994	3958.5	950.0	47.3	53.1	46.9	52.6	47.6	52.8	6471	73.9
1995	5429.4	950.0	66.1	54.4	65.2	53.9	65.2	54.0	6514	74.4
1996	4593.7	950.0	55.4	54.5	55.0	54.0	55.0	54.1	5590	63.6
1997	6326.5	950.0	77.2	56.4	75.4	55.7	76.0	55.9	7400	84.5
1998	4542.4	950.0	55.1	56.3	54.0	55.6	54.6	55.8	4867	55.6
1999	5537.9	950.0	72.0	57.4	66.4	56.4	66.5	56.6	6372	72.7
2000	4103.5	950.0	50.0	56.9	49.2	55.9	49.2	56.1	4486	51.1
2001	6206.5	950.0	74.8	58.0	74.4	57.0	74.4	57.2	6869	78.2
2002	6057.2	950.0	74.2	59.0	72.7	58.0	72.8	58.2	6565	74.9
2003	5507.7	950.0	66.2	59.4	65.8	58.4	66.2	58.6	5868	67.0



## UA-45 SOUTH UKRAINE-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	5867.2	21.4	UP1	A31	CONDENSER PROBLEM
01 Jan	5867.2	87.6	XP1	N	COOLING WATER TEMPERATURE LIMITS
01 Jan	612.0	12.0	UP1	A32	HIGH PRESSURE FEEDWATER HEATER (HPFWH-A) SWITCH OFF
27 Jan	18.1	24.9	UF2	A31	STEAMING REMOVAL ON CHECK SERVO-MOTOR VALVE HEAD OF MOISTURE SEPARATOR
18 Apr	2874.7	2739.9	PF	C	OVERHAUL: MAINTENANCE COMBINED WITH REFUELLING. SG-1,3 REPLACEMENT
15 Aug	914.0	13.5	UP1	A32	HIGH PRESSURE FEEDWATER HEATER (HPFWH-B) REPAIR

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		18			621	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	2874			1263		
D. Inspection, maintenance or repair without refuelling				563	6	
E. Testing of plant systems or components				14		
H. Nuclear regulatory requirements					1	6
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					81	
Subtotal	2874	18	0	1840	709	6
Total		2892			2555	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		12
15. Reactor Cooling Systems		23
16. Steam generation systems		501
17. Safety I&C Systems (excluding reactor I&C)		14
31. Turbine and auxiliaries	18	20
32. Feedwater and Main Steam System		45
41. Main Generator Systems		3
42. Electrical Power Supply Systems		0
Total	18	618

# UA-48 SOUTH UKRAINE-3

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)  
**Contractor:** PAA (PRODUCTION AMALGAMATION 'ATOMMASH', VOLGODONSK)

## 1. Station Details

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6036.5 GW(e).h  
**Energy Availability Factor:** 73.1%  
**Load Factor:** 72.5%  
**Operating Factor:** 76.3%  
**Energy Unavailability Factor:** 26.9%  
**Total Off-line Time:** 2080 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	695.0	639.6	707.6	672.0	675.2	569.7	637.9	206.8	0.0	15.3	655.4	562.0	6036.5
<b>EAF (%)</b>	98.3	99.8	99.6	97.5	95.5	92.2	90.3	29.3	0.0	2.2	95.8	79.3	73.1
<b>UCF (%)</b>	98.3	99.8	99.6	97.6	96.7	95.5	94.9	31.4	0.0	2.9	98.1	79.3	74.3
<b>LF (%)</b>	98.3	100.2	100.1	98.4	95.5	83.3	90.3	29.3	0.0	2.2	95.8	79.5	72.5
<b>OF (%)</b>	100.0	100.0	99.9	100.1	100.0	100.0	99.9	32.5	0.0	4.2	99.3	81.5	76.3
<b>EUf (%)</b>	1.7	0.2	0.4	2.5	4.5	7.8	9.7	70.7	100.0	97.8	4.2	20.7	26.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	67.6	100.0	97.0	1.3	0.0	22.3
<b>UCLF (%)</b>	1.7	0.2	0.4	2.5	3.3	4.5	5.1	1.0	0.0	0.0	0.7	20.7	3.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	1.2	3.3	4.6	2.1	0.0	0.8	2.2	0.0	1.2

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1985      **Lifetime Generation:** 84178.2 GW(e).h  
**Date of First Criticality:** 01 Sep 1989      **Cumulative Energy Availability Factor:** 70.9%  
**Date of Grid Connection:** 20 Sep 1989      **Cumulative Load Factor:** 70.8%  
**Date of Commercial Operation:** 29 Dec 1989      **Cumulative Unit Capability Factor:** 78.8%  
**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 (%)
1989	1299.7	950.0	0.0	0.0	15.6	100.0	15.6	0.0	1992	22.7
1990	5691.6	950.0	69.4	69.4	69.4	69.4	68.4	68.4	6408	73.2
1991	5762.8	950.0	70.4	69.9	70.0	69.7	69.2	68.8	6996	79.9
1992	6458.1	1000.0	75.3	71.7	75.2	71.6	73.5	70.4	6646	75.7
1993	6043.4	950.0	72.8	72.0	71.7	71.6	72.6	71.0	6527	74.5
1994	5565.0	950.0	66.5	70.9	66.4	70.6	66.9	70.2	6223	71.0
1995	4954.8	950.0	60.2	69.1	59.5	68.8	59.5	68.4	6300	71.9
1996	6155.0	950.0	76.4	70.2	73.8	69.5	73.8	69.2	7463	85.0
1997	6514.8	950.0	79.8	71.3	77.7	70.5	78.3	70.3	7079	80.8
1998	5851.0	950.0	71.0	71.3	69.9	70.4	70.3	70.3	6396	73.0
1999	5464.3	950.0	67.2	70.9	65.5	69.9	65.7	69.8	6244	71.3
2000	5909.7	950.0	73.3	71.1	70.6	70.0	70.8	69.9	6588	75.0
2001	6136.3	950.0	76.3	71.5	73.7	70.3	73.5	70.2	6985	79.5
2002	6335.2	950.0	77.5	72.0	76.0	70.7	76.1	70.7	7043	80.4
2003	6036.5	950.0	74.3	72.2	73.1	70.9	72.5	70.8	6680	76.3

## UA-48 SOUTH UKRAINE-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	6679.2	95.7	XP1	N	COOLING WATER TEMPERATURE LIMITS
01 Jan	5358.1	100.6	UP1	A31	CONDENSER PROBLEM
26 Jan	34.2	9.8	UP2	A15	REACTOR COOLANT PUMP (RCP-4) SWITCH-OFF
30 Apr	11.2	2.5	UF2	A15	RCP- 4 POWER SOURCE BREAKER CONVERTER SWITCH-OFF
26 May	24.7	4.5	UF2	A15	REACTOR COOLANT PUMP (RCP-2) SWITCH-OFF
02 Jun	187.3	60.9	XP	K	LOAD FOLLOWING DUE TO REDUCED ENERGY DEMAND
03 Jul	1.5	1.4	UF2	A33	TG SWITCH-OFF DUE TO TECHNOLOGICAL PROTECTION ACTUATION ON VACUUM DECREASING AFTER CIRCULATING PUMP SWITCH-OFF.
03 Jul	26.0	10.8	UP2	A33	REPAIR OF CIRCULATING PUMP
11 Aug	1901.4	1848.9	PF	C	INTERMEDIATE OUTAGE: MAINTENANCE COMBINED WITH REFUELLING.
07 Nov	4.8	8.8	PP	E31	TESTING OF TURBINE GOVERNING SYSTEM
02 Dec	85.6	87.1	UF1	A16	REMOVAL OF SG-3 LEAKAGE. BUBBLE TESTING OF SG TUBES.
15 Dec	14.3	4.2	UP2	A31	FALSE SYGNAL FOR CLOSING OF CONTROL VALVE ON THE ENTER OF ELECTROHYDRAULIC CONTROL SYSTEM
24 Dec	13.3	3.4	UP2	A31	FALSE SYGNAL FOR ELECTOHYDRAULIC CONTROL SYSTEM EQUIPMENT DURING SOFTWARE LOADING
29 Dec	52.6	49.9	UF2	A41	ACTUATION OF GENERATOR DIFFERENCIAL PROTECTION SYSTEM

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1990 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		175			142	
B. Refuelling without a maintenanc					0	
C. Inspection, maintenance or repai combined with refuelling	1901			1486		
D. Inspection, maintenance or repai without refuelling				268		
E. Testing of plant systems or component:				28		
Subtotal	1901	175	0	1782	142	0
Total		2076			1924	

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

System	2003 Hours Lost	1990 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems		5
13. Reactor Auxiliary System:		1
15. Reactor Cooling System:	35	1
16. Steam generation system:	85	
17. Safety I&C Systems (excluding reactor I&C		4
31. Turbine and auxiliarie:		16
32. Feedwater and Main Steam Syster		1
33. Circulating Water System	1	
35. All other I&C Systems		1
41. Main Generator System:	52	98
42. Electrical Power Supply System:		2
Total	173	134

# 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:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6596.4 GW(e).h  
**Energy Availability Factor:** 79.0%  
**Load Factor:** 79.3%  
**Operating Factor:** 82.5%  
**Energy Unavailability Factor:** 21.0%  
**Total Off-line Time:** 1537 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	723.5	642.6	687.4	675.3	109.3	0.0	453.8	685.5	677.8	705.9	571.8	663.6	6596.4
<b>EAF (%)</b>	99.8	99.8	97.1	98.7	15.5	0.0	64.2	97.0	99.1	99.7	83.6	93.9	79.0
<b>UCF (%)</b>	99.8	99.8	97.1	99.4	19.4	0.0	67.8	99.9	99.9	100.0	100.0	99.9	81.9
<b>LF (%)</b>	102.4	100.7	97.3	98.9	15.5	0.0	64.2	97.0	99.1	99.7	83.6	93.9	79.3
<b>OF (%)</b>	100.0	100.0	99.9	100.1	19.8	0.0	70.4	100.0	100.0	100.0	100.0	100.0	82.5
<b>EUf (%)</b>	0.2	0.2	2.9	1.3	84.5	100.0	35.8	3.0	0.9	0.3	16.4	6.1	21.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	80.6	100.0	13.4	0.0	0.0	0.0	0.0	0.0	16.2
<b>UCLF (%)</b>	0.2	0.2	2.9	0.6	0.0	0.0	18.8	0.1	0.1	0.1	0.0	0.2	2.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.7	4.0	0.0	3.6	3.0	0.8	0.2	16.4	6.0	2.9

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1980      **Lifetime Generation:** 91692.2 GW(e).h  
**Date of First Criticality:** 07 Dec 1984      **Cumulative Energy Availability Factor:** 58.6%  
**Date of Grid Connection:** 10 Dec 1984      **Cumulative Load Factor:** 58.3%  
**Date of Commercial Operation:** 25 Dec 1985      **Cumulative Unit Capability Factor:** 77.8%  
**Cumulative Energy Unavailability Factor:** 41.4%

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	4051.1	950.0	0.0	0.0	68.4	100.0	48.7	0.0	5893	67.3
1986	4826.3	950.0	61.5	61.5	58.3	58.3	58.0	58.0	5580	63.7
1987	6720.9	1000.0	80.8	71.4	80.8	69.8	76.7	67.6	7205	82.2
1988	5170.4	950.0	67.4	70.1	67.2	69.0	62.0	65.7	6225	70.9
1989	0.0	950.0	0.0	52.8	0.0	52.0	0.0	49.5	0	0.0
1990	4668.7	950.0	58.8	54.0	56.4	52.8	56.1	50.8	5684	64.9
1991	5332.2	950.0	68.5	56.4	64.2	54.7	64.1	53.0	6343	72.4
1992	6103.5	950.0	70.3	58.4	67.8	56.6	73.1	55.9	6739	76.7
1993	4209.7	950.0	53.5	57.8	52.1	56.0	50.6	55.2	6591	75.2
1994	3771.0	950.0	45.5	56.4	45.5	54.9	45.3	54.1	5062	57.8
1995	3557.3	950.0	44.9	55.3	42.7	53.7	42.7	53.0	4213	48.1
1996	4299.5	950.0	53.5	55.1	51.5	53.5	51.5	52.9	5224	59.5
1997	4070.6	950.0	53.9	55.0	48.9	53.1	48.9	52.5	5531	63.1
1998	5517.5	950.0	68.7	56.0	66.3	54.1	66.3	53.6	6122	69.9
1999	5992.5	950.0	84.0	58.0	72.0	55.4	72.0	54.9	7422	84.7
2000	4222.7	950.0	52.0	57.6	50.3	55.0	50.6	54.6	4589	52.2
2001	5847.1	950.0	71.8	58.5	69.9	56.0	70.1	55.6	6434	73.2
2002	6735.0	950.0	83.2	60.0	80.6	57.4	80.9	57.1	7334	83.7
2003	6596.4	950.0	81.8	61.2	79.0	58.6	79.3	58.3	7223	82.5

# UA-54 ZAPOROZHE-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	7223.0	129.1	XP1	N	COOLING WATER TEMPERATURE LIMITS
01 Jan	7223.0	7.3	UP1	A31	STEAM UNDERHEATING IN MOISTURE SEPARATOR
16 Feb	160.0	3.9	XP	J	TRANSMISSION LINE LIMITATION
09 Mar	34.0	16.2	XP2	J	GRID UNAVAILABILITY: TRANSMISSION LINE LIMITATION
13 Apr	9.0	1.7	XP	J	TRANSMISSION LINE-750KV DISCONNECTION
24 Apr	314.0	19.9	XP1	S	COASTDOWN OPERATION
07 May	1408.0	1348.1	PF	C	INTERMEDIATE OUTAGE: MAINTENANCE COMBINED WITH REFUELLING
09 Jul	8.0	2.0	UP2	A12	OPERATION AT REDUCED POWER N=67% WITH FOLLOWING SHUTDOWN (REACTOR SCRAM MANUAL) DUE TO TRANSITION PROCESS
09 Jul	9.0	15.2	UF5	A12	REACTOR SCRAM MANUAL
13 Jul	18.0	6.0	UP2	A15	OPERATION AT REDUCED POWER N=67% WITH FOLLOWING SHUTDOWN DUE TO RCP ELECTRIC MOTOR FAILURE
13 Jul	120.0	108.9	UF2	A15	REACTOR COOLANT PUMP REPAIR (ELECTRIC MOTOR REPLACEMENT)
08 Nov	9.0	1.7	XP	J	TRANSMISSION LINE-750 KV DISCONNECTION
10 Nov	744.0	154.0	XP	J	TRANSMISSION LINE LIMITATION

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		129		415	378	4
B. Refuelling without a maintenance					13	
C. Inspection, maintenance or repair combined with refuelling	1408			1533	41	
D. Inspection, maintenance or repair without refuelling				420	13	
E. Testing of plant systems or components				8		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					4	6
Subtotal	1408	129	0	2376	449	10
Total		1537			2835	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	9	58
15. Reactor Cooling Systems	120	34
16. Steam generation systems		510
17. Safety I&C Systems (excluding reactor I&C)		10
31. Turbine and auxiliaries		64
32. Feedwater and Main Steam System		47
33. Circulating Water System		4
35. All other I&C Systems		0
41. Main Generator Systems		44
42. Electrical Power Supply Systems		18
XX. Miscellaneous Systems		1
Total	129	790

# 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:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6742.4 GW(e).h  
**Energy Availability Factor:** 80.9%  
**Load Factor:** 81.0%  
**Operating Factor:** 84.3%  
**Energy Unavailability Factor:** 19.1%  
**Total Off-line Time:** 1373 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	709.2	641.6	708.7	682.1	643.4	666.5	77.3	18.9	672.0	700.3	525.5	697.0	6742.4
<b>EAF (%)</b>	99.9	99.9	99.9	99.7	91.0	97.4	10.9	2.7	98.3	98.9	76.8	98.6	80.9
<b>UCF (%)</b>	99.9	99.9	99.9	99.9	93.6	99.1	12.3	4.6	99.7	99.9	99.8	99.9	83.8
<b>LF (%)</b>	100.3	100.5	100.3	99.9	91.0	97.4	10.9	2.7	98.3	98.9	76.8	98.6	81.0
<b>OF (%)</b>	100.0	100.0	99.9	100.1	95.8	100.0	12.9	6.7	100.0	100.0	100.0	100.0	84.3
<b>EUF (%)</b>	0.1	0.1	0.1	0.3	9.0	2.6	89.1	97.3	1.7	1.1	23.2	1.4	19.1
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	5.6	0.0	87.6	94.9	0.0	0.0	0.0	0.0	16.0
<b>UCLF (%)</b>	0.1	0.1	0.1	0.1	0.8	0.9	0.2	0.5	0.3	0.1	0.2	0.1	0.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.2	2.6	1.7	1.3	2.0	1.5	1.0	23.0	1.3	2.9

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1981      **Lifetime Generation:** 94244.9 GW(e).h  
**Date of First Criticality:** 28 Jun 1985      **Cumulative Energy Availability Factor:** 63.4%  
**Date of Grid Connection:** 22 Jul 1985      **Cumulative Load Factor:** 62.1%  
**Date of Commercial Operation:** 15 Feb 1986      **Cumulative Unit Capability Factor:** 78.1%  
**Cumulative Energy Unavailability Factor:** 36.6%

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	443.9	950.0	0.0	0.0	5.3	100.0	5.3	0.0	718	8.2
1986	5651.6	950.0	0.0	0.0	71.1	100.0	67.9	0.0	6417	73.3
1987	6058.3	1000.0	76.0	76.0	76.0	76.0	69.2	69.2	6675	76.2
1988	6088.6	950.0	81.2	78.5	81.2	78.5	73.0	71.0	7253	82.6
1989	3050.9	950.0	45.1	67.6	45.1	67.6	36.7	59.8	3393	38.7
1990	1869.1	950.0	22.6	56.5	22.3	56.4	22.5	50.6	2165	24.7
1991	4583.9	950.0	56.1	56.4	55.4	56.2	55.1	51.5	5112	58.4
1992	6551.7	950.0	77.7	59.9	76.2	59.6	78.5	55.9	7016	79.9
1993	4386.1	950.0	56.5	59.5	53.8	58.7	52.7	55.5	6194	70.7
1994	4103.5	950.0	49.9	58.3	49.8	57.6	49.3	54.7	5924	67.6
1995	5051.8	950.0	63.5	58.9	60.7	58.0	60.7	55.4	7329	83.7
1996	5373.0	950.0	67.5	59.7	64.4	58.6	64.4	56.3	6247	71.1
1997	6081.7	950.0	76.5	61.2	73.0	59.9	73.1	57.8	6745	77.0
1998	4922.8	950.0	63.0	61.4	59.0	59.8	59.2	57.9	5601	63.9
1999	5476.0	950.0	66.9	61.8	65.7	60.3	65.8	58.5	5887	67.2
2000	5626.4	950.0	70.7	62.4	67.4	60.8	67.4	59.1	6281	71.5
2001	5867.6	950.0	72.5	63.1	70.6	61.4	70.3	59.9	6422	73.1
2002	6315.6	950.0	78.8	64.1	75.9	62.3	75.9	60.9	6834	78.0
2003	6742.4	950.0	83.8	65.2	80.9	63.4	81.0	62.1	7387	84.3

## UA-56 ZAPOROZHE-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	7387.0	130.8	XP	N	COOLING WATER TEMPERATURE LIMITS
02 Jan	7387.0	5.4	UP1	A31	OPERATION AT REDUCED POWER/ STEAM UNDERHEATING IN MOISTURE SEPARATOR
13 Apr	8.0	1.2	XP2	J	TRANSMISSION LINE-750 KV DISCONNECTION
01 May	3658.0	14.4	UP1	A31	CONDENSER PROBLEM
04 May	31.0	39.5	PF	D41	PREVENTIVE MAINTENANCE. GENERATOR HYDROGEN COOLER REPAIR
05 Jul	1341.0	1289.4	PF	C	INTERMEDIATE OUTAGE: MAINTENANCE COMBINED WITH REFUELLING
30 Aug	9.0	3.3	UP2	A17	RCP SWITCH OFF DUE TO FALSE CONTROL ON SG-4 LEVEL
09 Oct	3.0	0.5	XP2	J	TRANSMISSION LINE-750 KV DISCONNECTION
11 Nov	408.0	153.2	XP	J	TRANSMISSION LINE LIMITATION
29 Nov	19.0	3.9	XP	J	GRID UNAVAILABILITY: TRANSMISSION LINE REPAIR
01 Dec	161.0	7.2	XP	J	TRANSMISSION LINE LIMITATION

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1986 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					506	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	1341			1452		
D. Inspection, maintenance or repair without refuelling	31			633		
E. Testing of plant systems or components				7		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					3	15
Subtotal	1372	0	0	2092	513	15
Total		1372			2620	

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

System	2003 Hours Lost	1986 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		14
13. Reactor Auxiliary Systems		0
15. Reactor Cooling Systems		11
16. Steam generation systems		308
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		47
32. Feedwater and Main Steam System		10
35. All other I&C Systems		10
41. Main Generator Systems		83
42. Electrical Power Supply Systems		5
Total	0	489

**UA-78 ZAPOROZHE-3**

Operator: NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY &lt;ENERGOATOM&gt;)

Contractor: PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

**1. Station Details**

Type: WWER  
 Maximum Net Capacity  
 at the beginning of 2003: 950.0 MW(e)  
 Design Net Capacity: 950.0 MW(e)  
 Design Discharge Burnup: 40000 MW.d/t

**2. Production Summary 2003**

Energy Production: 6588.9 GW(e).h  
 Energy Availability Factor: 79.0%  
 Load Factor: 79.2%  
 Operating Factor: 82.6%  
 Energy Unavailability Factor: 21.0%  
 Total Off-line Time: 1524 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	712.3	525.4	709.1	680.6	688.3	665.7	670.8	667.9	113.4	0.0	451.4	704.1	6588.9
EAF (%)	99.8	82.3	99.8	99.2	97.4	97.3	94.9	94.5	16.6	0.0	66.0	99.6	79.0
UCF (%)	99.8	99.8	99.8	99.2	99.5	99.4	99.0	98.5	19.4	0.0	69.7	99.7	81.9
LF (%)	100.8	82.3	100.3	99.6	97.4	97.3	94.9	94.5	16.6	0.0	66.0	99.6	79.2
OF (%)	100.0	100.0	99.9	100.1	100.0	100.0	100.0	100.0	20.0	0.0	71.8	100.0	82.6
EUf (%)	0.2	17.7	0.2	0.8	2.6	2.7	5.1	5.5	83.4	100.0	34.0	0.4	21.0
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.3	100.0	29.7	0.0	17.6
UCLF (%)	0.2	0.2	0.2	0.8	0.5	0.6	1.1	1.5	0.3	0.0	0.6	0.4	0.5
XUF (%)	0.0	17.5	0.0	0.0	2.1	2.1	4.0	4.0	2.8	0.0	3.7	0.0	2.9

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Apr 1982      Lifetime Generation: 93772.2 GW(e).h  
 Date of First Criticality: 04 Dec 1986      Cumulative Energy Availability Factor: 65.8%  
 Date of Grid Connection: 10 Dec 1986      Cumulative Load Factor: 65.3%  
 Date of Commercial Operation: 05 Mar 1987      Cumulative Unit Capability Factor: 78.2%  
    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 (%)
1986	109.8	950.0	0.0	0.0	1.3	100.0	1.3	0.0	346	3.9
1987	6691.0	1000.0	0.0	0.0	83.5	100.0	76.4	0.0	7222	82.4
1988	6414.3	950.0	81.3	81.3	81.3	81.3	76.9	76.9	7077	80.6
1989	6614.4	950.0	80.8	81.1	80.9	81.1	79.5	78.2	7373	84.2
1990	5625.3	950.0	68.1	76.8	67.7	76.6	67.6	74.6	6166	70.4
1991	4958.8	950.0	61.1	72.8	59.9	72.4	59.6	70.9	5877	67.1
1992	4140.9	950.0	54.0	69.1	50.5	68.1	49.6	66.6	5274	60.0
1993	5416.6	950.0	67.6	68.8	66.0	67.7	65.1	66.4	7263	82.9
1994	4273.7	950.0	52.5	66.5	52.5	65.5	51.4	64.2	6068	69.3
1995	4027.8	950.0	49.7	64.4	48.4	63.4	48.4	62.2	5804	66.3
1996	4940.2	950.0	62.3	64.2	59.2	62.9	59.2	61.9	6096	69.4
1997	4869.8	950.0	70.1	64.8	58.5	62.5	58.5	61.6	6544	74.7
1998	4953.2	950.0	63.1	64.6	59.5	62.2	59.5	61.4	6316	72.1
1999	5114.5	950.0	64.8	64.6	61.5	62.2	61.5	61.4	6162	70.3
2000	6123.2	950.0	76.6	65.5	73.0	63.0	73.4	62.3	6875	78.3
2001	6307.8	950.0	80.8	66.6	75.7	63.9	75.6	63.3	7027	80.0
2002	6602.0	950.0	84.4	67.8	79.2	64.9	79.3	64.3	7470	85.3
2003	6588.9	950.0	81.9	68.7	79.0	65.8	79.2	65.3	7236	82.6



## UA-78 ZAPOROZHE-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	6792.0	154.3	XP	N	COOLING WATER TEMPERATURE LIMITS
01 Jan	2639.0	36.9	UP1	A31	CONDENSER PROBLEM
12 Feb	265.5	111.1	XP	J	TRANSMISSION LINE LIMITATION.
13 Apr	18.0	1.5	XP2	J	TRANSMISSION LINE-750KV DISCONNECTION
05 May	13.8	2.6	XP	J	GRID UNAVAILABILITY: TRANSMISSION LINE REPAIR
10 Aug	8.2	1.4	UP2	A33	CIRCULATING PUMP-2 SWITCH OFF DUE TO MOTOR WINDING DAMAGE
30 Aug	179.0	10.1	XP	S	COASTDOWN OPERATION.
07 Sep	1524.0	1460.5	PF	C	OVERHAUL: MAINTENANCE COMBINED WITH REFUELLING.
10 Nov	221.0	11.5	XP	J	TRANSMISSION LINE LIMITATION.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					118	
B. Refuelling without a maintenance					10	
C. Inspection, maintenance or repair combined with refuelling	1524			1489		
D. Inspection, maintenance or repair without refuelling				286		
E. Testing of plant systems or components				27	4	
J. Grid failure or grid unavailability						14
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				2	6	
Subtotal	1524	0	0	1804	138	14
Total		1524			1956	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		3
13. Reactor Auxiliary Systems		4
14. Safety Systems		7
15. Reactor Cooling Systems		0
16. Steam generation systems		18
31. Turbine and auxiliaries		6
32. Feedwater and Main Steam System		17
33. Circulating Water System		1
35. All other I&C Systems		2
41. Main Generator Systems		38
42. Electrical Power Supply Systems		6
XX. Miscellaneous Systems		0
Total	0	102

# 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:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6736.3 GW(e).h  
**Energy Availability Factor:** 80.9%  
**Load Factor:** 80.9%  
**Operating Factor:** 82.7%  
**Energy Unavailability Factor:** 19.1%  
**Total Off-line Time:** 1512 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	0.0	353.9	708.3	688.1	704.8	681.3	681.0	689.6	678.0	699.6	679.4	172.2	6736.3
<b>EAF (%)</b>	0.0	55.4	100.0	100.0	99.7	99.6	96.3	97.6	99.1	98.8	99.3	24.4	80.9
<b>UCF (%)</b>	0.0	60.0	100.0	100.0	100.0	100.0	98.9	100.0	100.0	99.4	99.4	31.6	82.5
<b>LF (%)</b>	0.0	55.4	100.2	100.7	99.7	99.6	96.3	97.6	99.1	98.8	99.3	24.4	80.9
<b>OF (%)</b>	0.0	60.7	99.9	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	32.3	82.7
<b>EUf (%)</b>	100.0	44.6	0.0	0.0	0.3	0.4	3.7	2.4	0.9	1.2	0.7	75.6	19.1
<b>PUF (%)</b>	100.0	40.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.4	0.4	68.3	17.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.0
<b>XUF (%)</b>	0.0	4.6	0.0	0.0	0.3	0.4	2.6	2.4	0.9	0.6	0.1	7.3	1.6

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1983      **Lifetime Generation:** 94432.6 GW(e).h  
**Date of First Criticality:** 15 Dec 1987      **Cumulative Energy Availability Factor:** 70.2%  
**Date of Grid Connection:** 18 Dec 1987      **Cumulative Load Factor:** 70.1%  
**Date of Commercial Operation:** 14 Apr 1988      **Cumulative Unit Capability Factor:** 78.5%  
**Cumulative Energy Unavailability Factor:** 29.8%

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	116.4	954.0	0.0	0.0	1.5	100.0	1.5	0.0	238	2.9
1988	6431.4	950.0	0.0	0.0	80.8	100.0	77.1	0.0	7143	81.3
1989	5828.1	950.0	73.1	73.1	73.1	73.1	70.0	70.0	6613	75.5
1990	6637.3	950.0	79.8	76.4	78.9	76.0	79.8	74.9	7393	84.4
1991	4259.5	950.0	51.3	68.0	51.1	67.7	51.2	67.0	5114	58.4
1992	6962.3	1000.0	78.8	70.8	78.6	70.5	79.3	70.2	6961	79.2
1993	6118.8	950.0	74.1	71.5	73.4	71.1	73.5	70.8	6821	77.9
1994	5888.7	950.0	71.4	71.5	71.3	71.1	70.8	70.8	6718	76.7
1995	4717.1	950.0	58.4	69.6	56.7	69.1	56.7	68.8	5902	67.4
1996	5372.2	950.0	66.3	69.2	64.4	68.5	64.4	68.3	6372	72.5
1997	6284.4	950.0	79.9	70.4	75.5	69.3	75.5	69.1	7060	80.6
1998	6022.0	950.0	74.0	70.8	72.4	69.6	72.4	69.4	6839	78.1
1999	3921.3	950.0	49.8	68.9	47.1	67.5	47.1	67.4	4630	52.9
2000	6708.4	950.0	83.8	70.1	80.3	68.6	80.4	68.5	7423	84.5
2001	6091.2	950.0	89.8	71.6	73.1	68.9	73.0	68.8	7884	89.8
2002	6337.1	950.0	78.5	72.1	76.1	69.5	76.1	69.3	6895	78.7
2003	6736.3	950.0	82.5	72.8	80.9	70.2	80.9	70.1	7248	82.7

## UA-79 ZAPOROZHE-4

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	1008.0	962.0	PF	C	INTERMEDIATE OUTAGE MAINTENANCE COMBINED WITH REFUELLING.
12 Feb	7248.0	187.7	XP	N	COOLING WATER TEMPERATURE LIMITS
12 Feb	102.0	19.9	XP	J	TRANSMISSION LINE LIMITATION.
13 Apr	18.0	1.3	XP2	J	TRANSMISSION LINE-750KV DISCONNECTION
05 May	14.0	2.1	XP	J	GRID UNAVAILABILITY: TRANSMISSION LINE REPAIR
09 Oct	3.4	0.5	XP	J	GRID UNAVAILABILITY: TRANSMISSION LINE REPAIR
13 Nov	173.0	4.3	XP	J	TRANSMISSION LINE LIMITATION.
01 Dec	240.0	47.4	XP	J	TRANSMISSION LINE LIMITATION.
10 Dec	504.0	482.6	PF	D42	REPLACEMENT OF THE BATTERY

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					192	
B. Refuelling without a maintenance					40	
C. Inspection, maintenance or repair combined with refuelling	1008			1573		
D. Inspection, maintenance or repair without refuelling	504			139		
E. Testing of plant systems or components				22	0	
J. Grid failure or grid unavailability						0
Subtotal	1512	0	0	1734	232	0
Total		1512			1966	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems		12
13. Reactor Auxiliary Systems		7
14. Safety Systems		2
15. Reactor Cooling Systems		13
16. Steam generation systems		23
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System		7
35. All other I&C Systems		0
41. Main Generator Systems		93
42. Electrical Power Supply Systems		6
XX. Miscellaneous Systems		1
Total	0	187

**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:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t

**2. Production Summary 2003**

**Energy Production:** 6585.5 GW(e).h  
**Energy Availability Factor:** 79.0%  
**Load Factor:** 79.1%  
**Operating Factor:** 81.1%  
**Energy Unavailability Factor:** 21.0%  
**Total Off-line Time:** 1653 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	714.5	492.6	307.8	684.2	686.2	660.5	665.5	327.7	0.0	666.7	681.1	698.7	6585.5
<b>EAF (%)</b>	99.8	77.0	43.7	99.9	97.1	96.6	94.2	46.4	0.0	94.2	99.6	98.9	79.0
<b>UCF (%)</b>	99.8	77.0	44.9	99.9	99.4	98.9	97.5	49.3	0.0	94.8	100.0	100.0	80.2
<b>LF (%)</b>	101.1	77.2	43.5	100.2	97.1	96.6	94.2	46.4	0.0	94.2	99.6	98.9	79.1
<b>OF (%)</b>	100.0	77.5	47.6	100.1	100.0	100.0	100.0	51.7	0.0	95.4	100.0	100.0	81.1
<b>EU (%)</b>	0.2	23.0	56.3	0.1	2.9	3.4	5.8	53.6	100.0	5.8	0.4	1.1	21.0
<b>PU (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.4	100.0	5.2	0.0	0.0	12.8
<b>UCLF (%)</b>	0.2	23.0	55.1	0.1	0.6	1.1	2.5	2.3	0.0	0.0	0.0	0.0	7.0
<b>XUF (%)</b>	0.0	0.0	1.2	0.0	2.3	2.3	3.3	2.9	0.0	0.6	0.4	1.1	1.2

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 01 Nov 1985  
**Date of First Criticality:** 20 Jul 1989  
**Date of Grid Connection:** 14 Aug 1989  
**Date of Commercial Operation:** 27 Oct 1989

**Lifetime Generation:** 84611.8 GW(e).h  
**Cumulative Energy Availability Factor:** 70.4%  
**Cumulative Load Factor:** 70.5%  
**Cumulative Unit Capability Factor:** 78.8%  
**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	2147.5	950.0	0.0	0.0	92.6	100.0	25.8	0.0	2938	33.5
1990	4678.7	950.0	57.9	57.9	56.6	56.6	56.2	56.2	6002	68.5
1991	6554.9	950.0	79.5	68.7	78.4	67.5	78.8	67.5	7319	83.6
1992	6898.8	1000.0	80.1	72.7	79.2	71.5	78.5	71.3	7032	80.1
1993	5661.8	950.0	68.9	71.7	68.3	70.7	68.0	70.5	6735	76.9
1994	4858.9	950.0	59.1	69.2	59.1	68.4	58.4	68.1	6779	77.4
1995	5391.9	950.0	66.0	68.7	64.7	67.8	64.8	67.6	6506	74.3
1996	6126.0	950.0	74.1	69.5	73.4	68.6	73.4	68.4	6799	77.4
1997	6381.5	950.0	76.2	70.3	75.8	69.5	76.7	69.4	6705	76.5
1998	5856.2	950.0	70.7	70.4	70.1	69.6	70.4	69.5	6249	71.3
1999	5070.2	950.0	63.0	69.6	60.6	68.7	60.9	68.7	5525	63.1
2000	6286.6	950.0	77.9	70.4	74.9	69.2	75.3	69.3	6928	78.9
2001	5890.8	950.0	76.2	70.8	70.7	69.4	70.6	69.4	6751	76.9
2002	6222.5	950.0	80.8	71.6	74.5	69.8	74.8	69.8	6983	79.7
2003	6585.5	950.0	80.2	72.2	79.0	70.4	79.1	70.5	7107	81.1

## UA-126 ZAPOROZHE-5

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	7107.0	120.2	XP1	N	COOLING WATER TEMPERATURE LIMITS
01 Jan	4932.0	49.7	UP1	A31	CONDENSER PROBLEM
22 Feb	540.0	523.1	UF2	A16	INCREASING OF SG-5 BLOWDOWN ACTIVITY
28 Mar	41.0	12.2	UP2	A35	CIRCULATING PUMP-2 SWITCH OFF DUE TO VALVE YD20S04 CLOSING
11 Aug	139.0	1.8	XP	S	COASTDOWN OPERATION.
17 Aug	1113.0	1062.7	PF	C	INTERMEDIATE OUTAGE: MAINTENANCE COMBINED WITH REFUELLING.
09 Nov	10.0	1.0	XP2	J	TRANSMISSION LINE -750KV DISCONNECTION
09 Nov	40.0	8.4	XP	J	TRANSMISSION LINE LIMITATION.
07 Dec	77.0	13.0	XP	J	TRANSMISSION LINE LIMITATION.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1989 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		540			84	
B. Refuelling without a maintenance					11	
C. Inspection, maintenance or repair combined with refuelling	1113			1371		
D. Inspection, maintenance or repair without refuelling				292		
E. Testing of plant systems or components				32		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					2	12
Subtotal	1113	540	0	1695	97	12
Total		1653			1804	

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

System	2003 Hours Lost	1989 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		9
14. Safety Systems		1
15. Reactor Cooling Systems		9
16. Steam generation systems	540	21
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		11
32. Feedwater and Main Steam System		10
41. Main Generator Systems		10
42. Electrical Power Supply Systems		8
Total	540	81

**UA-127 ZAPOROZHE-6****Operator:** NNEG (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)**1. Station Details**

**Type:** WWER  
**Maximum Net Capacity at the beginning of 2003:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** —

**2. Production Summary 2003**

**Energy Production:** 7006.4 GW(e).h  
**Energy Availability Factor:** 83.5%  
**Load Factor:** 84.2%  
**Operating Factor:** 86.6%  
**Energy Unavailability Factor:** 16.5%  
**Total Off-line Time:** 1170 hours

**3. 2003 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	713.4	573.6	280.1	0.0	599.0	682.1	707.7	708.2	699.0	723.5	641.7	678.1	7006.4
<b>EAF (%)</b>	99.0	89.9	39.8	0.0	84.2	98.3	100.0	100.0	100.0	100.0	93.8	95.9	83.5
<b>UCF (%)</b>	99.0	99.3	54.6	0.0	84.2	98.3	100.0	100.0	100.0	100.0	99.8	100.0	86.3
<b>LF (%)</b>	100.9	89.9	39.6	0.0	84.8	99.7	100.1	100.2	102.2	102.4	93.8	95.9	84.2
<b>OF (%)</b>	100.0	100.0	55.1	0.0	85.8	98.6	100.0	100.0	100.0	100.0	100.0	100.0	86.6
<b>EUf (%)</b>	1.0	10.1	60.2	100.0	15.8	1.7	0.0	0.0	0.0	0.0	6.2	4.1	16.5
<b>PUF (%)</b>	0.0	0.0	45.1	100.0	15.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.4
<b>UCLF (%)</b>	1.0	0.7	0.4	0.0	0.2	1.7	0.0	0.0	0.0	0.0	0.3	0.0	0.4
<b>XUF (%)</b>	0.0	9.5	14.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	4.1	2.8

UCLF replaces previously used UUF.

**4. 2003 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 01 Jun 1986      **Lifetime Generation:** 51434.1 GW(e).h  
**Date of First Criticality:** 06 Oct 1995      **Cumulative Energy Availability Factor:** 75.9%  
**Date of Grid Connection:** 19 Oct 1995      **Cumulative Load Factor:** 76.5%  
**Date of Commercial Operation:** 16 Sep 1996      **Cumulative Unit Capability Factor:** 81.9%  
**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 (%)
1995	422.8	950.0	0.0	0.0	5.1	100.0	5.1	0.0	1518	17.3
1996	6403.5	950.0	0.0	0.0	76.7	100.0	76.7	0.0	7871	89.6
1997	6332.7	950.0	75.5	75.5	75.2	75.2	76.1	76.1	6640	75.8
1998	6132.2	950.0	76.2	75.8	73.4	74.3	73.7	74.9	6766	77.2
1999	6165.4	950.0	78.4	76.7	74.1	74.2	74.1	74.6	6934	79.2
2000	5844.2	950.0	70.1	75.0	69.3	73.0	70.0	73.5	6191	70.5
2001	6336.2	950.0	80.1	76.1	75.2	73.4	75.9	74.0	7118	81.0
2002	6790.6	950.0	83.4	77.3	81.0	74.7	81.6	75.2	7393	84.4
2003	7006.4	950.0	86.3	78.6	83.5	75.9	84.2	76.5	7590	86.6

**UA-127 ZAPOROZHE-6****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	1826.0	10.6	UP1	A31	CONDENSER PROBLEM
09 Feb	873.0	161.4	XP	S	COASTDOWN OPERATION.
01 Mar	6175.0	129.8	XP	N	COOLING WATER TEMPERATURE LIMITS
17 Mar	10.0	1.6	XP	J	TRANSMISSION LINE LIMITATION
18 Mar	1159.0	1112.4	PF	C	INTERMEDIATE OUTAGE: MAINTENANCE COMBINED WITH REFUELLING.
26 Jun	10.0	11.4	UF2	A35	UNIT SHUTDOWN DUE TO GENERATOR PROTECTION ACTUATION
09 Oct	3.4	0.3	XP2	J	TRANSMISSION LINE-750KV DISCONNECTION
14 Nov	5.4	1.7	UP2	A15	RCP-4 SWITCH OFF DUE TO SG-4 LEVEL DECREASING
14 Nov	550.0	86.8	XP	J	TRANSMISSION LINE LIMITATION.

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

Outage Cause	2003 Hours Lost			1995 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		10			39	
C. Inspection, maintenance or repair combined with refuelling	1159			1189		
D. Inspection, maintenance or repair without refuelling				114		
E. Testing of plant systems or components				51		
Subtotal	1159	10	0	1354	39	0
Total		1169			1393	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1995 to 2003 Average Hours Lost Per Year
15. Reactor Cooling Systems		5
16. Steam generation systems		6
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		15
32. Feedwater and Main Steam System		0
35. All other I&C Systems	10	
41. Main Generator Systems		1
42. Electrical Power Supply Systems		3
XX. Miscellaneous Systems		2
Total	10	34

# US-313 ARKANSAS ONE-1

**Operator:** ENTERGY (ENTERGY NUCLEAR)  
**Contractor:** B&W (BABCOCK & WILCOX CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 836.0 MW(e)  
**Design Net Capacity:** 850.0 MW(e)  
**Design Discharge Burnup:** 29133 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6794.3 GW(e).h  
**Energy Availability Factor:** 91.8%  
**Load Factor:** 92.8%  
**Operating Factor:** 91.9%  
**Energy Unavailability Factor:** 8.2%  
**Total Off-line Time:** 710 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	638.7	576.7	637.9	614.1	622.3	611.2	598.0	571.3	583.1	637.5	290.4	413.0	6794.3
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.3	100.0	100.0	46.0	65.6	91.8
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.3	100.0	100.0	46.0	65.6	91.8
<b>LF (%)</b>	102.7	102.7	102.6	102.2	100.1	101.5	96.2	91.9	96.9	102.4	48.2	66.4	92.8
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.2	98.1	100.0	47.4	65.2	91.9
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.7	0.0	0.0	54.0	34.4	8.2
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.7	0.0	0.0	54.0	34.4	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1968      **Lifetime Generation:** 152686.1 GW(e).h  
**Date of First Criticality:** 06 Aug 1974      **Cumulative Energy Availability Factor:** 76.9%  
**Date of Grid Connection:** 17 Aug 1974      **Cumulative Load Factor:** 71.9%  
**Date of Commercial Operation:** 19 Dec 1974      **Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	3721.4	836.0	64.8	64.9	64.8	63.5	50.8	59.8	5671	64.7
1983	3220.6	836.0	48.3	63.1	48.3	61.8	44.0	58.1	4191	47.8
1984	4604.1	836.0	70.1	63.8	70.1	62.7	62.7	58.5	6150	70.0
1985	5190.4	836.0	78.3	65.1	78.3	64.1	70.9	59.6	6852	78.2
1986	3589.9	836.0	62.2	64.8	62.2	63.9	49.0	58.8	5446	62.2
1987	4763.3	836.0	88.2	66.7	88.2	65.8	65.0	59.2	7720	88.1
1988	3963.2	836.0	68.3	66.8	68.3	66.0	54.0	58.9	5996	68.3
1989	3377.0	836.0	67.1	66.8	67.1	66.0	46.1	58.0	5871	67.0
1990	4145.8	836.0	75.9	67.4	75.9	66.7	56.6	57.9	6437	73.5
1991	6540.5	836.0	91.3	68.8	91.3	68.1	89.3	59.8	7991	91.2
1992	5833.1	836.0	80.7	69.4	80.7	68.8	79.4	60.9	7088	80.7
1993	6126.5	836.0	85.9	70.3	85.9	69.7	83.7	62.1	7520	85.8
1994	7198.6	836.0	98.7	71.7	98.7	71.2	98.3	63.9	8643	98.7
1995	5978.2	836.0	85.6	72.4	85.6	71.9	81.6	64.7	7493	85.5
1996	6287.0	836.0	86.7	73.0	86.7	72.5	85.6	65.7	7613	86.7
1997	7251.1	836.0	99.6	74.2	99.6	73.7	99.0	67.1	8723	99.6
1998	6216.8	836.0	84.1	74.6	84.1	74.1	84.9	67.9	7364	84.1
1999	6714.7	836.0	90.3	75.2	90.3	74.8	91.7	68.8	7907	90.3
2000	6410.1	836.0	88.2	75.7	88.2	75.3	87.3	69.5	7748	88.2
2001	6875.5	836.0	91.8	76.3	91.8	75.9	93.9	70.4	8100	92.5
2002	6568.6	836.0	89.2	76.8	89.1	76.4	89.7	71.1	7820	89.3
2003	6794.3	836.0	91.8	77.3	91.8	76.9	92.8	71.9	8050	91.9



# US-313 ARKANSAS ONE-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
29 Aug	71.4	60.4	UF5	N	LIGHTNING IS SUSPECTED TO HAVE CAUSED AN AUTOMATIC SCRAM.
15 Nov	637.6	539.4	UF2	A42	THE UNIT WAS MANUALLY SHUTDOWN DUE TO MAIN TRANSFORMER PROBLEMS.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1975 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		637			667	
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling				956		
D. Inspection, maintenance or repair without refuelling				156		
E. Testing of plant systems or components				4	2	
H. Nuclear regulatory requirements						55
J. Grid failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				65	4	
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)		71				
<b>Subtotal</b>	<b>0</b>	<b>708</b>	<b>0</b>	<b>1181</b>	<b>679</b>	<b>56</b>
<b>Total</b>		<b>708</b>			<b>1916</b>	

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

System	2003 Hours Lost	1975 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		101
12. Reactor I&C Systems		39
13. Reactor Auxiliary Systems		17
14. Safety Systems		32
15. Reactor Cooling Systems		52
16. Steam generation systems		59
17. Safety I&C Systems (excluding reactor I&C)		24
31. Turbine and auxiliaries		126
32. Feedwater and Main Steam System		80
33. Circulating Water System		11
35. All other I&C Systems		1
41. Main Generator Systems		98
42. Electrical Power Supply Systems	637	18
XX. Miscellaneous Systems		0
<b>Total</b>	<b>637</b>	<b>658</b>

# US-368 ARKANSAS ONE-2

**Operator:** ENTERGY (ENTERGY NUCLEAR)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 858.0 MW(e)  
**Design Net Capacity:** 912.0 MW(e)  
**Design Discharge Burnup:** 34400 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7925.7 GW(e).h  
**Energy Availability Factor:** 92.5%  
**Load Factor:** 105.5%  
**Operating Factor:** 93.1%  
**Energy Unavailability Factor:** 7.5%  
**Total Off-line Time:** 604 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	753.7	679.0	753.0	726.1	748.1	722.7	735.2	663.7	389.1	392.8	730.1	632.2	7925.7
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	71.1	56.2	100.0	84.1	92.5
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	71.1	56.2	100.0	84.1	92.6
<b>LF (%)</b>	118.1	117.8	118.0	117.7	117.2	117.0	115.2	104.0	63.0	61.4	118.2	99.0	105.5
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	76.3	56.6	100.0	85.2	93.1
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.9	43.8	0.0	15.9	7.5
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.9	43.8	0.0	0.0	6.1
<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	15.9	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jul 1971      **Lifetime Generation:** 145098.7 GW(e).h  
**Date of First Criticality:** 05 Dec 1978      **Cumulative Energy Availability Factor:** 80.7%  
**Date of Grid Connection:** 26 Dec 1978      **Cumulative Load Factor:** 81.3%  
**Date of Commercial Operation:** 26 Mar 1980      **Cumulative Unit Capability Factor:** 77.4%  
**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 (%)
1982	3807.5	858.0	57.9	61.5	57.9	61.6	50.7	54.1	5023	57.3
1983	4427.9	858.0	61.5	61.5	61.5	61.5	58.9	55.7	5380	61.4
1984	6203.6	858.0	84.7	67.3	84.7	67.3	82.3	62.4	7439	84.7
1985	4701.2	858.0	69.2	67.7	69.0	67.7	62.5	62.4	6040	68.9
1986	5314.3	858.0	71.7	68.4	71.6	68.3	70.7	63.8	6274	71.6
1987	6605.2	858.0	87.7	71.1	87.7	71.1	87.9	67.2	7678	87.6
1988	4952.9	858.0	66.8	70.6	66.8	70.6	65.7	67.0	5867	66.8
1989	5472.2	858.0	74.4	71.0	74.4	71.0	72.8	67.7	6514	74.4
1990	7129.6	858.0	93.8	73.3	93.8	73.3	94.9	70.4	8211	93.7
1991	6123.3	858.0	82.0	74.1	82.1	74.1	81.5	71.4	7187	82.0
1992	5504.8	858.0	72.8	74.0	72.8	74.0	73.0	71.5	6390	72.7
1993	7344.7	858.0	95.3	75.6	95.3	75.6	97.7	73.6	8346	95.3
1994	6724.9	858.0	88.0	76.5	88.0	76.5	89.5	74.7	7707	88.0
1995	5694.5	858.0	75.9	76.5	75.9	76.4	75.8	74.8	6644	75.8
1996	7063.9	858.0	91.6	77.4	91.6	77.4	93.7	75.9	8049	91.6
1997	6957.0	858.0	91.5	78.2	91.5	78.2	92.6	76.9	8013	91.5
1998	6877.3	858.0	91.3	79.0	91.3	78.9	91.5	77.7	7995	91.3
1999	6226.9	858.0	82.4	79.1	82.4	79.1	82.8	78.0	7219	82.4
2000	5265.3	858.0	69.2	78.6	69.2	78.6	69.9	77.6	6077	69.2
2001	7917.0	858.0	96.8	79.5	96.8	79.5	105.3	78.9	8498	97.0
2002	8002.2	858.0	93.1	80.1	93.1	80.1	106.5	80.2	8203	93.6
2003	7925.7	858.0	92.5	80.7	92.5	80.7	105.5	81.3	8156	93.1

## US-368 ARKANSAS ONE-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
23 Sep	491.0	456.6	PF	C21	2R16 REFUELING OUTAGE
14 Oct	2.0	1.9	PF	D31	TURBINE OVERSPEED TRIP TEST, REACTOR REMAINED CRITICAL.
24 Dec	109.4	101.7	UF2	A31	UNIT MANUALLY TAKEN OFF-LINE DUE TO CONDENSER BOOT SEAL FAILURE.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1978 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		109			595	
B. Refuelling without a maintenance					15	
C. Inspection, maintenance or repair combined with refuelling	491			932		
D. Inspection, maintenance or repair without refuelling	2			151		
E. Testing of plant systems or components				15	24	
J. Grid failure or grid unavailability						18
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				0	4	0
Subtotal	493	109	0	1098	638	18
Total		602			1754	

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

System	2003 Hours Lost	1978 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		7
12. Reactor I&C Systems		74
13. Reactor Auxiliary Systems		24
14. Safety Systems		108
15. Reactor Cooling Systems		177
16. Steam generation systems		31
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries	109	50
32. Feedwater and Main Steam System		60
33. Circulating Water System		3
41. Main Generator Systems		12
42. Electrical Power Supply Systems		35
Total	109	582

# US-334 BEAVER VALLEY-1

**Operator:** FENOC (FIRST ENERGY NUCLEAR OPERATING CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 821.0 MW(e)  
**Design Net Capacity:** 835.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5985.4 GW(e).h  
**Energy Availability Factor:** 84.1%  
**Load Factor:** 83.2%  
**Operating Factor:** 84.0%  
**Energy Unavailability Factor:** 15.9%  
**Total Off-line Time:** 1401 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	624.9	488.5	68.8	0.0	560.0	577.7	618.5	616.9	602.7	627.1	568.8	631.5	5985.4
<b>EAF (%)</b>	100.0	91.4	23.6	0.0	100.0	97.5	100.0	100.0	100.0	100.0	96.3	100.0	84.1
<b>UCF (%)</b>	100.0	91.4	23.6	0.0	100.0	97.5	100.0	100.0	100.0	100.0	96.3	100.0	84.1
<b>LF (%)</b>	102.3	88.5	11.3	0.0	91.7	97.7	101.3	101.0	102.0	102.5	96.2	103.4	83.2
<b>OF (%)</b>	100.0	91.2	22.6	0.0	100.0	97.4	100.0	100.0	100.0	100.0	96.1	100.0	84.0
<b>EUf (%)</b>	0.0	8.6	76.4	100.0	0.0	2.5	0.0	0.0	0.0	0.0	3.7	0.0	15.9
<b>PUF (%)</b>	0.0	0.0	76.4	100.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	14.9
<b>UCLF (%)</b>	0.0	8.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	0.0	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1970      **Lifetime Generation:** 124859.2 GW(e).h  
**Date of First Criticality:** 10 May 1976      **Cumulative Energy Availability Factor:** 68.1%  
**Date of Grid Connection:** 14 Jun 1976      **Cumulative Load Factor:** 64.7%  
**Date of Commercial Operation:** 01 Oct 1976      **Cumulative Unit Capability Factor:** 77.2%  
**Cumulative Energy Unavailability Factor:** 31.9%

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	2717.4	810.0	41.7	37.0	41.7	37.0	38.3	34.6	3644	41.6
1983	4682.2	810.0	68.5	41.5	68.5	41.5	66.0	39.1	5976	68.2
1984	4756.8	810.0	71.8	45.3	71.8	45.3	66.9	42.5	6301	71.7
1985	5901.5	810.0	91.9	50.4	91.9	50.4	83.2	47.0	8046	91.8
1986	4784.2	810.0	70.7	52.4	70.7	52.4	67.4	49.0	6195	70.7
1987	5620.9	810.0	84.0	55.3	84.0	55.3	79.2	51.8	7320	83.6
1988	4993.6	810.0	79.6	57.3	79.6	57.3	70.2	53.3	6989	79.6
1989	3794.3	810.0	66.5	58.0	66.5	58.0	53.5	53.3	5822	66.5
1990	6167.1	810.0	92.2	60.5	92.2	60.5	86.9	55.7	8074	92.2
1991	3710.9	810.0	55.8	60.1	55.8	60.1	52.3	55.5	4883	55.7
1992	6298.4	810.0	93.6	62.2	93.6	62.2	88.5	57.6	8218	93.6
1993	4359.8	810.0	67.3	62.5	67.3	62.5	61.4	57.8	5891	67.2
1994	5504.4	810.0	79.9	63.5	79.9	63.5	77.6	58.9	6991	79.8
1995	5449.2	810.0	77.8	64.2	77.8	64.2	76.8	59.8	6813	77.8
1996	5698.1	810.0	81.3	65.1	81.3	65.1	80.1	60.8	7132	81.2
1997	4025.8	810.0	56.8	64.7	56.8	64.7	56.7	60.6	4972	56.8
1998	2829.3	810.0	40.4	63.6	40.4	63.6	39.9	59.7	3557	40.6
1999	6106.2	810.0	88.5	64.7	88.5	64.7	86.1	60.8	7746	88.4
2000	5883.0	810.0	84.6	65.5	84.6	65.5	82.7	61.8	7430	84.6
2001	5991.0	812.0	84.6	66.3	84.6	66.3	84.2	62.7	7407	84.6
2002	6989.9	821.0	97.0	67.5	97.0	67.5	97.2	64.0	8490	96.9
2003	5985.4	821.0	84.1	68.1	84.1	68.1	83.2	64.7	7359	84.0

# US-334 BEAVER VALLEY-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
24 Feb	58.8	47.6	UF4	Z	THE UNIT EXPERIENCED AN AUTOMATIC REACTOR TRIP AND SAFETY INJECTION DUE TO LOW MAIN STEAM PRESSURE WHEN THE C MAIN STEAM ISOLATION VALVE FAILED CLOSED.
08 Mar	1269.7	1028.5	PF	C21	REFUELING OUTAGE.
05 Jun	18.6	15.1	PF	D31	A PLANNED SHUTDOWN WAS PERFORMED IN ORDER TO MAKE A BALANCE MOVE ON THE LOW PRESSURE TURBINE DUE TO VIBRATION CONCERNS WITH THE #3 BEARING IDENTIFIED DURING STARTUP FORM THE 15TH REFUELING OUTAGE.
13 Nov	27.1	22.0	UF5	Z31	THE UNIT EXPERIENCED AN AUTOMATIC REACTOR TRIP FOLLOWING AN INADVERTENT TURBINE TRIP FROM 100% OUTPUT DURING A SOLID STATE PROTECTION SYSTEM TRAIN B BI-MONTHLY TEST.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1976 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					788	
B. Refuelling without a maintenance					17	
C. Inspection, maintenance or repair combined with refuelling	1269			1230	6	
D. Inspection, maintenance or repair without refuelling	18			122		
E. Testing of plant systems or components				11	23	
H. Nuclear regulatory requirements					139	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				24	217	2
Z. Others		85				
Subtotal	1287	85	0	1387	1190	2
Total		1372			2579	

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

System	2003 Hours Lost	1976 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		9
13. Reactor Auxiliary Systems		39
14. Safety Systems		22
15. Reactor Cooling Systems		198
16. Steam generation systems		2
17. Safety I&C Systems (excluding reactor I&C)		4
31. Turbine and auxiliaries		22
32. Feedwater and Main Steam System		155
35. All other I&C Systems		1
41. Main Generator Systems		26
42. Electrical Power Supply Systems		175
XX. Miscellaneous Systems		69
Total	0	722

# US-412 BEAVER VALLEY-2

**Operator:** FENOC (FIRST ENERGY NUCLEAR OPERATING CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 831.0 MW(e)  
**Design Net Capacity:** 836.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6637.0 GW(e).h  
**Energy Availability Factor:** 91.8%  
**Load Factor:** 91.2%  
**Operating Factor:** 91.7%  
**Energy Unavailability Factor:** 8.2%  
**Total Off-line Time:** 723 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	631.1	567.2	628.4	606.7	610.3	588.9	617.5	614.8	224.6	307.4	607.8	632.3	6637.0
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	40.0	61.1	100.0	100.0	91.8
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	40.0	61.1	100.0	100.0	91.8
<b>LF (%)</b>	102.1	101.6	101.6	101.5	98.7	98.4	99.9	99.4	37.5	49.7	101.6	102.3	91.2
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	40.0	60.9	100.0	100.0	91.7
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.0	38.9	0.0	0.0	8.2
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.0	35.2	0.0	0.0	7.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1974  
**Date of First Criticality:** 04 Aug 1987  
**Date of Grid Connection:** 17 Aug 1987  
**Date of Commercial Operation:** 17 Nov 1987

**Lifetime Generation:** 91926.9 GW(e).h  
**Cumulative Energy Availability Factor:** 83.4%  
**Cumulative Load Factor:** 78.9%  
**Cumulative Unit Capability Factor:** 78.2%  
**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 (%)
1987	738.1	822.0	0.0	0.0	13.0	100.0	10.7	0.0	950	11.4
1988	6477.1	833.0	93.8	93.8	93.8	93.8	88.5	88.5	8224	93.6
1989	4557.1	833.0	71.7	82.8	71.7	82.7	62.5	75.5	6245	71.3
1990	4291.6	827.0	77.1	80.9	77.1	80.9	59.2	70.1	6734	76.9
1991	6762.2	820.0	99.5	85.5	99.5	85.5	94.1	76.1	8720	99.5
1992	5647.1	820.0	94.8	87.3	94.8	87.3	78.4	76.5	7342	83.6
1993	5212.7	820.0	77.3	85.7	77.3	85.7	72.6	75.9	6770	77.3
1994	7024.7	820.0	96.8	87.3	96.8	87.3	97.8	79.0	8481	96.8
1995	6047.0	820.0	87.0	87.2	87.0	87.2	84.2	79.6	7616	86.9
1996	4788.6	820.0	70.3	85.3	70.3	85.4	66.5	78.2	6169	70.2
1997	6158.7	820.0	86.6	85.5	86.6	85.5	85.7	78.9	7583	86.6
1998	1808.7	820.0	25.1	80.0	25.1	80.0	25.2	74.1	2179	24.9
1999	5752.5	820.0	81.7	80.2	81.7	80.2	80.1	74.6	7155	81.7
2000	6227.8	820.0	88.9	80.8	88.9	80.8	86.5	75.5	7804	88.8
2001	7191.7	822.0	99.3	82.2	99.4	82.1	99.9	77.2	8702	99.3
2002	6604.3	831.0	93.0	82.9	92.9	82.9	90.7	78.1	8133	92.8
2003	6637.0	831.0	91.8	83.4	91.8	83.4	91.2	78.9	8037	91.7

## US-412 BEAVER VALLEY-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
13 Sep	694.3	577.0	PF	C21	REFUELING OUTAGE
14 Oct	27.8	23.1	UF4	A16	AUTOMATIC RX TRIP OCCURRED DUE TO LOW LEVEL IN THE B SG. THE CAUSE WAS A FAILURE IN THE FEEDWATER FLOW CONTROL LOOP.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		27			600	
B. Refuelling without a maintenance					8	
C. Inspection, maintenance or repair combined with refuelling	694			660	4	
D. Inspection, maintenance or repair without refuelling				24		
E. Testing of plant systems or components				1	26	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					87	
Subtotal	694	27	0	685	725	0
Total		721			1410	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		20
12. Reactor I&C Systems		7
13. Reactor Auxiliary Systems		55
14. Safety Systems		18
15. Reactor Cooling Systems		346
16. Steam generation systems	27	33
17. Safety I&C Systems (excluding reactor I&C)		10
31. Turbine and auxiliaries		30
32. Feedwater and Main Steam System		12
35. All other I&C Systems		5
41. Main Generator Systems		4
42. Electrical Power Supply Systems		39
XX. Miscellaneous Systems		14
Total	27	593

# US-456 BRAIDWOOD-1

**Operator:** EXELON (Exelon Nuclear Co.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1161.0 MW(e)  
**Design Net Capacity:** 1120.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 10094.8 GW(e).h  
**Energy Availability Factor:** 95.3%  
**Load Factor:** 99.3%  
**Operating Factor:** 95.4%  
**Energy Unavailability Factor:** 4.7%  
**Total Off-line Time:** 407 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	912.7	825.2	900.2	365.0	859.6	874.5	897.7	894.4	876.0	913.3	877.9	898.5	10094.8
<b>EAF (%)</b>	100.0	100.0	100.0	45.5	96.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.3
<b>UCF (%)</b>	100.0	100.0	100.0	45.5	96.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.3
<b>LF (%)</b>	105.7	105.8	104.2	43.7	99.5	104.6	103.9	103.5	104.8	105.6	105.0	104.0	99.3
<b>OF (%)</b>	100.0	100.0	100.0	46.6	96.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.4
<b>EUf (%)</b>	0.0	0.0	0.0	54.5	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7
<b>PUf (%)</b>	0.0	0.0	0.0	54.5	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1975      **Lifetime Generation:** 125451.6 GW(e).h  
**Date of First Criticality:** 29 May 1987      **Cumulative Energy Availability Factor:** 84.3%  
**Date of Grid Connection:** 12 Jul 1987      **Cumulative Load Factor:** 81.6%  
**Date of Commercial Operation:** 29 Jul 1988      **Cumulative Unit Capability Factor:** 78.5%  
**Cumulative Energy Unavailability Factor:** 15.7%

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 (%)
1987	1456.6	1105.0	0.0	0.0	49.6	100.0	15.5	0.0	2611	30.7
1988	3424.2	1105.0	0.0	0.0	96.1	100.0	38.3	0.0	3409	42.1
1989	4649.1	1120.0	62.3	62.3	62.3	62.3	47.4	47.4	5435	62.0
1990	8264.6	1120.0	89.1	75.7	89.1	75.7	84.2	65.8	7778	88.8
1991	5018.6	1120.0	59.4	70.2	59.4	70.2	51.2	60.9	5198	59.3
1992	7157.9	1120.0	81.4	73.0	81.4	73.0	72.8	63.9	7142	81.3
1993	8693.1	1120.0	92.1	76.8	92.1	76.8	88.6	68.8	8048	91.9
1994	7398.2	1120.0	79.8	77.3	79.8	77.3	75.4	69.9	6940	79.2
1995	6614.3	1120.0	71.8	76.5	71.7	76.5	67.4	69.6	6214	70.9
1996	7618.9	1120.0	80.5	77.0	80.5	77.0	77.4	70.6	7021	79.9
1997	8096.3	1120.0	84.0	77.8	84.0	77.8	82.5	71.9	7339	83.8
1998	7578.8	1118.0	79.9	78.0	79.9	78.0	77.4	72.4	6976	79.6
1999	9904.8	1120.0	99.1	79.9	99.1	79.9	101.0	75.0	8680	99.1
2000	9311.3	1103.0	95.0	81.2	94.9	81.2	96.1	76.8	8335	94.9
2001	9557.9	1116.0	94.0	82.2	94.0	82.2	97.8	78.4	8247	94.1
2002	10612.2	1164.0	100.0	83.5	100.0	83.5	104.1	80.3	8760	100.0
2003	10094.8	1161.0	95.3	84.3	95.3	84.3	99.3	81.6	8353	95.4



# US-456 BRAIDWOOD-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
15 Apr	407.0	482.3	PF	C21	REFUELING OUTAGE.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					367	
B. Refuelling without a maintenance					10	
C. Inspection, maintenance or repair combined with refuelling	407			719		
D. Inspection, maintenance or repair without refuelling				162	0	
E. Testing of plant systems or components				2		
H. Nuclear regulatory requirements						28
J. Grid failure or grid unavailability						5
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				0		8
Subtotal	407	0	0	883	418	0
Total		407			1301	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
13. Reactor Auxiliary Systems		5
14. Safety Systems		6
15. Reactor Cooling Systems		2
16. Steam generation systems		29
17. Safety I&C Systems (excluding reactor I&C)		11
31. Turbine and auxiliaries		3
32. Feedwater and Main Steam System		24
41. Main Generator Systems		209
42. Electrical Power Supply Systems		15
XX. Miscellaneous Systems		16
Total	0	320

# US-457 BRAIDWOOD-2

**Operator:** EXELON (Exelon Nuclear Co.)

**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1154.0 MW(e)  
**Design Net Capacity:** 1120.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9932.2 GW(e).h  
**Energy Availability Factor:** 95.1%  
**Load Factor:** 98.3%  
**Operating Factor:** 95.2%  
**Energy Unavailability Factor:** 4.9%  
**Total Off-line Time:** 423 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	903.6	815.1	902.1	873.2	892.3	860.3	883.7	882.3	859.7	881.9	373.3	804.8	9932.2
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	47.2	93.1	95.1
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	47.2	93.2	95.1
<b>LF (%)</b>	105.2	105.1	105.1	105.2	103.9	103.5	102.9	102.8	103.5	102.6	44.9	93.7	98.3
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	48.2	93.3	95.2
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.8	6.9	4.9
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.8	0.0	4.3
<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	6.9	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1975      **Lifetime Generation:** 127187.2 GW(e).h  
**Date of First Criticality:** 08 Mar 1988      **Cumulative Energy Availability Factor:** 88.7%  
**Date of Grid Connection:** 25 May 1988      **Cumulative Load Factor:** 85.3%  
**Date of Commercial Operation:** 17 Oct 1988      **Cumulative Unit Capability Factor:** 78.5%  
**Cumulative Energy Unavailability Factor:** 11.3%

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 (%)
1988	1350.9	1097.0	0.0	0.0	96.0	100.0	14.7	0.0	1476	17.6
1989	7142.0	1120.0	86.9	86.9	86.9	86.9	72.8	72.8	7581	86.5
1990	6353.6	1120.0	78.8	82.8	78.8	82.8	64.8	68.8	6849	78.2
1991	6545.5	1120.0	75.7	80.5	75.7	80.5	66.7	68.1	6626	75.6
1992	8751.1	1120.0	95.1	84.1	95.1	84.1	89.0	73.3	8346	95.0
1993	7362.3	1120.0	81.5	83.6	81.5	83.6	75.0	73.7	7098	81.0
1994	6636.1	1120.0	74.1	82.0	74.1	82.0	67.6	72.7	6454	73.7
1995	9533.0	1120.0	98.1	84.3	98.1	84.3	97.2	76.2	8583	98.0
1996	8011.8	1120.0	84.1	84.3	84.1	84.3	81.4	76.8	7349	83.7
1997	8234.7	1120.0	86.5	84.5	86.5	84.5	83.9	77.6	7563	86.3
1998	9694.6	1118.0	97.7	85.8	97.7	85.8	99.0	79.7	8552	97.6
1999	9030.9	1120.0	92.3	86.4	92.3	86.4	92.0	80.9	8070	92.1
2000	9510.9	1103.0	94.6	87.1	94.6	87.1	98.2	82.3	8303	94.5
2001	9647.9	1112.0	96.7	87.8	96.7	87.8	99.0	83.6	8481	96.8
2002	9449.5	1144.0	92.5	88.2	92.5	88.2	94.3	84.3	8099	92.5
2003	9932.2	1154.0	95.1	88.7	95.1	88.7	98.3	85.3	8337	95.2

## US-457 BRAIDWOOD-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
03 Nov	367.1	432.1	PF	C21	REFUELING OUTAGE.
19 Nov	5.4	6.4	PF	D35	REPAIR EH FLUID LEAK.
03 Dec	50.0	58.9	UF	A35	A2F37 CAUSED BY OLD BROKEN TIE WRAP BLOCKING SWITCH CONTACTS.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		50			168	
B. Refuelling without a maintenance					16	
C. Inspection, maintenance or repair combined with refuelling	367			631		
D. Inspection, maintenance or repair without refuelling	5			100		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					24	
Subtotal	372	50	0	731	208	0
Total		422			939	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		16
14. Safety Systems		12
15. Reactor Cooling Systems		4
21. Fuel Handling and Storage Facilities		10
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		23
35. All other I&C Systems	50	2
41. Main Generator Systems		9
42. Electrical Power Supply Systems		80
Total	50	157

# US-259 BROWNS FERRY-1

**Operator:** TVA (TENNESSEE VALLEY AUTHORITY)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1065.0 MW(e)  
**Design Net Capacity:** 1065.0 MW(e)  
**Design Discharge Burnup:** 19000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 766.8 GW(e).h  
**Energy Availability Factor:** 8.2%  
**Load Factor:** 8.2%  
**Operating Factor:** 8.2%  
**Energy Unavailability Factor:** 91.8%  
**Total Off-line Time:** 8040 hours

## 3. 2003 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	766.8	766.8
<b>EAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	96.8	8.2
<b>UCF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	96.8	8.2
<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	96.8	8.2
<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	96.8	8.2
<b>EUF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	3.2	91.8
<b>PUF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	3.2	91.8
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1967      **Lifetime Generation:** 57285.7 GW(e).h  
**Date of First Criticality:** 17 Aug 1973      **Cumulative Energy Availability Factor:** 20.2%  
**Date of Grid Connection:** 15 Oct 1973      **Cumulative Load Factor:** 19.1%  
**Date of Commercial Operation:** 01 Aug 1974      **Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 79.8%

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	7880.9	1065.0	91.3	55.1	91.2	55.1	84.5	52.7	7967	90.9
1983	2175.5	1065.0	26.5	52.0	26.5	51.9	23.3	49.5	2316	26.4
1984	7848.5	1065.0	90.3	55.8	90.3	55.8	83.9	52.9	7930	90.3
1985	1603.0	1065.0	18.6	52.4	18.6	52.4	17.2	49.7	1626	18.6
1986	0.0	1065.0	0.0	48.1	0.0	48.0	0.0	45.5	0	0.0
1987	0.0	1065.0	0.0	44.4	0.0	44.4	0.0	42.0	0	0.0
1988	0.0	1065.0	0.0	41.2	0.0	41.2	0.0	39.0	0	0.0
1989	0.0	1065.0	0.0	38.4	0.0	38.4	0.0	36.4	0	0.0
1990	0.0	1065.0	0.0	36.0	0.0	36.0	0.0	34.1	0	0.0
1991	0.0	1065.0	0.0	33.9	0.0	33.9	0.0	32.1	0	0.0
1992	0.0	1065.0	0.0	32.0	0.0	32.0	0.0	30.4	0	0.0
1993	0.0	1065.0	0.0	30.4	0.0	30.3	0.0	28.8	0	0.0
1994	0.0	1065.0	0.0	28.8	0.0	28.8	0.0	27.3	0	0.0
1995	0.0	1065.0	0.0	27.5	0.0	27.5	0.0	26.0	0	0.0
1996	0.0	1065.0	0.0	26.2	0.0	26.2	0.0	24.8	0	0.0
1997	0.0	1065.0	0.0	25.1	0.0	25.1	0.0	23.8	0	0.0
1998	0.0	1065.0	0.0	24.0	0.0	24.0	0.0	22.8	0	0.0
1999	0.0	1065.0	0.0	23.1	0.0	23.1	0.0	21.9	0	0.0
2000	0.0	1065.0	0.0	22.2	0.0	22.2	0.0	21.0	0	0.0
2001	0.0	1065.0	0.0	21.4	0.0	21.4	0.0	20.2	0	0.0
2002	0.0	1065.0	0.0	20.6	0.0	20.6	0.0	19.5	0	0.0
2003	766.8	1065.0	8.2	20.2	8.2	20.2	8.2	19.1	720	8.2

## US-259 BROWNS FERRY-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	8040.0	8562.6	PF	H	ADMINISTRATIVE HOLD TO RESOLVE VARIOUS TVA AND NRC CONCERNS.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1973 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					158	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling				695	69	
D. Inspection, maintenance or repair without refuelling				52		
E. Testing of plant systems or components				0	13	
H. Nuclear regulatory requirements	8040			2	51	0
J. Grid failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				2544	2620	
Subtotal	8040	0	0	3293	2915	0
Total		8040			6208	

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

System	2003 Hours Lost	1973 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		7
13. Reactor Auxiliary Systems		12
14. Safety Systems		5
15. Reactor Cooling Systems		51
31. Turbine and auxiliaries		25
32. Feedwater and Main Steam System		20
41. Main Generator Systems		3
42. Electrical Power Supply Systems		3
XX. Miscellaneous Systems		10
Total	0	137

# US-260 BROWNS FERRY-2

**Operator:** TVA (TENNESSEE VALLEY AUTHORITY)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1118.0 MW(e)  
**Design Net Capacity:** 1065.0 MW(e)  
**Design Discharge Burnup:** 19000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8369.2 GW(e).h  
**Energy Availability Factor:** 90.1%  
**Load Factor:** 85.5%  
**Operating Factor:** 90.0%  
**Energy Unavailability Factor:** 9.9%  
**Total Off-line Time:** 872 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	687.7	450.7	196.1	773.5	843.4	811.0	787.8	826.3	805.2	726.0	614.0	847.4	8369.2
<b>EAF (%)</b>	100.0	82.1	33.6	100.0	100.0	100.0	100.0	100.0	100.0	87.1	77.6	100.0	90.1
<b>UCF (%)</b>	100.0	82.1	33.6	100.0	100.0	100.0	100.0	100.0	100.0	87.1	77.6	100.0	90.1
<b>LF (%)</b>	82.7	60.0	23.6	96.2	101.4	100.8	94.7	99.3	100.0	87.2	76.3	101.9	85.5
<b>OF (%)</b>	100.0	83.5	32.4	100.0	100.0	100.0	100.0	100.0	100.0	88.3	76.3	100.0	90.0
<b>EUf (%)</b>	0.0	17.9	66.4	0.0	0.0	0.0	0.0	0.0	0.0	12.9	22.4	0.0	9.9
<b>PUF (%)</b>	0.0	17.9	46.8	0.0	0.0	0.0	0.0	0.0	0.0	12.9	22.4	0.0	8.3
<b>UCLF (%)</b>	0.0	0.0	19.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1967  
**Date of First Criticality:** 20 Jul 1974  
**Date of Grid Connection:** 28 Aug 1974  
**Date of Commercial Operation:** 01 Mar 1975

**Lifetime Generation:** 155611.9 GW(e).h  
**Cumulative Energy Availability Factor:** 61.2%  
**Cumulative Load Factor:** 58.0%  
**Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	4450.9	1065.0	54.9	61.8	54.9	61.8	47.7	58.6	4778	54.5
1983	6385.6	1065.0	74.8	63.4	74.8	63.4	68.4	59.9	6514	74.4
1984	4044.4	1065.0	66.5	63.8	66.5	63.7	43.2	58.0	5844	66.5
1985	0.0	1065.0	0.0	57.4	0.0	57.4	0.0	52.2	0	0.0
1986	0.0	1065.0	0.0	52.2	0.0	52.2	0.0	47.5	0	0.0
1987	0.0	1065.0	0.0	47.8	0.0	47.8	0.0	43.5	0	0.0
1988	0.0	1065.0	0.0	44.1	0.0	44.1	0.0	40.2	0	0.0
1989	0.0	1065.0	0.0	41.0	0.0	41.0	0.0	37.3	0	0.0
1990	0.0	1065.0	0.0	38.3	0.0	38.2	0.0	34.8	0	0.0
1991	3804.0	1065.0	47.1	38.8	47.1	38.8	40.8	35.2	4125	47.1
1992	8388.8	1065.0	95.7	42.2	95.7	42.2	89.7	38.4	8401	95.6
1993	5776.8	1065.0	65.7	43.5	65.7	43.5	61.9	39.7	5753	65.7
1994	7345.2	1065.0	82.6	45.5	82.6	45.5	78.7	41.8	7234	82.6
1995	9197.0	1065.0	98.5	48.2	98.5	48.2	98.6	44.6	8629	98.5
1996	8046.3	1065.0	88.7	50.1	88.7	50.1	86.0	46.6	7795	88.7
1997	8372.9	1065.0	92.8	52.1	92.8	52.0	89.7	48.5	8130	92.8
1998	9301.0	1065.0	99.7	54.1	99.7	54.1	99.7	50.8	8730	99.7
1999	8586.3	1100.0	91.0	55.7	91.0	55.7	89.1	52.4	7985	91.2
2000	9733.5	1118.0	99.4	57.5	99.4	57.5	99.1	54.4	8727	99.4
2001	8414.6	1118.0	87.2	58.7	87.2	58.7	85.9	55.6	7636	87.2
2002	8911.3	1118.0	94.4	60.1	94.4	60.1	91.0	57.0	8269	94.4
2003	8369.2	1118.0	90.1	61.2	90.1	61.2	85.5	58.0	7888	90.0

## US-260 BROWNS FERRY-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
24 Feb	468.1	523.3	PF	C21	BEGAN CYCLE 12 REFUELING OUTAGE.
20 Mar	119.5	133.6	UF5	A32	MANUAL SCRAM TO REPAIR A FEEDWATER VALVE.
26 Mar	26.4	29.5	UF5	A34	MANUAL SCRAM AFTER THE 2B RECIRCULATION PUMP TRIPPED.
28 Oct	257.2	287.5	PF	D16	SHUTDOWN TO REPAIR THE NUMBER 2 EXTRACTION STEAM LINE BELLOWS.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		145			193	
B. Refuelling without a maintenance					26	
C. Inspection, maintenance or repair combined with refuelling	468			974	72	
D. Inspection, maintenance or repair without refuelling	257			61	3	
E. Testing of plant systems or components				8	3	
H. Nuclear regulatory requirements						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					1966	
Subtotal	725	145	0	1043	2263	0
Total		870			3306	

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

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		29
13. Reactor Auxiliary Systems		11
14. Safety Systems		8
15. Reactor Cooling Systems		28
31. Turbine and auxiliaries		55
32. Feedwater and Main Steam System	119	6
35. All other I&C Systems		0
41. Main Generator Systems		9
42. Electrical Power Supply Systems		28
XX. Miscellaneous Systems	26	1
Total	145	181

# US-296 BROWNS FERRY-3

**Operator:** TVA (TENNESSEE VALLEY AUTHORITY)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1118.0 MW(e)  
**Design Net Capacity:** 1065.0 MW(e)  
**Design Discharge Burnup:** 19760 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9325.7 GW(e).h  
**Energy Availability Factor:** 96.6%  
**Load Factor:** 95.2%  
**Operating Factor:** 96.6%  
**Energy Unavailability Factor:** 3.4%  
**Total Off-line Time:** 297 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	845.3	678.1	829.3	812.0	836.5	498.0	745.5	819.7	799.8	811.3	807.2	843.1	9325.7
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	60.2	98.8	100.0	100.0	100.0	100.0	100.0	96.6
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	60.2	98.8	100.0	100.0	100.0	100.0	100.0	96.6
<b>LF (%)</b>	101.6	90.3	99.7	101.0	100.6	61.9	89.6	98.5	99.4	97.4	100.3	101.4	95.2
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	62.9	96.0	100.0	100.0	100.0	100.0	100.0	96.6
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	39.8	1.2	0.0	0.0	0.0	0.0	0.0	3.4
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	39.8	1.2	0.0	0.0	0.0	0.0	0.0	3.4
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jul 1968      **Lifetime Generation:** 118222.3 GW(e).h  
**Date of First Criticality:** 08 Aug 1976      **Cumulative Energy Availability Factor:** 46.3%  
**Date of Grid Connection:** 12 Sep 1976      **Cumulative Load Factor:** 44.8%  
**Date of Commercial Operation:** 01 Mar 1977      **Cumulative Unit Capability Factor:** 77.2%  
**Cumulative Energy Unavailability Factor:** 53.7%

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 (%)
1982	4892.8	1065.0	57.4	65.7	57.4	65.5	52.4	62.4	5022	57.3
1983	5394.3	1065.0	61.9	65.0	61.9	64.9	57.8	61.6	5417	61.8
1984	290.5	1065.0	5.8	56.5	5.7	56.4	3.1	53.3	503	5.7
1985	1526.5	1065.0	17.1	51.6	17.1	51.5	16.4	48.7	1496	17.1
1986	0.0	1065.0	0.0	45.9	0.0	45.8	0.0	43.3	0	0.0
1987	0.0	1065.0	0.0	41.3	0.0	41.2	0.0	38.9	0	0.0
1988	0.0	1065.0	0.0	37.5	0.0	37.5	0.0	35.4	0	0.0
1989	0.0	1065.0	0.0	34.4	0.0	34.4	0.0	32.4	0	0.0
1990	0.0	1065.0	0.0	31.8	0.0	31.7	0.0	29.9	0	0.0
1991	0.0	1065.0	0.0	29.5	0.0	29.5	0.0	27.8	0	0.0
1992	0.0	1065.0	0.0	27.5	0.0	27.5	0.0	26.0	0	0.0
1993	0.0	1065.0	0.0	25.8	0.0	25.8	0.0	24.3	0	0.0
1994	0.0	1065.0	0.0	24.3	0.0	24.3	0.0	22.9	0	0.0
1995	764.6	1065.0	9.8	23.5	9.8	23.5	8.6	22.1	810	9.7
1996	8803.5	1065.0	95.8	27.3	95.8	27.3	94.1	26.0	8412	95.8
1997	8523.4	1065.0	94.8	30.7	94.8	30.7	91.4	29.2	8302	94.8
1998	7884.9	1078.0	89.9	33.6	89.9	33.5	83.5	31.8	7863	89.8
1999	9730.6	1118.0	100.0	36.7	100.0	36.7	99.4	35.1	8760	100.0
2000	9097.4	1118.0	94.6	39.4	94.6	39.4	92.6	37.7	8311	94.6
2001	9803.4	1118.0	100.0	42.0	100.0	42.0	100.1	40.4	8760	100.0
2002	9260.1	1118.0	96.0	44.3	96.0	44.2	94.6	42.7	8407	96.0
2003	9325.7	1118.0	96.6	46.4	96.6	46.3	95.2	44.8	8463	96.6



## US-296 BROWNS FERRY-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
19 Jun	297.0	330.6	PF	D	THE REACTOR WAS MANUALLY SCRAMMED TO BEGIN A UNIT 3, CYCLE 11, MID-CYCLE OUTAGE TO REPLACE A LEAKING FUEL ASSEMBLY AND PERFORM OTHER MAINTENANCE ACTIVITIES.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1977 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					210	
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling				557	288	
D. Inspection, maintenance or repair without refuelling	297			8		
E. Testing of plant systems or components				5		
H. Nuclear regulatory requirements					556	2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				598	2291	
Subtotal	297	0	0	1168	3351	2
Total		297			4521	

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

System	2003 Hours Lost	1977 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		13
13. Reactor Auxiliary Systems		11
14. Safety Systems		18
15. Reactor Cooling Systems		43
31. Turbine and auxiliaries		56
32. Feedwater and Main Steam System		26
41. Main Generator Systems		0
42. Electrical Power Supply Systems		23
XX. Miscellaneous Systems		1
Total	0	192

# US-325 BRUNSWICK-1

**Operator:** PROGRESS (Progress Energy Corporation)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 872.0 MW(e)  
**Design Net Capacity:** 821.0 MW(e)  
**Design Discharge Burnup:** 25000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7701.8 GW(e).h  
**Energy Availability Factor:** 98.9%  
**Load Factor:** 100.8%  
**Operating Factor:** 98.8%  
**Energy Unavailability Factor:** 1.1%  
**Total Off-line Time:** 107 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	625.8	610.4	670.7	645.9	668.1	639.5	579.1	658.5	638.6	670.5	625.6	669.2	7701.8
<b>EAF (%)</b>	95.2	100.0	100.0	100.0	100.0	100.0	91.3	100.0	100.0	100.0	100.0	100.0	98.9
<b>UCF (%)</b>	95.2	100.0	100.0	100.0	100.0	100.0	91.3	100.0	100.0	100.0	100.0	100.0	98.9
<b>LF (%)</b>	96.5	104.2	103.4	103.0	103.0	101.9	89.3	101.5	101.7	103.2	99.6	103.1	100.8
<b>OF (%)</b>	94.9	100.0	100.0	100.0	100.0	100.0	90.7	100.0	100.0	100.0	100.0	100.0	98.8
<b>EUf (%)</b>	4.8	0.0	0.0	0.0	0.0	0.0	8.7	0.0	0.0	0.0	0.0	0.0	1.1
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	4.8	0.0	0.0	0.0	0.0	0.0	8.7	0.0	0.0	0.0	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1969      **Lifetime Generation:** 124533.9 GW(e).h  
**Date of First Criticality:** 08 Oct 1976      **Cumulative Energy Availability Factor:** 70.8%  
**Date of Grid Connection:** 04 Dec 1976      **Cumulative Load Factor:** 67.2%  
**Date of Commercial Operation:** 18 Mar 1977      **Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1982	2935.4	790.0	62.9	60.3	62.9	60.3	42.4	51.2	5428	62.0
1983	1419.1	790.0	26.4	54.7	26.4	54.7	20.5	46.1	2116	24.2
1984	5037.7	790.0	81.5	58.5	79.8	58.3	72.6	49.9	6797	77.4
1985	1942.5	790.0	38.9	56.0	38.9	55.8	28.1	47.2	3247	37.1
1986	5973.8	790.0	92.2	60.1	92.2	59.9	86.3	51.5	8068	92.1
1987	4057.9	790.0	65.6	60.6	65.6	60.5	58.6	52.2	5651	64.5
1988	4458.4	790.0	74.5	61.9	74.5	61.7	64.2	53.3	6514	74.2
1989	4193.8	790.0	64.6	62.1	64.6	62.0	60.6	53.9	5568	63.6
1990	4340.3	790.0	68.4	62.6	68.4	62.5	62.7	54.6	5909	67.5
1991	4400.3	780.0	67.3	62.9	67.3	62.8	64.4	55.3	5849	66.8
1992	1874.5	767.0	28.3	60.7	28.3	60.6	27.8	53.5	2486	28.3
1993	0.0	767.0	0.0	57.0	0.0	56.9	0.0	50.3	0	0.0
1994	5956.3	767.0	88.6	58.8	88.6	58.7	88.7	52.5	7755	88.5
1995	5780.7	767.0	84.4	60.2	84.4	60.1	86.0	54.3	7391	84.4
1996	5708.2	767.0	88.6	61.6	85.3	61.4	84.7	55.9	7490	85.3
1997	6857.0	767.0	97.7	63.4	97.7	63.2	102.1	58.1	8558	97.7
1998	6360.4	820.0	91.4	64.8	89.9	64.5	88.5	59.6	7811	89.2
1999	6998.2	820.0	99.0	66.4	96.8	66.0	97.4	61.4	8481	96.8
2000	6746.5	820.0	92.5	67.6	92.5	67.2	93.7	62.9	8122	92.5
2001	7303.1	820.0	100.0	69.0	100.0	68.6	101.7	64.6	8760	100.0
2002	6697.3	820.0	89.9	69.9	89.9	69.5	93.2	65.8	7874	89.9
2003	7701.8	872.0	98.8	71.1	98.9	70.8	100.8	67.2	8653	98.8

# US-325 BRUNSWICK-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
12 Jan	38.0	31.2	UF4	A14	UNIT 1 AUTOMATICALLY TRIPPED DUE TO A TRIP OF THE 1B REACTOR FEED PUMP FROM LOW OIL PRESSURE.
01 Jul	68.8	56.4	UF2	A15	UNIT 1 WAS SHUTDOWN TO PERFORM A REPAIR ON A REACTOR COOLANT SYSTEM VALVE PACKING LEAK IN THE DRYWELL.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1977 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		106			413	
B. Refuelling without a maintenance					46	
C. Inspection, maintenance or repair combined with refuelling	1429					
D. Inspection, maintenance or repair without refuelling	551					
E. Testing of plant systems or components	7				80	
H. Nuclear regulatory requirements					2	
J. Grid failure or grid unavailability						5
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					15	22
Subtotal	0	106	0	1987	556	27
Total		106			2570	

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

System	2003 Hours Lost	1977 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		19
13. Reactor Auxiliary Systems		12
14. Safety Systems	38	29
15. Reactor Cooling Systems	68	75
21. Fuel Handling and Storage Facilities		7
31. Turbine and auxiliaries		42
32. Feedwater and Main Steam System		15
41. Main Generator Systems		97
42. Electrical Power Supply Systems		54
XX. Miscellaneous Systems		13
Total	106	363

# US-324 BRUNSWICK-2

**Operator:** PROGRESS (Progress Energy Corporation)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 811.0 MW(e)  
**Design Net Capacity:** 821.0 MW(e)  
**Design Discharge Burnup:** 25000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7028.1 GW(e).h  
**Energy Availability Factor:** 91.0%  
**Load Factor:** 98.9%  
**Operating Factor:** 90.9%  
**Energy Unavailability Factor:** 9.0%  
**Total Off-line Time:** 794 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	621.2	539.2	124.5	501.8	673.8	637.4	684.9	672.1	649.2	690.3	565.7	667.9	7028.1
<b>EAF (%)</b>	100.0	100.0	19.4	86.8	100.0	100.0	100.0	100.0	100.0	100.0	86.6	100.0	91.0
<b>UCF (%)</b>	100.0	100.0	19.4	86.8	100.0	100.0	100.0	100.0	100.0	100.0	86.6	100.0	91.0
<b>LF (%)</b>	103.0	98.9	20.6	86.1	111.7	109.2	113.5	111.4	111.2	114.3	96.9	110.7	98.9
<b>OF (%)</b>	100.0	100.0	22.4	83.3	100.0	100.0	100.0	100.0	100.0	100.0	86.5	100.0	90.9
<b>EUf (%)</b>	0.0	0.0	80.6	13.2	0.0	0.0	0.0	0.0	0.0	0.0	13.4	0.0	9.0
<b>PUF (%)</b>	0.0	0.0	80.6	8.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6
<b>UCLF (%)</b>	0.0	0.0	0.0	4.6	0.0	0.0	0.0	0.0	0.0	0.0	13.4	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1969      **Lifetime Generation:** 125119.8 GW(e).h  
**Date of First Criticality:** 20 Mar 1975      **Cumulative Energy Availability Factor:** 68.2%  
**Date of Grid Connection:** 29 Apr 1975      **Cumulative Load Factor:** 64.1%  
**Date of Commercial Operation:** 03 Nov 1975      **Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	1942.1	790.0	41.4	48.6	41.4	48.7	28.1	42.2	3378	38.6
1983	3941.7	790.0	65.3	50.7	65.3	50.7	57.0	44.1	5630	64.3
1984	1429.0	790.0	28.9	48.3	28.9	48.3	20.6	41.4	2236	25.5
1985	5021.9	790.0	84.1	51.9	80.0	51.5	72.6	44.6	6983	79.7
1986	2933.1	790.0	48.5	51.6	48.5	51.2	42.4	44.4	4027	46.0
1987	5694.1	790.0	94.0	55.1	94.0	54.8	82.3	47.5	8203	93.6
1988	3929.2	790.0	62.8	55.7	62.8	55.4	56.6	48.2	5361	61.0
1989	4195.4	790.0	67.4	56.5	67.4	56.2	60.6	49.1	5763	65.8
1990	4067.4	790.0	66.1	57.2	66.1	56.9	58.8	49.7	5616	64.1
1991	3664.2	775.0	57.8	57.2	57.8	56.9	54.0	50.0	4959	56.6
1992	1315.1	754.0	25.1	55.4	25.1	55.1	19.9	48.3	2200	25.0
1993	4000.9	754.0	63.1	55.8	63.1	55.6	60.6	49.0	5525	63.1
1994	4823.2	754.0	73.5	56.7	73.5	56.5	73.0	50.2	6436	73.5
1995	6216.0	754.0	100.0	58.8	94.1	58.6	94.1	52.3	8760	100.0
1996	5188.1	754.0	86.9	60.1	82.9	59.7	78.3	53.5	7277	82.8
1997	6055.4	754.0	89.3	61.4	89.2	61.0	91.7	55.2	7816	89.2
1998	6963.5	811.0	98.9	63.0	97.7	62.6	98.0	57.1	8539	97.5
1999	6095.2	811.0	89.2	64.2	86.5	63.7	85.8	58.3	7577	86.5
2000	7055.0	811.0	98.1	65.6	98.1	65.1	99.0	60.0	8616	98.1
2001	6540.4	811.0	91.3	66.6	91.3	66.1	92.1	61.3	7996	91.3
2002	7078.6	811.0	98.3	67.8	98.3	67.4	99.6	62.8	8609	98.3
2003	7028.1	811.0	91.0	68.7	91.0	68.2	98.9	64.1	7966	90.9

## US-324 BRUNSWICK-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
07 Mar	662.8	537.5	PF	C21	REFUELING OUTAGE.
04 Apr	32.9	26.7	UF4	A33	PRIOR TO SYNCHRONIZING TO THE GRID AFTER THE REFUELING OUTAGE, UNIT NO. 2 RECEIVED AN UNPLANNED AUTOMATIC SCRAM DUE TO PROBLEMS WITH THE ELECTRO HYDRAULIC CONTROL SYSTEM. CORRECTIVE ACTIONS ARE DOCUMENTED IN AR 89687.
04 Nov	96.3	78.1	UF4	A41	UNIT 2 TRIPPED DUE TO LOSS OF MAIN GENERATOR EXCITATION. THE EXCITER COLLECTOR RING AND BRUSHES FAILED DUE TO A LOOSE COLLECTOR RING ASSEMBLY. COLLECTOR RING AND BRUSH ASSEMBLIES WERE REPLACED.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1975 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		129			749	
B. Refuelling without a maintenance					61	
C. Inspection, maintenance or repair combined with refuelling	662			1292		
D. Inspection, maintenance or repair without refuelling				441		
E. Testing of plant systems or components				16	4	
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling				0		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					6	36
Subtotal	662	129	0	1749	820	36
Total		791			2605	

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

System	2003 Hours Lost	1975 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		24
13. Reactor Auxiliary Systems		16
14. Safety Systems		44
15. Reactor Cooling Systems		301
31. Turbine and auxiliaries		104
32. Feedwater and Main Steam System		57
33. Circulating Water System	32	
41. Main Generator Systems	96	34
42. Electrical Power Supply Systems		65
XX. Miscellaneous Systems		7
Total	128	653

# US-454 BYRON-1

**Operator:** EXELON (Exelon Nuclear Co.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1163.0 MW(e)  
**Design Net Capacity:** 1120.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9858.8 GW(e).h  
**Energy Availability Factor:** 94.0%  
**Load Factor:** 96.8%  
**Operating Factor:** 94.2%  
**Energy Unavailability Factor:** 6.0%  
**Total Off-line Time:** 512 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	906.4	817.0	906.1	872.5	902.7	871.6	893.3	890.3	591.3	461.0	858.2	888.3	9858.8
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	69.2	59.3	100.0	100.0	94.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	69.2	59.4	100.0	100.0	94.0
<b>LF (%)</b>	104.8	104.5	104.7	104.3	104.3	104.1	103.2	102.9	70.6	53.2	102.5	102.7	96.8
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	73.2	57.2	100.0	100.0	94.2
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.8	40.7	0.0	0.0	6.0
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.8	40.7	0.0	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1975      **Lifetime Generation:** 143942.3 GW(e).h  
**Date of First Criticality:** 02 Feb 1985      **Cumulative Energy Availability Factor:** 85.7%  
**Date of Grid Connection:** 01 Mar 1985      **Cumulative Load Factor:** 80.8%  
**Date of Commercial Operation:** 16 Sep 1985      **Cumulative Unit Capability Factor:** 77.8%  
**Cumulative Energy Unavailability Factor:** 14.3%

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	1696.1	1124.0	0.0	0.0	83.7	100.0	18.0	0.0	2025	24.1
1986	7396.0	1129.0	89.1	89.1	89.1	89.1	74.8	74.8	7760	88.6
1987	5355.7	1125.0	69.6	79.4	68.7	78.9	54.3	64.6	6005	68.6
1988	6303.7	1112.0	72.9	77.2	72.9	76.9	64.5	64.6	6393	72.8
1989	8945.5	1105.0	99.7	82.8	99.7	82.6	92.4	71.4	8737	99.7
1990	6951.7	1105.0	80.3	82.3	80.3	82.1	71.8	71.5	7059	80.6
1991	6318.1	1105.0	81.3	82.1	81.3	82.0	65.3	70.5	7148	81.6
1992	8986.4	1105.0	99.3	84.6	99.3	84.5	92.6	73.6	8723	99.3
1993	7366.9	1105.0	80.8	84.1	80.9	84.0	76.1	73.9	7104	81.1
1994	6801.6	1105.0	81.2	83.8	81.2	83.7	70.3	73.5	7136	81.5
1995	7706.5	1105.0	82.3	83.7	82.3	83.6	79.6	74.1	7228	82.5
1996	6871.1	1105.0	74.7	82.8	74.7	82.8	70.8	73.8	6588	75.0
1997	7161.7	1105.0	76.8	82.3	76.8	82.3	74.0	73.8	6737	76.9
1998	7804.6	1105.0	81.5	82.3	81.5	82.2	80.6	74.4	7145	81.6
1999	8908.5	1105.0	90.6	82.9	90.6	82.8	92.0	75.6	7944	90.7
2000	9291.9	1105.0	94.2	83.6	94.2	83.6	95.7	77.0	8284	94.3
2001	10389.9	1138.0	100.0	84.7	100.0	84.6	104.2	78.7	8760	100.0
2002	9827.8	1163.0	94.1	85.3	94.1	85.2	96.5	79.8	8256	94.2
2003	9858.8	1163.0	94.0	85.8	94.0	85.7	96.8	80.8	8248	94.2

# US-454 BYRON-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
22 Sep	511.5	610.8	PF	C21	REFUELING OUTAGE

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					87	
B. Refuelling without a maintenance					11	
C. Inspection, maintenance or repair combined with refuelling	511			883		
D. Inspection, maintenance or repair without refuelling				224		
H. Nuclear regulatory requirements					3	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				4	7	4
Subtotal	511	0	0	1111	108	4
Total		511			1223	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		3
13. Reactor Auxiliary Systems		1
15. Reactor Cooling Systems		9
21. Fuel Handling and Storage Facilities		26
31. Turbine and auxiliaries		20
32. Feedwater and Main Steam System		12
41. Main Generator Systems		0
42. Electrical Power Supply Systems		6
Total	0	77

# US-455 BYRON-2

**Operator:** EXELON (Exelon Nuclear Co.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1131.0 MW(e)  
**Design Net Capacity:** 1120.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 10298.7 GW(e).h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 103.9%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 0 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	886.3	798.8	883.9	849.0	874.6	846.0	873.1	870.3	833.4	863.6	845.2	874.4	10298.7
<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>	105.3	105.1	105.0	104.4	103.9	103.9	103.8	103.4	102.3	102.5	103.8	103.9	103.9
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1975      **Lifetime Generation:** 137808.5 GW(e).h  
**Date of First Criticality:** 09 Jan 1987      **Cumulative Energy Availability Factor:** 90.4%  
**Date of Grid Connection:** 06 Feb 1987      **Cumulative Load Factor:** 86.1%  
**Date of Commercial Operation:** 21 Aug 1987      **Cumulative Unit Capability Factor:** 78.2%  
**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 (%)
1987	3876.1	1128.0	0.0	0.0	91.4	100.0	39.9	0.0	5071	58.8
1988	6357.9	1112.0	95.9	95.9	95.9	95.9	65.1	65.1	8419	95.8
1989	6069.5	1105.0	79.5	87.7	79.5	87.7	62.7	63.9	6981	79.7
1990	6052.7	1105.0	75.0	83.5	75.0	83.5	62.5	63.4	6598	75.3
1991	8772.7	1105.0	96.9	86.8	96.9	86.8	90.6	70.2	8489	96.9
1992	7000.3	1105.0	79.8	85.4	79.8	85.4	72.1	70.6	7027	80.0
1993	7622.5	1105.0	84.3	85.2	84.3	85.2	78.7	72.0	7399	84.5
1994	9504.2	1105.0	99.4	87.2	99.4	87.2	98.2	75.7	8704	99.4
1995	8183.8	1105.0	87.9	87.3	87.9	87.3	84.5	76.8	7710	88.0
1996	7830.6	1105.0	82.0	86.7	82.0	86.7	80.7	77.2	7225	82.3
1997	9102.9	1105.0	95.2	87.6	95.2	87.6	94.0	78.9	8344	95.3
1998	8592.8	1105.0	89.5	87.8	89.5	87.8	88.8	79.8	7855	89.7
1999	9174.1	1105.0	93.3	88.2	93.3	88.2	94.8	81.1	8182	93.4
2000	10005.4	1105.0	99.3	89.1	99.3	89.1	103.1	82.7	8724	99.3
2001	9826.7	1120.0	95.3	89.5	95.3	89.5	100.2	84.0	8353	95.4
2002	9537.6	1131.0	92.3	89.7	92.3	89.7	96.3	84.8	8119	92.7
2003	10298.7	1131.0	100.0	90.4	100.0	90.4	103.9	86.1	8760	100.0



## US-455 BYRON-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure				11	101	
C. Inspection, maintenance or repair combined with refuelling				667		
D. Inspection, maintenance or repair without refuelling				43		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					10	
Subtotal	0	0	0	721	111	0
Total		0			832	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		5
15. Reactor Cooling Systems		14
16. Steam generation systems		25
17. Safety I&C Systems (excluding reactor I&C)		4
21. Fuel Handling and Storage Facilities		3
32. Feedwater and Main Steam System		5
35. All other I&C Systems		3
41. Main Generator Systems		12
42. Electrical Power Supply Systems		1
Total	0	72

# US-483 CALLAWAY-1

Operator: AMEREN (AMEREN)

Contractor: WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Maximum Net Capacity at the beginning of 2003: 1125.0 MW(e)  
 Design Net Capacity: 1171.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t

## 2. Production Summary 2003

Energy Production: 9699.7 GW(e).h  
 Energy Availability Factor: 95.8%  
 Load Factor: 98.4%  
 Operating Factor: 95.9%  
 Energy Unavailability Factor: 4.2%  
 Total Off-line Time: 363 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	872.9	784.8	584.8	773.6	863.5	831.3	851.1	851.0	829.3	749.9	835.2	872.2	9699.7
EAF (%)	100.0	100.0	67.2	94.3	100.0	100.0	100.0	100.0	100.0	88.9	100.0	100.0	95.8
UCF (%)	100.0	100.0	67.2	94.4	100.0	100.0	100.0	100.0	100.0	88.9	100.0	100.0	95.8
LF (%)	104.3	103.8	69.9	95.6	103.2	102.6	101.7	101.7	102.4	89.5	103.1	104.2	98.4
OF (%)	100.0	100.0	68.5	93.5	100.0	100.0	100.0	100.0	100.0	89.0	100.0	100.0	95.9
EU (%)	0.0	0.0	32.8	5.7	0.0	0.0	0.0	0.0	0.0	11.1	0.0	0.0	4.2
PU (%)	0.0	0.0	32.8	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.1	0.0	0.0	1.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Sep 1975  
 Date of First Criticality: 02 Oct 1984  
 Date of Grid Connection: 24 Oct 1984  
 Date of Commercial Operation: 19 Dec 1984

Lifetime Generation: 162787.7 GW(e).h  
 Cumulative Energy Availability Factor: 88.7%  
 Cumulative Load Factor: 86.8%  
 Cumulative Unit Capability Factor: 77.8%  
 Cumulative Energy Unavailability Factor: 11.3%

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	577.2	1140.0	0.0	0.0	6.5	100.0	6.5	0.0	863	11.1
1985	8045.8	1120.0	90.0	90.0	90.0	90.0	82.0	82.0	7882	90.0
1986	7199.1	1120.0	81.6	85.8	81.6	85.8	73.4	77.7	7121	81.3
1987	6321.8	1120.0	70.0	80.5	70.0	80.5	64.4	73.3	6141	70.1
1988	8144.2	1120.0	92.5	83.5	92.5	83.5	82.8	75.7	7413	84.4
1989	8350.9	1118.0	84.0	83.6	84.0	83.6	85.3	77.6	7368	84.1
1990	8005.1	1125.0	81.8	83.3	81.8	83.3	81.2	78.2	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	85.2	82.0	85.2	81.9	81.5	7204	82.0
1993	8390.0	1120.0	85.5	85.3	85.5	85.2	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	86.4	84.0	86.4	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	87.7	90.9	87.7	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	88.6	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

# US-483 CALLAWAY-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
22 Mar	280.5	320.6	PF	D14	PLANT WAS SHUTDOWN TO REPLACE A PRESSURIZER SAFETY VALVE THAT WAS EXPERIENCING LEAKAGE PAS THE SEAT.
21 Oct	81.5	93.2	UF1	A42	SHUTDOWN TO REPAIR A 120 V INVERTER.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		81			133	
B. Refuelling without a maintenance					9	
C. Inspection, maintenance or repair combined with refuelling				670		
D. Inspection, maintenance or repair without refuelling	280			96	1	
E. Testing of plant systems or components				0		
H. Nuclear regulatory requirements					0	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					8	1
Subtotal	280	81	0	766	151	1
Total		361			918	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		12
15. Reactor Cooling Systems		17
16. Steam generation systems		0
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		16
32. Feedwater and Main Steam System		35
33. Circulating Water System		18
35. All other I&C Systems		0
41. Main Generator Systems		11
42. Electrical Power Supply Systems	81	5
Total	81	115

# US-317 CALVERT CLIFFS-1

**Operator:** CONST (CONSTELLATION NUCLEAR GROUP)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 825.0 MW(e)  
**Design Net Capacity:** 845.0 MW(e)  
**Design Discharge Burnup:** 13775 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7532.5 GW(e).h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 104.2%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 0 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	647.2	584.1	647.5	624.2	644.5	617.9	631.9	624.4	607.1	642.4	615.7	645.5	7532.5
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>LF (%)</b>	105.4	105.4	105.5	105.2	105.0	104.0	102.9	101.7	102.2	104.5	103.7	105.2	104.2
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1968      **Lifetime Generation:** 155386.4 GW(e).h  
**Date of First Criticality:** 07 Oct 1974      **Cumulative Energy Availability Factor:** 74.0%  
**Date of Grid Connection:** 03 Jan 1975      **Cumulative Load Factor:** 74.7%  
**Date of Commercial Operation:** 08 May 1975      **Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	5362.1	825.0	73.9	74.4	73.9	73.7	74.2	72.4	6419	73.3
1983	5570.7	825.0	77.0	74.7	77.0	74.1	77.1	73.0	6719	76.7
1984	6221.6	825.0	86.7	76.1	84.3	75.3	85.9	74.4	7422	84.5
1985	4359.7	825.0	58.8	74.3	58.8	73.6	60.3	73.0	5186	59.2
1986	5830.7	825.0	78.2	74.7	78.2	74.0	80.7	73.7	6855	78.3
1987	5268.5	825.0	70.9	74.4	70.9	73.8	72.9	73.6	6233	71.2
1988	5164.2	825.0	71.0	74.1	71.0	73.6	71.3	73.5	6263	71.3
1989	1345.6	825.0	18.8	70.1	18.8	69.6	18.6	69.5	1727	19.7
1990	1344.4	825.0	20.1	66.8	20.1	66.3	18.6	66.1	1840	21.0
1991	5465.3	825.0	75.5	67.3	75.5	66.9	75.6	66.7	6638	75.8
1992	4113.9	825.0	55.6	66.6	55.6	66.2	56.8	66.1	4927	56.1
1993	7334.9	827.0	98.2	68.4	98.2	68.0	101.2	68.1	8599	98.2
1994	4686.4	832.0	64.6	68.2	64.5	67.8	64.3	67.9	5656	64.6
1995	7030.2	835.0	96.9	69.6	96.9	69.3	96.1	69.3	8487	96.9
1996	4846.9	835.0	65.7	69.4	65.7	69.1	66.1	69.2	5762	65.6
1997	7158.4	835.0	96.0	70.7	95.9	70.3	97.9	70.5	8400	95.9
1998	6116.8	835.0	82.0	71.2	82.0	70.9	83.6	71.1	7184	82.0
1999	6994.3	835.0	96.8	72.3	94.0	71.8	95.6	72.1	8231	94.0
2000	6449.6	827.0	86.2	72.8	86.2	72.4	88.8	72.8	7580	86.3
2001	7454.8	825.0	99.6	73.8	99.6	73.5	103.2	73.9	8727	99.6
2002	4645.2	825.0	62.8	73.4	62.8	73.1	64.3	73.6	5506	62.9
2003	7532.5	825.0	100.0	74.4	100.0	74.0	104.2	74.7	8760	100.0

# US-317 CALVERT CLIFFS-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1975 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					335	
B. Refuelling without a maintenance					9	
C. Inspection, maintenance or repair combined with refuelling				1068		
D. Inspection, maintenance or repair without refuelling				576		
E. Testing of plant systems or components				54		
H. Nuclear regulatory requirements					7	24
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					76	15
Subtotal	0	0	0	1698	427	39
Total		0			2164	

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

System	2003 Hours Lost	1975 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		13
12. Reactor I&C Systems		10
13. Reactor Auxiliary Systems		25
14. Safety Systems		43
15. Reactor Cooling Systems		74
16. Steam generation systems		0
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		74
32. Feedwater and Main Steam System		56
33. Circulating Water System		1
35. All other I&C Systems		1
41. Main Generator Systems		2
42. Electrical Power Supply Systems		16
XX. Miscellaneous Systems		0
Total	0	316

# US-318 CALVERT CLIFFS-2

**Operator:** CONST (CONSTELLATION NUCLEAR GROUP)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 835.0 MW(e)  
**Design Net Capacity:** 845.0 MW(e)  
**Design Discharge Burnup:** 13775 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6156.9 GW(e).h  
**Energy Availability Factor:** 81.4%  
**Load Factor:** 84.2%  
**Operating Factor:** 81.3%  
**Energy Unavailability Factor:** 18.6%  
**Total Off-line Time:** 1636 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	645.5	288.1	0.0	160.3	613.5	622.1	638.3	633.8	619.2	651.3	629.3	655.3	6156.9
<b>EAF (%)</b>	100.0	46.1	0.0	31.3	95.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	81.4
<b>UCF (%)</b>	100.0	46.1	0.0	31.3	95.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	81.4
<b>LF (%)</b>	103.9	51.3	0.0	26.7	98.8	103.5	102.8	102.0	103.0	104.7	104.7	105.5	84.2
<b>OF (%)</b>	100.0	46.4	0.0	30.5	95.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	81.3
<b>EUf (%)</b>	0.0	53.9	100.0	68.7	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.6
<b>PUf (%)</b>	0.0	53.9	100.0	68.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	4.3	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1968  
**Date of First Criticality:** 30 Nov 1976  
**Date of Grid Connection:** 07 Dec 1976  
**Date of Commercial Operation:** 01 Apr 1977

**Lifetime Generation:** 152328.8 GW(e).h  
**Cumulative Energy Availability Factor:** 77.3%  
**Cumulative Load Factor:** 77.4%  
**Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1982	5005.2	825.0	74.2	80.6	74.2	80.0	69.3	76.7	6496	74.2
1983	6113.1	825.0	86.4	81.5	86.4	81.1	84.6	78.0	7567	86.4
1984	5338.4	825.0	73.7	80.4	73.7	80.0	73.7	77.4	6502	74.0
1985	5608.0	825.0	77.4	80.0	77.4	79.7	77.6	77.4	6789	77.5
1986	7006.7	825.0	96.0	81.8	96.0	81.5	97.0	79.6	8405	95.9
1987	4832.0	825.0	66.3	80.3	66.3	80.0	66.9	78.3	5859	66.9
1988	6602.7	825.0	88.8	81.0	88.8	80.8	91.1	79.5	7813	88.9
1989	1448.5	825.0	18.3	75.8	18.3	75.6	20.0	74.5	1731	19.8
1990	0.0	825.0	0.0	70.0	0.0	69.8	0.0	68.8	0	0.0
1991	3635.6	825.0	51.3	68.6	51.3	68.4	50.3	67.5	4515	51.5
1992	6590.3	825.0	89.3	70.0	89.3	69.8	90.9	69.0	7855	89.4
1993	4975.2	827.0	67.4	69.8	67.3	69.7	68.7	69.0	5939	67.8
1994	6576.5	835.0	90.6	71.1	90.5	70.9	89.9	70.3	7925	90.5
1995	5911.1	840.0	81.4	71.7	81.4	71.5	80.3	70.8	7121	81.3
1996	7247.7	840.0	97.5	73.0	97.5	72.9	98.2	72.3	8561	97.5
1997	5979.9	840.0	81.1	73.5	81.1	73.3	81.3	72.8	7100	81.1
1998	7225.5	840.0	95.8	74.5	95.8	74.4	98.2	74.0	8393	95.8
1999	6332.7	840.0	84.5	75.0	84.5	74.9	86.1	74.5	7400	84.5
2000	7391.0	835.0	98.0	76.0	98.1	75.9	100.8	75.7	8614	98.1
2001	6201.5	835.0	83.3	76.3	83.3	76.2	84.8	76.1	7297	83.3
2002	7480.6	835.0	100.0	77.3	100.0	77.2	102.3	77.1	8760	100.0
2003	6156.9	835.0	81.4	77.4	81.4	77.3	84.2	77.4	7124	81.3

## US-318 CALVERT CLIFFS-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
14 Feb	1605.0	1348.2	PF	C21	REFUELING OUTAGE.
28 May	31.5	26.5	UF4	E12	AN AUTO TRIP RESULTED FROM A SHORT CIRCUIT CREATED WHILE CONNECTING TEST EQUIPMENT USED FOR TROUBLE SHOOTING IN AN INSTRUMENT CABINET.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1977 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					268	
B. Refuelling without a maintenance					16	
C. Inspection, maintenance or repair combined with refuelling	1605			1419		
D. Inspection, maintenance or repair without refuelling				101		
E. Testing of plant systems or components		31		12		
H. Nuclear regulatory requirements					2	8
J. Grid failure or grid unavailability					0	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					14	
Subtotal	1605	31	0	1532	300	8
Total		1636			1840	

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

System	2003 Hours Lost	1977 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		17
13. Reactor Auxiliary Systems		32
14. Safety Systems		2
15. Reactor Cooling Systems		81
16. Steam generation systems		3
31. Turbine and auxiliaries		32
32. Feedwater and Main Steam System		51
35. All other I&C Systems		3
41. Main Generator Systems		19
42. Electrical Power Supply Systems		21
Total	0	264

# US-413 CATAWBA-1

Operator: DUKE (DUKE POWER CO.)

Contractor: WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Maximum Net Capacity at the beginning of 2003: 1129.0 MW(e)  
 Design Net Capacity: 1145.0 MW(e)  
 Design Discharge Burnup: 36000 MW.d/t

## 2. Production Summary 2003

Energy Production: 8198.5 GW(e).h  
 Energy Availability Factor: 81.7%  
 Load Factor: 82.9%  
 Operating Factor: 81.7%  
 Energy Unavailability Factor: 18.3%  
 Total Off-line Time: 1603 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	868.6	729.0	860.8	833.8	858.8	827.2	851.7	747.9	575.0	863.0	182.9	0.0	8198.5
EAF (%)	100.0	94.5	100.0	100.0	100.0	100.0	100.0	90.3	72.8	100.0	23.3	0.0	81.7
UCF (%)	100.0	94.5	100.0	100.0	100.0	100.0	100.0	90.3	72.8	100.0	23.3	0.0	81.7
LF (%)	103.4	96.1	102.5	102.7	102.2	101.8	101.4	89.0	70.7	102.6	22.5	0.0	82.9
OF (%)	100.0	94.3	100.0	100.0	100.0	100.0	100.0	90.6	72.4	100.0	23.3	0.0	81.7
EUf (%)	0.0	5.5	0.0	0.0	0.0	0.0	0.0	9.7	27.2	0.0	76.7	100.0	18.3
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	76.7	57.1	11.2
UCLF (%)	0.0	5.5	0.0	0.0	0.0	0.0	0.0	9.7	27.2	0.0	0.0	42.9	7.1
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. 2003 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 May 1974  
 Date of First Criticality: 07 Jan 1985  
 Date of Grid Connection: 22 Jan 1985  
 Date of Commercial Operation: 29 Jun 1985  
 Lifetime Generation: 147282.2 GW(e).h  
 Cumulative Energy Availability Factor: 82.0%  
 Cumulative Load Factor: 80.6%  
 Cumulative Unit Capability Factor: 77.8%  
 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	3440.5	1138.0	0.0	0.0	88.2	100.0	37.4	0.0	3513	43.4
1986	5199.1	1145.0	58.9	58.9	58.9	58.9	51.8	51.8	5151	58.8
1987	6406.0	1145.0	68.0	63.4	68.0	63.4	63.9	57.9	5924	67.6
1988	7640.0	1129.0	79.8	68.8	79.8	68.8	77.0	64.2	7003	79.7
1989	7775.4	1129.0	84.7	72.8	84.7	72.8	78.6	67.8	7278	83.1
1990	6900.5	1129.0	71.7	72.5	71.7	72.5	69.8	68.2	6277	71.7
1991	6681.1	1129.0	71.1	72.3	71.1	72.3	67.6	68.1	6227	71.1
1992	7050.9	1129.0	72.1	72.3	72.1	72.3	71.1	68.5	6338	72.2
1993	7597.1	1129.0	79.0	73.1	79.0	73.1	76.8	69.5	6916	78.9
1994	9778.8	1129.0	99.6	76.0	99.6	76.0	98.9	72.8	8722	99.6
1995	8721.6	1129.0	88.1	77.2	88.1	77.2	88.2	74.3	7712	88.0
1996	6341.1	1129.0	66.2	76.2	66.2	76.2	63.9	73.4	5806	66.1
1997	9192.5	1129.0	90.7	77.4	90.7	77.4	92.9	75.0	7966	90.9
1998	8903.7	1129.0	90.5	78.4	90.5	78.4	90.0	76.2	7923	90.4
1999	9073.7	1129.0	91.2	79.3	91.2	79.3	91.7	77.3	7987	91.2
2000	8923.0	1129.0	89.3	80.0	89.3	80.0	90.0	78.1	7844	89.3
2001	9977.0	1129.0	99.6	81.2	99.6	81.2	100.9	79.5	8722	99.6
2002	9481.6	1129.0	94.2	82.0	94.2	82.0	95.9	80.5	8250	94.2
2003	8198.5	1129.0	81.7	82.0	81.7	82.0	82.9	80.6	7157	81.7



# US-413 CATAWBA-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
04 Feb	37.1	41.9	UF	A31	MAIN TURBINE TRIP GENERATED BY HI HI STEAM GENERATOR 1B LEVEL. AUTOMATIC TRIP WAS INITIATED DUE TO RESISTANCE TEMPERATURE DETECTOR TRIPPED BY FAILURE OF PRESSURIZER CHANNEL 2 FAILING LOW.
29 Aug	268.1	302.7	UF4	A15	
08 Nov	962.2	1086.3	PF	C21	REFUELING OUTAGE.
18 Dec	120.0	135.5	UF3	A33	OUTAGE DELAY OF 5 DAYS DUE TO ADDITIONAL EDDY CURRENT TESTING.
23 Dec	48.0	54.2	UF3	A15	OUTAGE DELAY OF 2 DAYS DUE TO PRESSURIZER SPRAY VALVE LEAKAGE.
25 Dec	151.0	170.5	UF3	A41	OUTAGE DELAY OF 6.29 DAYS DUE TO ELECTRICAL GENERATOR LEAKAGE.
31 Dec	8.6	9.7	PF	D31	MAIN TURBINE OVERSPEED TRIP TEST.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		624		3	342	
B. Refuelling without a maintenance					8	
C. Inspection, maintenance or repair combined with refuelling	962			1005		
D. Inspection, maintenance or repair without refuelling	8			74		
E. Testing of plant systems or components				2	5	
H. Nuclear regulatory requirements					6	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				3	8	
Subtotal	970	624	0	1087	369	0
Total		1594			1456	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems		39
13. Reactor Auxiliary Systems		14
14. Safety Systems		30
15. Reactor Cooling Systems	316	118
16. Steam generation systems		1
31. Turbine and auxiliaries	37	14
32. Feedwater and Main Steam System		75
33. Circulating Water System	120	10
41. Main Generator Systems	151	7
42. Electrical Power Supply Systems		13
XX. Miscellaneous Systems		11
Total	624	340

# US-414 CATAWBA-2

**Operator:** DUKE (DUKE POWER CO.)

**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1129.0 MW(e)  
**Design Net Capacity:** 1145.0 MW(e)  
**Design Discharge Burnup:** 36000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9318.2 GW(e).h  
**Energy Availability Factor:** 92.7%  
**Load Factor:** 94.2%  
**Operating Factor:** 92.7%  
**Energy Unavailability Factor:** 7.3%  
**Total Off-line Time:** 643 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	875.3	783.4	51.8	837.3	862.9	823.0	846.1	852.7	832.0	867.0	820.6	866.0	9318.2
<b>EAF (%)</b>	100.0	100.0	13.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.7
<b>UCF (%)</b>	100.0	100.0	13.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.7
<b>LF (%)</b>	104.2	103.3	6.2	103.1	102.7	101.2	100.7	101.5	102.4	103.1	101.0	103.1	94.2
<b>OF (%)</b>	100.0	100.0	13.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.7
<b>EUf (%)</b>	0.0	0.0	86.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3
<b>PUF (%)</b>	0.0	0.0	84.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.2
<b>UCLF (%)</b>	0.0	0.0	1.5	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1974      **Lifetime Generation:** 139737.1 GW(e).h  
**Date of First Criticality:** 08 May 1986      **Cumulative Energy Availability Factor:** 84.0%  
**Date of Grid Connection:** 18 May 1986      **Cumulative Load Factor:** 82.2%  
**Date of Commercial Operation:** 19 Aug 1986      **Cumulative Unit Capability Factor:** 78.1%  
**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 (%)
1986	1324.2	1135.0	0.0	0.0	77.1	100.0	14.0	0.0	1325	15.9
1987	7169.5	1145.0	80.2	80.2	80.2	80.2	71.5	71.5	7014	80.1
1988	5435.0	1129.0	71.8	76.0	71.8	76.0	54.8	63.2	5571	63.4
1989	6527.1	1129.0	72.0	74.7	72.0	74.7	66.0	64.1	6302	71.9
1990	6503.0	1129.0	69.0	73.3	69.0	73.3	65.8	64.5	5984	68.3
1991	7274.9	1129.0	75.6	73.7	75.6	73.7	73.6	66.3	6621	75.6
1992	9273.5	1129.0	94.3	77.2	94.3	77.1	93.5	70.9	8281	94.3
1993	8177.4	1129.0	82.6	77.9	82.6	77.9	82.7	72.5	7233	82.6
1994	7691.7	1129.0	79.8	78.2	79.7	78.1	77.8	73.2	6978	79.7
1995	7960.2	1129.0	80.8	78.4	80.8	78.4	80.5	74.0	7074	80.8
1996	9233.6	1129.0	92.3	79.8	92.3	79.8	93.1	75.9	8107	92.3
1997	8593.4	1129.0	87.1	80.5	87.1	80.5	86.9	76.9	7623	87.0
1998	8672.3	1129.0	86.5	81.0	86.5	81.0	87.7	77.8	7580	86.5
1999	8855.4	1129.0	88.2	81.5	88.2	81.6	89.5	78.7	7727	88.2
2000	8981.4	1129.0	90.3	82.2	90.3	82.2	90.6	79.6	7928	90.3
2001	8574.1	1129.0	85.7	82.4	85.7	82.4	86.7	80.0	7507	85.7
2002	10172.3	1129.0	100.0	83.5	100.0	83.5	102.9	81.5	8760	100.0
2003	9318.2	1129.0	92.7	84.0	92.7	84.0	94.2	82.2	8117	92.7

## US-414 CATAWBA-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Mar	629.2	710.4	PF	C21	REFUELING OUTAGE.
27 Mar	2.8	3.1	PF	D31	MAIN TURBINE OVERSPEED TRIP TEST.
28 Mar	11.1	12.5	UF1	A32	REPAIR FEEDWATER VALVE (2CA-42).

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1986 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		11		19	459	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	629			805		
D. Inspection, maintenance or repair without refuelling	2			78	0	
E. Testing of plant systems or components				2	2	
H. Nuclear regulatory requirements					6	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				0	14	
Subtotal	631	11	0	904	483	0
Total		642			1387	

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

System	2003 Hours Lost	1986 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		5
13. Reactor Auxiliary Systems		33
14. Safety Systems		11
15. Reactor Cooling Systems		65
16. Steam generation systems		6
17. Safety I&C Systems (excluding reactor I&C)		19
31. Turbine and auxiliaries		20
32. Feedwater and Main Steam System	11	115
41. Main Generator Systems		160
42. Electrical Power Supply Systems		41
Total	11	475

# US-461 CLINTON-1

**Operator:** AMERGEN (AMERGEN ENERGY Co.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1022.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 31448 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8700.8 GW(e).h  
**Energy Availability Factor:** 98.6%  
**Load Factor:** 97.2%  
**Operating Factor:** 98.6%  
**Energy Unavailability Factor:** 1.4%  
**Total Off-line Time:** 126 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	756.2	686.7	762.0	666.6	758.5	749.4	774.1	773.9	731.7	717.6	725.4	598.6	8700.8
<b>EAF (%)</b>	100.0	100.0	100.0	92.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.1	98.6
<b>UCF (%)</b>	100.0	100.0	100.0	92.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.1	98.6
<b>LF (%)</b>	99.5	100.0	100.2	90.7	99.8	101.8	101.8	101.8	99.4	94.3	98.6	78.7	97.2
<b>OF (%)</b>	100.0	100.0	100.0	92.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.7	98.6
<b>EUf (%)</b>	0.0	0.0	0.0	7.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9	1.4
<b>PUF (%)</b>	0.0	0.0	0.0	7.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
<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	8.9	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1975  
**Date of First Criticality:** 27 Feb 1987  
**Date of Grid Connection:** 24 Apr 1987  
**Date of Commercial Operation:** 24 Nov 1987

**Lifetime Generation:** 85471.5 GW(e).h  
**Cumulative Energy Availability Factor:** 67.6%  
**Cumulative Load Factor:** 63.7%  
**Cumulative Unit Capability Factor:** 78.2%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1987	1628.8	932.0	0.0	0.0	73.7	100.0	21.3	0.0	3264	39.8
1988	5860.7	930.0	82.5	82.5	82.5	82.5	71.7	71.7	7244	82.5
1989	2861.9	931.0	45.1	63.8	45.1	63.8	35.1	53.4	3947	45.1
1990	3596.6	930.0	52.6	60.1	52.6	60.1	44.1	50.3	4604	52.6
1991	6048.0	930.0	79.1	64.8	79.1	64.8	74.2	56.3	6927	79.1
1992	4935.3	930.0	66.3	65.1	66.3	65.1	60.4	57.1	5824	66.3
1993	5879.2	930.0	77.1	67.1	77.1	67.1	72.2	59.6	6750	77.1
1994	7410.3	930.0	93.8	70.9	93.8	70.9	91.0	64.1	8217	93.8
1995	6109.2	930.0	81.6	72.3	81.6	72.3	75.0	65.5	7140	81.5
1996	5312.9	930.0	66.5	71.6	66.5	71.6	65.0	65.4	5833	66.4
1997	0.0	930.0	0.0	64.5	0.0	64.5	0.0	58.9	0	0.0
1998	0.0	930.0	0.0	58.6	0.0	58.6	0.0	53.5	0	0.0
1999	4704.2	930.0	60.2	58.7	60.2	58.7	57.7	53.9	5270	60.2
2000	6888.8	930.0	85.9	60.8	85.9	60.8	84.3	56.2	7542	85.9
2001	7877.2	930.0	97.8	63.5	97.8	63.5	96.7	59.1	8565	97.8
2002	7657.5	983.0	89.8	65.3	89.8	65.3	88.9	61.2	7805	89.1
2003	8700.8	1022.0	98.6	67.6	98.6	67.6	97.2	63.7	8634	98.6

# US-461 CLINTON-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
11 Apr	51.0	50.5	PF	D31	PLANNED OUTAGE TO REPAIR THE 'B' REACTOR RECIRCULATION FLOW CONTROL VALVE. DURING THE DOWN-POWERING EVOLUTION, A MANUAL REACTOR SCRAM WAS INITIATED AT APPROX. 33% POWER DUE TO HIGH VIBRATION LEVELS OBSERVED ON THE MAIN TURBINE BEARINGS.
02 Dec	68.2	67.5	UF5	A42	INSERTED MANUAL SCRAM WHEN UNIT SUB 11 DEENERGIZED.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		68			407	
B. Refuelling without a maintenance					24	
C. Inspection, maintenance or repair combined with refuelling				2095		
D. Inspection, maintenance or repair without refuelling	51			246		
E. Testing of plant systems or components				1		
H. Nuclear regulatory requirements					11	
J. Grid failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					74	
Subtotal	51	68	0	2342	516	0
Total		119			2858	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		8
14. Safety Systems		12
15. Reactor Cooling Systems		125
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		42
32. Feedwater and Main Steam System		23
41. Main Generator Systems		1
42. Electrical Power Supply Systems	68	26
Total	68	239

# US-397 COLUMBIA

**Operator:** ENERGINW (Energy Northwest)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1107.0 MW(e)  
**Design Net Capacity:** 1100.0 MW(e)  
**Design Discharge Burnup:** 28400 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7614.9 GW(e).h  
**Energy Availability Factor:** 80.4%  
**Load Factor:** 78.5%  
**Operating Factor:** 80.4%  
**Energy Unavailability Factor:** 19.6%  
**Total Off-line Time:** 1721 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	830.8	718.4	451.9	793.5	70.6	11.6	666.9	819.9	796.2	817.2	806.8	831.2	7614.9
<b>EAF (%)</b>	100.0	92.9	61.5	100.0	9.7	7.6	93.8	100.0	100.0	100.0	100.0	100.0	80.4
<b>UCF (%)</b>	100.0	92.9	61.5	100.0	9.7	7.6	93.8	100.0	100.0	100.0	100.0	100.0	80.4
<b>LF (%)</b>	100.9	96.6	54.9	99.7	8.6	1.5	81.0	99.5	99.9	99.1	101.2	100.9	78.5
<b>OF (%)</b>	100.0	96.9	57.7	100.0	9.7	8.8	92.5	100.0	100.0	100.0	100.0	100.0	80.4
<b>EUf (%)</b>	0.0	7.1	38.5	0.0	90.3	92.4	6.2	0.0	0.0	0.0	0.0	0.0	19.6
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	74.3	89.1	0.0	0.0	0.0	0.0	0.0	0.0	13.6
<b>UCLF (%)</b>	0.0	7.2	38.5	0.0	16.1	3.3	6.2	0.0	0.0	0.0	0.0	0.0	6.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1972  
**Date of First Criticality:** 19 Jan 1984  
**Date of Grid Connection:** 27 May 1984  
**Date of Commercial Operation:** 13 Dec 1984

**Lifetime Generation:** 124131.4 GW(e).h  
**Cumulative Energy Availability Factor:** 74.0%  
**Cumulative Load Factor:** 67.0%  
**Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1984	1458.4	1104.0	0.0	0.0	99.5	100.0	16.9	0.0	2393	30.6
1985	5176.4	1100.0	77.1	77.1	77.1	77.1	53.7	53.7	6624	75.6
1986	5183.2	1095.0	74.1	75.6	74.1	75.6	54.0	53.9	6133	70.0
1987	5398.0	1095.0	67.9	73.0	67.9	73.1	56.3	54.7	5979	68.3
1988	6000.4	1095.0	68.2	71.8	68.2	71.8	62.4	56.6	6020	68.5
1989	6127.9	1095.0	76.0	72.7	76.1	72.7	63.9	58.1	6680	76.3
1990	5791.3	1095.0	65.3	71.5	65.3	71.5	60.4	58.4	5752	65.7
1991	4272.5	1090.0	47.1	68.0	47.1	68.0	44.7	56.5	4194	47.9
1992	5705.4	1085.0	62.0	67.3	62.0	67.2	59.9	56.9	5505	62.7
1993	7142.0	1107.0	77.2	68.4	77.1	68.4	73.6	58.8	6757	77.1
1994	6753.8	1086.0	73.7	68.9	73.7	68.9	71.0	60.0	6500	74.2
1995	6948.0	1091.0	76.0	69.5	76.0	69.5	72.7	61.2	6680	76.3
1996	5562.6	1106.0	79.7	70.4	68.3	69.4	57.3	60.8	5999	68.3
1997	6129.9	1107.0	77.4	70.9	71.3	69.6	63.2	61.0	6248	71.3
1998	6922.8	1107.0	72.8	71.1	72.8	69.8	71.4	61.8	6373	72.8
1999	6099.7	1107.0	68.5	70.9	68.5	69.7	62.9	61.8	6018	68.7
2000	8605.2	1107.0	95.4	72.4	95.4	71.3	88.5	63.5	8385	95.5
2001	8257.7	1107.0	86.1	73.3	86.1	72.2	85.2	64.8	7553	86.2
2002	8981.3	1107.0	97.3	74.6	97.4	73.6	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

# US-397 COLUMBIA

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
27 Feb	334.8	371.0	UF	H	TECHNICAL SPECIFICATION REQUIRED SHUTDOWN DUE TO DG INOPERABILITY.
04 May	119.4	132.3	UF1	A31	SHUTDOWN BECAUSE OF REACTOR COOLANT CHEMISTRY THAT WAS IMPLEMENTED BY A CONDENSER TUBE LEAK.
09 May	1193.7	1322.6	PF	C21	FROM THE FORCED OUTAGE, IMMEDIATELY ENTERED THE PLANNED REFUELING AND MAINTENANCE OUTAGE R-16.
30 Jun	70.0	77.6	UF	A42	FORCED OUTAGE DUE TO A TURBINE TRIP CAUSED BY A MAIN TRANSFORMER FAULT THAT OCCURRED ON JUNE 30.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		189			282	
B. Refuelling without a maintenance					19	
C. Inspection, maintenance or repair combined with refuelling	1193			1206		
D. Inspection, maintenance or repair without refuelling				149		
E. Testing of plant systems or components				32	0	
H. Nuclear regulatory requirements		334			35	
J. Grid failure or grid unavailability						76
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				93	170	
Subtotal	1193	523	0	1480	506	76
Total		1716			2062	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		1
13. Reactor Auxiliary Systems		3
14. Safety Systems		22
15. Reactor Cooling Systems		30
17. Safety I&C Systems (excluding reactor I&C)		34
21. Fuel Handling and Storage Facilities		19
31. Turbine and auxiliaries	119	75
32. Feedwater and Main Steam System		39
35. All other I&C Systems		7
41. Main Generator Systems		2
42. Electrical Power Supply Systems	70	45
Total	189	277

# US-445 COMANCHE PEAK-1

**Operator:** TXU (TXU Electric Co.)

**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1150.0 MW(e)  
**Design Net Capacity:** 1150.0 MW(e)  
**Design Discharge Burnup:** 30000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9626.0 GW(e).h  
**Energy Availability Factor:** 98.9%  
**Load Factor:** 95.6%  
**Operating Factor:** 98.8%  
**Energy Unavailability Factor:** 1.1%  
**Total Off-line Time:** 107 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	852.6	769.1	641.3	821.6	734.0	814.7	837.0	832.1	811.5	846.2	815.6	850.3	9626.0
<b>EAF (%)</b>	100.0	100.0	96.8	100.0	89.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.9
<b>UCF (%)</b>	100.0	100.0	96.9	100.0	89.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.9
<b>LF (%)</b>	99.7	99.5	75.0	99.4	85.8	98.4	97.8	97.3	98.0	98.8	98.5	99.4	95.6
<b>OF (%)</b>	100.0	100.0	96.6	100.0	89.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.8
<b>EUf (%)</b>	0.0	0.0	3.2	0.0	10.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	3.2	0.0	10.4	0.0	0.0	0.0	0.0	0.0	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1974      **Lifetime Generation:** 109772.9 GW(e).h  
**Date of First Criticality:** 03 Apr 1990      **Cumulative Energy Availability Factor:** 87.3%  
**Date of Grid Connection:** 24 Apr 1990      **Cumulative Load Factor:** 81.2%  
**Date of Commercial Operation:** 13 Aug 1990      **Cumulative Unit Capability Factor:** 79.4%  
**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 (%)
1990	3335.2	1140.0	0.0	0.0	80.2	100.0	37.1	0.0	4399	55.7
1991	5360.5	1150.0	60.5	60.5	60.5	60.5	53.2	53.2	5341	61.0
1992	6937.5	1150.0	79.1	69.8	79.1	69.8	68.7	61.0	6947	79.1
1993	7150.4	1150.0	79.1	72.9	79.1	72.9	71.0	64.3	6932	79.1
1994	9367.6	1150.0	98.8	79.4	98.8	79.4	93.0	71.5	8653	98.8
1995	7803.7	1150.0	85.0	80.5	85.0	80.5	77.5	72.7	7444	85.0
1996	7756.2	1150.0	83.0	80.9	82.7	80.9	76.8	73.3	7265	82.7
1997	9478.9	1150.0	98.8	83.5	98.8	83.4	94.1	76.3	8656	98.8
1998	8506.0	1150.0	89.6	84.2	89.6	84.2	84.4	77.3	7848	89.6
1999	8601.5	1150.0	90.4	84.9	90.4	84.9	85.4	78.2	7922	90.4
2000	9619.8	1150.0	100.0	86.4	100.0	86.4	95.2	79.9	8784	100.0
2001	8444.3	1150.0	88.9	86.7	88.9	86.6	83.8	80.3	7781	88.8
2002	7785.3	1150.0	83.0	86.3	83.0	86.3	77.3	80.0	7213	82.3
2003	9626.0	1150.0	98.8	87.3	98.9	87.3	95.6	81.2	8653	98.8



## US-445 COMANCHE PEAK-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
16 Mar	24.9	27.0	UF5	A31	THE CONDENSATE PUMP 1-01 TRIPPED, THIS CAUSED THE FEEDWATER PUMPS TO TRIP AND A MANUAL REACTOR TRIP WAS INITIATED.
15 May	81.8	88.7	UF4	N42	AUTOMATIC REACTOR TRIP DUE TO GRID INSTABILITY AND THE LOSS OF THE 345KV SWITCHYARD (DUAL UNIT TRIP). LIGHTNING WAS THE CAUSE OF THE SWITCHYARD LOSS.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1990 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		24			205	
B. Refuelling without a maintenance					24	
C. Inspection, maintenance or repair combined with refuelling				751		
D. Inspection, maintenance or repair without refuelling				155		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					3	1
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)		81				
<b>Subtotal</b>	<b>0</b>	<b>105</b>	<b>0</b>	<b>906</b>	<b>232</b>	<b>1</b>
<b>Total</b>		<b>105</b>			<b>1139</b>	

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

System	2003 Hours Lost	1990 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		25
13. Reactor Auxiliary Systems		0
15. Reactor Cooling Systems		7
16. Steam generation systems		12
31. Turbine and auxiliaries	24	50
32. Feedwater and Main Steam System		21
35. All other I&C Systems		12
41. Main Generator Systems		26
42. Electrical Power Supply Systems		28
<b>Total</b>	<b>24</b>	<b>181</b>

# US-446 COMANCHE PEAK-2

**Operator:** TXU (TXU Electric Co.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1150.0 MW(e)  
**Design Net Capacity:** 1150.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8123.4 GW(e).h  
**Energy Availability Factor:** 83.8%  
**Load Factor:** 80.6%  
**Operating Factor:** 83.4%  
**Energy Unavailability Factor:** 16.2%  
**Total Off-line Time:** 1453 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	851.6	770.3	853.8	821.9	422.2	809.2	348.9	822.4	809.1	97.5	793.0	723.6	8123.4
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	54.6	100.0	46.7	100.0	100.0	20.4	100.0	87.7	83.8
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	54.6	100.0	46.7	100.0	100.0	20.4	100.0	87.7	83.8
<b>LF (%)</b>	99.5	99.7	99.8	99.4	49.3	97.7	40.8	96.1	97.7	11.4	95.8	84.6	80.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	53.5	100.0	45.4	100.0	100.0	18.5	100.0	87.4	83.4
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	45.4	0.0	53.3	0.0	0.0	79.6	0.0	12.3	16.2
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	79.6	0.0	0.0	6.8
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	45.4	0.0	53.3	0.0	0.0	0.0	0.0	12.3	9.4
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1974  
**Date of First Criticality:** 24 Mar 1993  
**Date of Grid Connection:** 09 Apr 1993  
**Date of Commercial Operation:** 03 Aug 1993

**Lifetime Generation:** 87758.4 GW(e).h  
**Cumulative Energy Availability Factor:** 87.9%  
**Cumulative Load Factor:** 83.0%  
**Cumulative Unit Capability Factor:** 80.8%  
**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 (%)
1993	4131.7	1150.0	0.0	0.0	77.7	100.0	41.3	0.0	4600	52.9
1994	5263.2	1150.0	65.1	65.1	65.1	65.1	52.2	52.2	5697	65.0
1995	9166.6	1150.0	95.7	80.4	95.7	80.4	91.0	71.6	8382	95.7
1996	7370.4	1150.0	79.4	80.1	78.7	79.8	73.0	72.1	6911	78.7
1997	8062.1	1150.0	86.2	81.6	86.2	81.4	80.0	74.1	7554	86.2
1998	9345.3	1150.0	99.8	85.2	99.8	85.1	92.8	77.8	8741	99.8
1999	8756.0	1150.0	90.2	86.1	90.2	85.9	86.9	79.3	7901	90.2
2000	8868.0	1150.0	90.2	86.7	90.2	86.6	87.8	80.5	7927	90.2
2001	9877.9	1150.0	99.7	88.3	99.7	88.2	98.1	82.7	8731	99.7
2002	8793.8	1150.0	90.1	88.5	90.1	88.4	87.3	83.2	7888	90.0
2003	8123.4	1150.0	83.8	88.0	83.8	87.9	80.6	83.0	7307	83.4

## US-446 COMANCHE PEAK-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
15 May	345.8	388.7	UF4	N42	AUTOMATIC REACTOR TRIP DUE TO GRID INSTABILITY AND THE LOSS OF THE 345KV SWITCHYARD (DUAL UNIT TRIP). LIGHTNING WAS THE CAUSE OF THE SWITCHYARD LOSS.
09 Jul	395.1	444.1	UF4	A15	REACTOR SCRAM DUE TO A PHASE B GROUND ON RCP MOTOR STATOR ON 7/9 AT 0108. REPAIRS COMPLETED, UNIT CRITICAL ON 07/25 AT 0333, UNIT RETURNED TO SERVICE 7/25 AT 1214.
25 Jul	10.3	11.6	UF	Z31	AT 1317, 07/25/03, THE TURBINE WAS TAKEN OFF LINE FROM 12% POWER DUE TO LACK OF SUCTION PRESSURE ON THE MAIN FEEDWATER PUMPS. THE REACTOR REMAINED CRITICAL IN MODE 2. THE UNIT WAS RETURNED TO SERVICE THE SAME DAY AT 2334.
04 Oct	606.9	682.2	PF	C21	REFUELING OUTAGE.
22 Dec	93.6	105.2	UF4	A41	ON DEC 22 AT 0827, THE TURBINE AND REACTOR TRIPPED DUE TO A STROBE LIGHT REFLECTOR THAT FELL AND MADE CONTACT WITH THE GENERATOR EXCITER. THE REFLECTOR CAUSED ARCING AND SMOKE IN THE EXCITER AND AN AUTOMATIC TURBINE/REACTOR TRIP.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1993 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		488			219	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	606			547		
D. Inspection, maintenance or repair without refuelling				116		
E. Testing of plant systems or components				94		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				19	5	5
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)		345				
Z. Others		10				
Subtotal	606	843	0	776	224	5
Total		1449			1005	

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

System	2003 Hours Lost	1993 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		2
13. Reactor Auxiliary System:		3
14. Safety Systems		62
15. Reactor Cooling System:	395	47
31. Turbine and auxiliaries:		23
32. Feedwater and Main Steam System		68
41. Main Generator System:	93	
42. Electrical Power Supply System:		6
Total	488	211

# US-298 COOPER

**Operator:** NPPD (NEBRASKA PUBLIC POWER DISTRICT)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 764.0 MW(e)  
**Design Net Capacity:** 778.0 MW(e)  
**Design Discharge Burnup:** 18000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4492.3 GW(e).h  
**Energy Availability Factor:** 71.3%  
**Load Factor:** 67.1%  
**Operating Factor:** 71.2%  
**Energy Unavailability Factor:** 28.7%  
**Total Off-line Time:** 2524 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	570.9	371.3	0.0	100.1	473.6	0.0	515.7	549.2	467.1	483.4	478.2	482.8	4492.3
<b>EAF (%)</b>	100.0	79.2	0.0	26.6	80.8	0.0	99.3	100.0	100.0	87.2	86.9	93.9	71.3
<b>UCF (%)</b>	100.0	79.2	0.0	26.6	80.8	0.0	99.3	100.0	100.0	87.2	86.9	93.9	71.3
<b>LF (%)</b>	100.4	72.3	0.0	18.2	83.3	0.0	90.7	96.6	84.9	84.9	86.9	84.9	67.1
<b>OF (%)</b>	100.0	79.0	0.0	26.0	82.9	0.0	96.9	100.0	100.0	87.4	89.4	91.0	71.2
<b>EUf (%)</b>	0.0	20.8	100.0	73.4	19.2	100.0	0.7	0.0	0.0	12.8	13.1	6.1	28.7
<b>PUF (%)</b>	0.0	0.0	100.0	63.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.7
<b>UCLF (%)</b>	0.0	20.8	0.0	10.2	19.2	100.0	0.7	0.0	0.0	12.8	13.1	6.1	15.0
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 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:** 132813.3 GW(e).h  
**Cumulative Energy Availability Factor:** 72.0%  
**Cumulative Load Factor:** 67.4%  
**Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 28.0%

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 (%)
1982	5276.1	764.0	84.4	68.4	84.4	68.3	78.8	64.1	7412	84.6
1983	3343.3	764.0	62.7	67.8	62.7	67.6	50.0	62.5	5544	63.3
1984	3470.0	764.0	67.6	67.8	67.1	67.6	51.7	61.4	5901	67.2
1985	1067.7	764.0	20.1	63.4	20.1	63.3	16.0	57.3	1884	21.5
1986	4052.1	764.0	74.7	64.4	74.7	64.2	60.5	57.6	6546	74.7
1987	5522.1	764.0	94.6	66.7	94.6	66.6	82.5	59.5	8291	94.6
1988	4200.6	764.0	66.5	66.7	66.5	66.6	62.6	59.7	5887	67.0
1989	4790.9	764.0	74.9	67.2	74.9	67.1	71.6	60.5	6594	75.3
1990	5111.4	764.0	78.5	67.9	78.5	67.8	76.4	61.5	6908	78.9
1991	4803.8	764.0	77.9	68.5	77.9	68.4	71.8	62.1	6830	78.0
1992	6227.9	764.0	96.0	70.0	96.0	70.0	92.8	63.8	8436	96.0
1993	3712.9	764.0	56.8	69.3	56.8	69.3	55.5	63.4	5041	57.5
1994	2227.3	764.0	33.4	67.5	33.4	67.5	33.3	61.9	3033	34.6
1995	4127.8	764.0	64.0	67.4	64.0	67.3	61.7	61.9	5663	64.6
1996	6338.9	764.0	97.2	68.7	97.2	68.7	94.5	63.3	8540	97.2
1997	5455.7	764.0	83.6	69.4	83.6	69.3	81.5	64.1	7336	83.7
1998	4869.9	764.0	74.4	69.6	74.4	69.5	72.8	64.5	6544	74.7
1999	6510.4	764.0	97.7	70.7	97.7	70.7	97.3	65.8	8563	97.8
2000	4735.9	764.0	73.1	70.8	73.1	70.8	70.6	66.0	6414	73.0
2001	5206.5	764.0	80.0	71.2	79.9	71.1	77.8	66.4	7009	80.0
2002	6318.2	764.0	96.8	72.1	96.8	72.0	94.4	67.4	8478	96.8
2003	4492.3	764.0	71.3	72.0	71.3	72.0	67.1	67.4	6236	71.2

## US-298 COOPER

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
23 Feb	141.0	106.9	UF5	A32	CNS REDUCED POWER FOLLOWING A FAILURE IN A FEEDWATER HEATER CONTROL VALVE, REPAIR REQUIRED COLD CONDITIONS AND A MANUAL SHUTDOWN INITIATED ON 02/24/03. PLANT REMAINED SHUTDOWN AND ENTERED REFUELING OUTAGE ON 3/1/03.
01 Mar	1202.0	911.1	PF	C21	REFUELING OUTAGE. CNS REDUCED POWER FOLLOWING A FAILURE IN A FEEDWATER HEATER CONTROL VALVE, REPAIR REQUIRED COLD CONDITIONS AND A MANUAL SHUTDOWN INITIATED ON 02/24/03. PLANT REMAINED SHUTDOWN AND ENTERED REFUELING OUTAGE ON 3/1/03.
20 Apr	74.0	56.1	UF	A31	STEAM LEAK ON THE HP TURBINE NOTED AFTER TURBINE SYNC AND TROUBLE WITH TURBINE STOP VALVE.
26 May	869.5	659.1	UF5	A31	CNS EXPERIENCED HIGH MAIN TURBINE VIBRATION ON THE AFTERNOON OF 05/26/03, RESULTING IN A DECISION TO MANUALLY SCRAM THE PLANT.
28 Oct	119.2	90.4	UF	P42	FIRE IN THE MAIN SWITCHYARD.
28 Nov	118.6	89.9	UF	A11	AUTO TRIP DUE TO REACTOR LOW LEVEL.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		1203		4	181	1
B. Refuelling without a maintenance					10	
C. Inspection, maintenance or repair combined with refuelling	1202			1341		
D. Inspection, maintenance or repair without refuelling				159		
E. Testing of plant systems or components				0	1	
H. Nuclear regulatory requirements				5	8	6
J. Grid failure or grid unavailability						2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					267	0
P. Fire		119				
Subtotal	1202	1322	0	1509	467	9
Total		2524			1985	

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

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	118	0
12. Reactor I&C Systems		8
13. Reactor Auxiliary Systems		26
14. Safety Systems		8
15. Reactor Cooling Systems		15
31. Turbine and auxiliaries	943	64
32. Feedwater and Main Steam System	141	9
35. All other I&C Systems		5
41. Main Generator Systems		8
42. Electrical Power Supply Systems		14
XX. Miscellaneous Systems		7
Total	1202	164

# US-302 CRYSTAL RIVER-3

**Operator:** PROGRESS (Progress Energy Corporation)  
**Contractor:** B&W (BABCOCK & WILCOX CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 834.0 MW(e)  
**Design Net Capacity:** 825.0 MW(e)  
**Design Discharge Burnup:** 24200 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6579.4 GW(e).h  
**Energy Availability Factor:** 90.3%  
**Load Factor:** 90.1%  
**Operating Factor:** 90.3%  
**Energy Unavailability Factor:** 9.7%  
**Total Off-line Time:** 849 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	634.1	574.6	639.9	603.6	626.7	609.3	626.6	627.1	518.6	44.7	444.1	630.2	6579.4
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	9.8	76.9	98.8	90.3
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	9.8	76.9	98.8	90.3
<b>LF (%)</b>	102.2	102.5	103.1	100.7	101.0	101.5	101.0	101.1	86.4	7.2	74.0	101.6	90.1
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	9.7	76.9	98.7	90.3
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.2	23.1	1.2	9.7
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.2	15.1	0.0	8.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	1.2	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1967      **Lifetime Generation:** 127877.1 GW(e).h  
**Date of First Criticality:** 14 Jan 1977      **Cumulative Energy Availability Factor:** 69.2%  
**Date of Grid Connection:** 30 Jan 1977      **Cumulative Load Factor:** 66.5%  
**Date of Commercial Operation:** 13 Mar 1977      **Cumulative Unit Capability Factor:** 77.2%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	4915.7	806.0	76.1	56.4	76.1	56.3	69.6	53.8	6651	75.9
1983	3772.3	806.0	59.1	56.9	59.1	56.8	53.4	53.8	5149	58.8
1984	6478.9	821.0	94.6	62.4	94.5	62.3	89.8	59.1	8295	94.4
1985	2863.6	821.0	48.2	60.6	48.2	60.5	39.8	56.6	4171	47.6
1986	2653.2	821.0	42.3	58.5	42.3	58.5	36.9	54.4	3659	41.8
1987	3620.8	821.0	60.2	58.7	60.2	58.6	50.3	54.0	5263	60.1
1988	5768.1	821.0	84.1	61.0	84.1	61.0	80.0	56.4	7375	84.0
1989	2930.0	821.0	48.4	60.0	48.4	59.9	40.7	55.1	4190	47.8
1990	4142.9	821.0	62.3	60.2	62.3	60.1	57.6	55.2	5421	61.9
1991	5457.2	821.0	82.3	61.8	81.5	61.7	75.9	56.7	7136	81.5
1992	5315.9	821.0	75.9	62.7	75.9	62.6	73.7	57.9	6633	75.5
1993	6080.0	821.0	84.8	64.1	84.8	64.0	84.5	59.6	7409	84.6
1994	5939.9	818.0	83.4	65.3	83.4	65.2	82.9	61.0	7292	83.2
1995	7234.9	818.0	99.7	67.2	99.7	67.1	101.0	63.2	8733	99.7
1996	2417.4	818.0	35.9	65.5	35.9	65.5	33.6	61.6	3107	35.4
1997	0.0	818.0	0.0	62.2	0.0	62.2	0.0	58.5	0	0.0
1998	6481.9	818.0	88.8	63.5	88.8	63.4	90.5	60.1	7777	88.8
1999	6373.1	818.0	87.6	64.6	87.6	64.5	88.9	61.4	7677	87.6
2000	7197.7	843.0	97.5	66.1	97.5	66.0	97.2	63.0	8555	97.4
2001	6514.2	834.0	88.9	67.0	88.9	67.0	89.2	64.1	7784	88.9
2002	7300.3	834.0	99.2	68.4	99.2	68.3	99.9	65.6	8692	99.2
2003	6579.4	834.0	90.3	69.2	90.3	69.2	90.1	66.5	7911	90.3

## US-302 CRYSTAL RIVER-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
04 Oct	781.3	651.6	PF	C21	REFUELING OUTAGE.
05 Nov	19.8	16.5	UF4	A12	REACTOR TRIP DUE TO REACTOR COOLANT SYSTEM REACHING HIGH PRESSURE SETPOINT. CAUSE WAS TRACED TO ELECTRONIC CARD INSTALLED IN THE INTEGRATED CONTROL SYSTEM WHICH DROVE THE B MAIN FEEDWATER PUMP SPEED TO ZERO.
07 Nov	37.6	31.4	UF	A12	THE PLANT SHUTDOWN TO REPLACE THE STATOR FOR CONTROL ROD DRIVE 2-1. COOLING WATER TO THE STATOR WAS LOST AFTER A QUICK DISCONNECTED SEPARATED.
09 Dec	9.2	7.7	UF	A31	THE PLANT SHUT DOWN TO REPAIR AN EHC FLUID LEAK ON RHV-5.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1977 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		66		0	715	
B. Refuelling without a maintenance					9	
C. Inspection, maintenance or repair combined with refuelling	781			979		
D. Inspection, maintenance or repair without refuelling				357		
E. Testing of plant systems or components				1		
H. Nuclear regulatory requirements				24	401	
J. Grid failure or grid unavailability						2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				5	97	1
Subtotal	781	66	0	1366	1222	3
Total		847			2591	

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

System	2003 Hours Lost	1977 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	57	76
14. Safety Systems		29
15. Reactor Cooling Systems		249
16. Steam generation systems		7
21. Fuel Handling and Storage Facilities		176
31. Turbine and auxiliaries	9	82
32. Feedwater and Main Steam System		55
33. Circulating Water System		6
42. Electrical Power Supply Systems		19
XX. Miscellaneous Systems		1
Total	66	700

# US-346 DAVIS BESSE-1

**Operator:** FENOC (FIRST ENERGY NUCLEAR OPERATING CO.)  
**Contractor:** B&W (BABCOCK & WILCOX CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 882.0 MW(e)  
**Design Net Capacity:** 906.0 MW(e)  
**Design Discharge Burnup:** 31700 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 0.0 GW(e).h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

## 3. 2003 Monthly Performance Data

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

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1970  
**Date of First Criticality:** 12 Aug 1977  
**Date of Grid Connection:** 28 Aug 1977  
**Date of Commercial Operation:** 31 Jul 1978

**Lifetime Generation:** 121125.4 GW(e).h  
**Cumulative Energy Availability Factor:** 64.7%  
**Cumulative Load Factor:** 61.5%  
**Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1982	3218.1	874.0	51.5	48.2	51.5	48.2	42.0	41.0	4508	51.5
1983	4883.3	874.0	72.3	53.0	72.3	53.0	63.8	45.5	6389	72.9
1984	4291.6	874.0	62.5	54.5	62.5	54.5	55.9	47.2	5486	62.5
1985	1942.9	862.0	30.9	51.2	30.9	51.2	25.7	44.2	2729	31.2
1986	3.5	860.0	1.3	45.1	1.3	45.1	0.0	38.8	116	1.3
1987	5064.0	860.0	82.8	49.3	82.8	49.2	67.2	41.9	7308	83.4
1988	1164.4	860.0	20.4	46.4	20.3	46.4	15.4	39.3	1891	21.5
1989	7322.1	870.0	97.1	51.0	97.1	51.0	96.1	44.4	8506	97.1
1990	4161.5	874.0	55.6	51.4	55.6	51.4	54.4	45.3	4867	55.6
1991	5843.9	874.0	78.6	53.5	78.6	53.5	76.3	47.6	6962	79.5
1992	7650.5	877.0	99.5	56.8	99.5	56.8	99.3	51.4	8742	99.5
1993	6083.4	871.0	82.7	58.5	82.7	58.5	79.7	53.2	7246	82.7
1994	6385.0	868.0	86.9	60.3	86.9	60.2	84.0	55.1	7667	87.5
1995	7670.6	869.0	100.0	62.6	100.0	62.6	100.8	57.8	8760	100.0
1996	6456.3	872.0	84.8	63.8	84.8	63.8	84.3	59.3	7452	84.8
1997	7183.4	873.0	93.5	65.4	93.4	65.4	93.9	61.1	8184	93.4
1998	6130.7	873.0	85.4	66.4	82.0	66.2	80.2	62.1	7181	82.0
1999	7370.0	873.0	94.9	67.7	94.9	67.6	96.4	63.7	8311	94.9
2000	6770.5	876.0	87.0	68.6	87.0	68.4	88.0	64.8	7633	86.9
2001	7690.8	882.0	99.8	70.0	99.8	69.8	99.5	66.3	8738	99.7
2002	929.0	882.0	12.4	67.5	12.4	67.4	12.0	64.0	1081	12.3
2003	0.0	882.0	0.0	64.8	0.0	64.7	0.0	61.5	0	0.0



# US-346 DAVIS BESSE-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	8760.0	7647.5	PF	C21	CONT'D REFUELING OUTAGE. DISCOVERY OF BORIC ACID CORROSION ON REACTOR VESSEL HEAD.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1977 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					954	
B. Refuelling without a maintenance					16	
C. Inspection, maintenance or repair combined with refuelling	8760			1345		
D. Inspection, maintenance or repair without refuelling				237		
E. Testing of plant systems or components				14	0	
H. Nuclear regulatory requirements					0	64
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					21	10
Subtotal	8760	0	0	1596	991	74
Total		8760			2661	

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

System	2003 Hours Lost	1977 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		81
13. Reactor Auxiliary Systems		7
15. Reactor Cooling Systems		61
16. Steam generation systems		0
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		15
32. Feedwater and Main Steam System		557
35. All other I&C Systems		3
41. Main Generator Systems		1
42. Electrical Power Supply Systems		98
XX. Miscellaneous Systems		1
Total	0	824

# US-275 DIABLO CANYON-1

**Operator:** PGE (PACIFIC GAS & ELECTRIC CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1087.0 MW(e)  
**Design Net Capacity:** 1084.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9585.4 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. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	821.5	744.4	821.1	796.3	826.1	738.6	821.6	823.2	794.9	821.7	794.9	781.2	9585.4
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>LF (%)</b>	101.6	101.9	101.5	101.9	102.1	94.4	101.6	101.8	101.6	101.5	101.6	96.6	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1968  
**Date of First Criticality:** 29 Apr 1984  
**Date of Grid Connection:** 11 Nov 1984  
**Date of Commercial Operation:** 07 May 1985

**Lifetime Generation:** 147067.1 GW(e).h  
**Cumulative Energy Availability Factor:** 84.7%  
**Cumulative Load Factor:** 83.5%  
**Cumulative Unit Capability Factor:** 77.8%  
**Cumulative Energy Unavailability Factor:** 15.3%

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	204.0	1074.0	0.0	0.0	95.2	100.0	2.2	0.0	814	9.5
1985	5234.2	1073.0	0.0	0.0	93.9	100.0	56.6	0.0	5206	60.4
1986	5316.2	1073.0	65.7	65.7	65.7	65.7	56.6	56.6	5757	65.7
1987	8284.2	1073.0	95.3	80.5	95.3	80.5	88.1	72.3	8340	95.2
1988	5276.1	1073.0	34.6	65.2	34.6	65.2	56.0	66.9	5555	63.2
1989	7199.9	1073.0	80.7	69.0	80.7	69.0	76.6	69.3	7069	80.7
1990	8713.5	1073.0	96.2	74.5	96.2	74.5	92.7	74.0	8425	96.2
1991	7366.3	1073.0	80.4	75.5	80.4	75.5	78.4	74.7	7125	81.3
1992	7454.7	1073.0	82.3	76.4	82.3	76.4	79.1	75.3	7224	82.2
1993	9028.0	1073.0	98.5	79.2	98.5	79.2	96.0	77.9	8630	98.5
1994	7372.0	1073.0	79.8	79.3	79.9	79.3	78.4	78.0	6991	79.8
1995	7451.8	1073.0	81.9	79.5	81.9	79.5	79.3	78.1	7175	81.9
1996	8786.8	1073.0	94.7	80.9	94.7	80.9	93.2	79.5	8316	94.7
1997	8195.0	1073.0	87.9	81.5	87.9	81.5	87.2	80.1	7700	87.9
1998	8967.8	1073.0	97.8	82.8	97.8	82.8	95.4	81.3	8564	97.8
1999	8224.8	1073.0	90.3	83.3	88.7	83.2	87.5	81.7	7764	88.6
2000	7853.5	1073.0	85.2	83.4	85.2	83.3	83.3	81.9	7485	85.2
2001	9504.6	1084.0	99.4	84.4	99.4	84.3	100.1	83.0	8708	99.4
2002	7048.2	1087.0	76.0	83.9	76.0	83.8	74.0	82.5	6652	75.9
2003	9585.4	1087.0	100.0	84.8	100.0	84.7	100.7	83.5	8760	100.0

## US-275 DIABLO CANYON-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					265	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling				852		
D. Inspection, maintenance or repair without refuelling				98		
E. Testing of plant systems or components				0		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					12	7
Subtotal	0	0	0	950	291	7
Total		0			1248	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		4
14. Safety Systems		7
15. Reactor Cooling Systems		9
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		8
32. Feedwater and Main Steam System		135
33. Circulating Water System		13
35. All other I&C Systems		1
41. Main Generator Systems		3
42. Electrical Power Supply Systems		55
Total	0	237

# US-323 DIABLO CANYON-2

**Operator:** PGE (PACIFIC GAS & ELECTRIC CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1087.0 MW(e)  
**Design Net Capacity:** 1106.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7725.2 GW(e).h  
**Energy Availability Factor:** 82.5%  
**Load Factor:** 81.1%  
**Operating Factor:** 82.5%  
**Energy Unavailability Factor:** 17.5%  
**Total Off-line Time:** 1535 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	809.9	51.1	35.1	399.7	818.7	791.8	817.6	819.9	790.7	816.9	788.9	784.9	7725.2
<b>EAF (%)</b>	100.0	7.1	14.6	61.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.5
<b>UCF (%)</b>	100.0	7.1	14.6	61.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.5
<b>LF (%)</b>	100.1	7.0	4.3	51.1	101.2	101.2	101.1	101.4	101.0	100.9	100.8	97.1	81.1
<b>OF (%)</b>	100.0	7.7	13.8	61.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.5
<b>EUf (%)</b>	0.0	92.9	85.4	38.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.5
<b>PUf (%)</b>	0.0	92.9	81.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0
<b>UCLF (%)</b>	0.0	0.0	4.4	38.1	0.0	0.0	0.0	0.0	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Dec 1970  
**Date of First Criticality:** 19 Aug 1985  
**Date of Grid Connection:** 20 Oct 1985  
**Date of Commercial Operation:** 13 Mar 1986

**Lifetime Generation:** 145221.3 GW(e).h  
**Cumulative Energy Availability Factor:** 87.5%  
**Cumulative Load Factor:** 85.2%  
**Cumulative Unit Capability Factor:** 78.1%  
**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	540.6	1088.0	0.0	0.0	94.2	100.0	6.0	0.0	1213	14.6
1986	6757.7	1080.0	0.0	0.0	96.2	100.0	73.9	0.0	7078	83.6
1987	5728.8	1079.0	65.4	65.4	65.4	65.4	60.6	60.6	5752	65.7
1988	6243.3	1087.0	69.3	67.4	69.3	67.4	65.4	63.0	6086	69.3
1989	8616.0	1087.0	92.2	75.7	92.2	75.7	90.5	72.2	8072	92.1
1990	7578.1	1087.0	83.2	77.5	83.2	77.5	79.6	74.0	7284	83.2
1991	7718.5	1087.0	84.7	79.0	84.7	79.0	81.1	75.4	7420	84.7
1992	9247.7	1087.0	98.5	82.2	98.5	82.2	96.9	79.0	8651	98.5
1993	7796.2	1087.0	83.6	82.4	83.6	82.4	81.9	79.4	7324	83.6
1994	7896.1	1087.0	85.0	82.8	85.0	82.8	82.9	79.9	7439	84.9
1995	8821.0	1087.0	96.3	84.3	96.3	84.3	92.6	81.3	8430	96.2
1996	7932.9	1087.0	85.0	84.3	85.0	84.3	83.1	81.5	7459	84.9
1997	8883.5	1087.0	96.4	85.4	96.4	85.4	93.3	82.5	8441	96.4
1998	8159.0	1087.0	87.1	85.6	87.1	85.6	85.7	82.8	7624	87.0
1999	8443.7	1087.0	91.3	86.0	90.2	85.9	88.7	83.3	7902	90.2
2000	9188.5	1087.0	96.9	86.8	96.9	86.7	96.2	84.2	8512	96.9
2001	8658.4	1087.0	91.9	87.1	91.9	87.1	90.9	84.6	8051	91.9
2002	9286.1	1087.0	99.6	87.9	98.9	87.8	97.5	85.4	8663	98.9
2003	7725.2	1087.0	82.5	87.6	82.5	87.5	81.1	85.2	7225	82.5

## US-323 DIABLO CANYON-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
03 Feb	1227.5	1334.3	PF	C21	REFUELING OUTAGE.
28 Mar	32.5	35.3	UF	A12	NUCLEAR INSTRUMENTATION (NI-42) (POWER RANGE) FAILED.THIS MAINTENANCE COULD NOT BE PERFORMED IN MODES 1 OR 2.
04 Apr	273.8	297.6	UF5	H	TECHNICAL SPECIFICATION REQUIRED MANUAL SHUTDOWN IN RESPONSE TO THE DISCOVERY OF AN AFW CHECK VALVE WITH INTERNALS INSTALLED INCORRECTLY. REFERENCE NRC EVENT NUMBER 39735, LER 2-2003-005. THE VALVE WAS REPLACED WITH A DIFFERENT MODEL.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		32			175	
B. Refuelling without a maintenance					16	
C. Inspection, maintenance or repair combined with refuelling	1227			683		
D. Inspection, maintenance or repair without refuelling				20		
E. Testing of plant systems or components				2		
H. Nuclear regulatory requirements		273				
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					36	8
Subtotal	1227	305	0	705	227	8
Total		1532			940	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	32	10
13. Reactor Auxiliary Systems		9
15. Reactor Cooling Systems		8
31. Turbine and auxiliaries		28
32. Feedwater and Main Steam System		29
33. Circulating Water System		2
35. All other I&C Systems		11
41. Main Generator Systems		13
42. Electrical Power Supply Systems		61
Total	32	171

# US-315 DONALD COOK-1

**Operator:** IMPCO (INDIANA MICHIGAN POWER CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1000.0 MW(e)  
**Design Net Capacity:** 1030.0 MW(e)  
**Design Discharge Burnup:** 32500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6570.1 GW(e).h  
**Energy Availability Factor:** 74.1%  
**Load Factor:** 75.0%  
**Operating Factor:** 74.1%  
**Energy Unavailability Factor:** 25.9%  
**Total Off-line Time:** 2272 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	369.2	577.6	771.8	573.9	60.9	745.2	756.8	750.5	741.7	418.1	33.9	770.6	6570.1
<b>EAF (%)</b>	45.2	88.4	100.0	76.6	11.6	100.0	100.0	100.0	100.0	54.9	13.8	100.0	74.1
<b>UCF (%)</b>	45.2	88.4	100.0	76.6	11.6	100.0	100.0	100.0	100.0	54.9	13.8	100.0	74.1
<b>LF (%)</b>	49.6	86.0	103.7	79.8	8.2	103.5	101.7	100.9	102.9	56.1	4.7	103.6	75.0
<b>OF (%)</b>	47.8	85.3	100.0	77.1	11.0	100.0	100.0	100.0	100.0	54.8	13.8	100.0	74.1
<b>EUf (%)</b>	54.8	11.6	0.0	23.4	88.4	0.0	0.0	0.0	0.0	45.1	86.3	0.0	25.9
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.1	86.3	0.0	10.9
<b>UCLF (%)</b>	54.8	11.6	0.0	23.4	88.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Mar 1969  
**Date of First Criticality:** 18 Jan 1975  
**Date of Grid Connection:** 10 Feb 1975  
**Date of Commercial Operation:** 27 Aug 1975

**Lifetime Generation:** 159826.4 GW(e).h  
**Cumulative Energy Availability Factor:** 66.3%  
**Cumulative Load Factor:** 62.3%  
**Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 33.7%

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 (%)
1982	5352.7	1044.0	64.2	68.9	64.2	68.2	58.5	66.3	5487	62.6
1983	5286.7	1030.0	64.3	68.3	64.3	67.8	58.6	65.4	5628	64.2
1984	7550.8	1020.0	91.3	70.9	91.3	70.3	84.3	67.4	8016	91.3
1985	2116.1	1020.0	29.9	66.8	29.9	66.3	23.7	63.1	2489	28.4
1986	6650.1	1020.0	85.5	68.5	85.5	68.1	74.4	64.1	7464	85.2
1987	5033.8	1020.0	68.2	68.5	68.2	68.1	56.3	63.5	5917	67.5
1988	7467.8	1020.0	95.5	70.5	95.5	70.2	83.3	65.0	8379	95.4
1989	5433.0	1020.0	69.9	70.5	69.9	70.2	60.8	64.7	6069	69.3
1990	6301.6	1020.0	79.2	71.1	79.2	70.8	70.5	65.1	6939	79.2
1991	7338.2	1013.0	86.0	72.0	86.0	71.7	82.7	66.2	7524	85.9
1992	4990.7	1008.0	65.1	71.6	65.1	71.3	56.4	65.6	5690	64.8
1993	8759.4	1006.0	100.0	73.1	99.4	72.9	99.4	67.5	8760	100.0
1994	5759.5	1000.0	71.0	73.0	71.0	72.8	65.7	67.4	6214	70.9
1995	5396.8	1000.0	66.4	72.7	66.4	72.5	61.6	67.1	5809	66.3
1996	8373.3	1000.0	97.6	73.9	97.6	73.6	95.3	68.4	8574	97.6
1997	4545.9	1000.0	52.4	72.9	52.4	72.7	51.9	67.7	4608	52.6
1998	0.0	1000.0	0.0	69.8	0.0	69.6	0.0	64.8	0	0.0
1999	0.0	1000.0	0.0	67.0	0.0	66.8	0.0	62.1	0	0.0
2000	129.8	1000.0	2.8	64.4	2.8	64.2	1.5	59.7	242	2.8
2001	7797.9	1000.0	90.5	65.4	89.5	65.2	89.0	60.9	7840	89.5
2002	7740.9	1000.0	88.9	66.3	88.9	66.0	88.4	61.9	7782	88.8
2003	6570.1	1000.0	74.1	66.5	74.1	66.3	75.0	62.3	6489	74.1

# US-315 DONALD COOK-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
15 Jan	486.4	486.4	UF	P42	THE UNIT WAS SHUTDOWN DUE TO A FAULT AND SUBSEQUENT FIRE IN THE UNIT 1 MAIN TRANSFORMER. THE CAUSE OF THE FAULT IS UNDER INVESTIGATION. THE MAIN TRANSFORMER HAS BEEN REPLACED.
24 Apr	826.1	826.1	UF5	A33	A LARGE INFLUX OF ALEWIVES CAUSED A HIGH DP ON THE TRAVELING SCREENS. THE UNIT WAS MANUALLY TRIPPED DUE TO DEGRADED CIRCULATING WATER CONDITIONS. THE INVESTIGATION IS ONGOING.
18 Oct	957.8	957.8	PF	C21	SCHEDULED REFUELING OUTAGE.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1975 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		826			240	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling	957			1243		
D. Inspection, maintenance or repair without refuelling				146		
E. Testing of plant systems or components				10	7	
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling				3		
H. Nuclear regulatory requirements					0	26
J. Grid failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					1002	3
P. Fire		486				
Subtotal	957	1312	0	1402	1263	29
Total		2269			2694	

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

System	2003 Hours Lost	1975 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		22
14. Safety Systems		10
15. Reactor Cooling Systems		41
16. Steam generation systems		9
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		70
32. Feedwater and Main Steam System		22
33. Circulating Water System	826	16
35. All other I&C Systems		0
41. Main Generator Systems		24
42. Electrical Power Supply Systems		20
Total	826	235

# US-316 DONALD COOK-2

**Operator:** IMPCO (INDIANA MICHIGAN POWER CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1060.0 MW(e)  
**Design Net Capacity:** 1100.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7112.2 GW(e).h  
**Energy Availability Factor:** 75.5%  
**Load Factor:** 76.6%  
**Operating Factor:** 75.5%  
**Energy Unavailability Factor:** 24.5%  
**Total Off-line Time:** 2150 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	700.6	478.3	818.6	606.1	0.0	198.2	798.3	363.2	783.8	819.8	799.1	746.2	7112.2
<b>EAF (%)</b>	87.9	67.1	100.0	76.6	0.0	33.8	100.0	47.7	100.0	100.0	100.0	91.9	75.5
<b>UCF (%)</b>	87.9	67.1	100.0	76.6	0.0	33.8	100.0	47.7	100.0	100.0	100.0	91.9	75.5
<b>LF (%)</b>	88.8	67.1	103.8	79.5	0.0	26.0	101.2	46.1	102.6	104.0	104.7	94.6	76.6
<b>OF (%)</b>	87.9	67.0	100.0	77.1	0.0	33.6	100.0	47.6	100.0	100.0	100.0	91.8	75.5
<b>EUf (%)</b>	12.1	32.9	0.0	23.4	100.0	66.3	0.0	52.3	0.0	0.0	0.0	8.1	24.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	87.5	66.3	0.0	0.0	0.0	0.0	0.0	0.0	12.9
<b>UCLF (%)</b>	12.1	32.9	0.0	23.4	12.5	0.0	0.0	52.3	0.0	0.0	0.0	8.1	11.7
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Mar 1969      **Lifetime Generation:** 141812.3 GW(e).h  
**Date of First Criticality:** 10 Mar 1978      **Cumulative Energy Availability Factor:** 63.7%  
**Date of Grid Connection:** 22 Mar 1978      **Cumulative Load Factor:** 59.1%  
**Date of Commercial Operation:** 01 Jul 1978      **Cumulative Unit Capability Factor:** 77.2%  
**Cumulative Energy Unavailability Factor:** 36.3%

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 (%)
1982	6995.6	1082.0	77.2	72.8	77.2	71.5	73.8	68.6	6738	76.9
1983	7013.6	1071.0	78.3	73.9	78.3	72.9	74.8	69.8	6835	78.0
1984	5364.4	1060.0	59.2	71.5	59.2	70.6	57.6	67.8	5196	59.2
1985	5683.6	1060.0	66.8	70.8	66.9	70.1	61.2	66.9	5852	66.8
1986	4335.6	1060.0	61.5	69.7	61.5	69.0	46.7	64.4	5389	61.5
1987	5026.6	1060.0	71.4	69.9	71.4	69.3	54.1	63.3	6248	71.3
1988	2323.3	1060.0	30.9	66.0	30.9	65.5	25.0	59.5	2715	30.9
1989	6661.0	1060.0	74.4	66.8	74.4	66.3	71.7	60.6	6518	74.4
1990	4813.3	1060.0	55.4	65.8	55.4	65.4	51.8	59.8	4854	55.4
1991	8185.9	1065.0	92.2	67.8	91.5	67.4	87.7	62.0	8013	91.5
1992	1427.3	1072.0	20.5	64.5	20.4	64.0	15.2	58.6	1714	19.5
1993	7553.8	1070.0	96.6	66.6	96.6	66.2	80.6	60.1	8459	96.6
1994	3531.5	1060.0	54.4	65.8	54.4	65.5	38.0	58.7	4757	54.3
1995	8602.5	1060.0	94.5	67.5	94.5	67.1	92.6	60.7	8268	94.4
1996	8022.6	1060.0	87.0	68.6	87.0	68.2	86.2	62.1	7641	87.0
1997	5875.2	1060.0	64.9	68.4	64.9	68.1	63.3	62.2	5705	65.1
1998	0.0	1060.0	0.0	65.0	0.0	64.7	0.0	59.1	0	0.0
1999	0.0	1060.0	0.0	61.9	0.0	61.6	0.0	56.3	0	0.0
2000	4789.8	1060.0	51.9	61.5	51.9	61.2	51.4	56.1	4557	51.9
2001	7963.4	1060.0	87.8	62.6	87.8	62.3	85.8	57.3	7690	87.8
2002	7687.7	1060.0	83.8	63.5	83.8	63.2	82.8	58.4	7335	83.7
2003	7112.2	1060.0	75.5	64.0	75.5	63.7	76.6	59.1	6610	75.5



## US-316 DONALD COOK-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
26 Jan	89.7	95.1	UF	A17	THE UNIT WAS SHUTDOWN IN ACCORDANCE WITH TECHNICAL SPECIFICATIONS WHEN THE CD EDG COULD NOT BE RETURNED TO SERVICE WITHIN THE ALLOWED OUTAGE TIME FOLLOWING SCHEDULED MAINTENANCE DUE TO FAILURE OF THE ELECTRONIC GOVERNOR.
05 Feb	213.2	226.0	UF4	A31	UNIT 2 TURBINE/REACTOR TRIP FROM 100% DUE TO A DUAL FAILURE OF THE 24 VDC POWER SUPPLIES IN CONTROL GROUP 3.
14 Feb	8.0	8.5	UF	A31	THE UNIT 2 TURBINE WAS MANUALLY TRIPPED DUE TO A HIGH-HIGH LEVEL IN THE MOISTURE SEPARATOR DRAIN TANK (MSDT).
24 Apr	260.5	276.1	UF5	Z33	A LARGE INFLUX OF ALEWIVES CAUSED A HIGH DP ON THE TRAVELING SCREENS. THE UNIT WAS MANUALLY TRIPPED DUE TO DEGRADED CIRCULATING WATER CONDITIONS.
05 May	1125.3	1192.8	PF	C21	SCHEDULED REFUELING OUTAGE ACTIVITIES COMMENCED WHILE ALREADY SHUT DOWN DUE TO THE FISH INTRUSION EVENT DESCRIBED ABOVE.
13 Aug	389.1	412.4	UF2	A32	UNIT MANUALLY SHUT DOWN DUE TO A STEAM LEAK FOUND ON FEEDWATER CHECK VALVE 2-FW-118-2.
30 Dec	34.5	36.6	UF4	Z16	UNIT 2 REACTOR AUTOMATICALLY TRIPPED FROM 100% POWER DUE TO A LOW STEAM GENERATOR LEVEL COINCIDENT WITH FEED FLOW LESS THAN STEAM FLOW, WHICH OCCURRED DURING MAINTENANCE ACTIVITIES.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1978 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		700			596	
B. Refuelling without a maintenance					18	
C. Inspection, maintenance or repair combined with refuelling	1125			1212		
D. Inspection, maintenance or repair without refuelling				135	151	
H. Nuclear regulatory requirement					3	26
J. Grid failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					861	
Z. Others		295				
Subtotal	1125	995	0	1347	1629	28
Total		2120			3004	

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

System	2003 Hours Lost	1978 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		12
13. Reactor Auxiliary System:		59
15. Reactor Cooling System:		97
16. Steam generation system:		207
17. Safety I&C Systems (excluding reactor I&C)	89	7
31. Turbine and auxiliaries:	221	22
32. Feedwater and Main Steam System	389	11
33. Circulating Water System:		43
35. All other I&C Systems:		16
41. Main Generator System:		50
42. Electrical Power Supply System:		54
Total	699	578

# US-237 DRESDEN-2

**Operator:** EXELON (Exelon Nuclear Co.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 850.0 MW(e)  
**Design Net Capacity:** 794.0 MW(e)  
**Design Discharge Burnup:** 20950 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6703.1 GW(e).h  
**Energy Availability Factor:** 92.0%  
**Load Factor:** 90.0%  
**Operating Factor:** 91.3%  
**Energy Unavailability Factor:** 8.0%  
**Total Off-line Time:** 761 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	619.0	581.5	646.7	624.2	576.5	609.9	643.7	645.2	613.1	189.6	352.8	600.9	6703.1
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.9	45.2	66.4	95.6	92.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.9	45.2	66.4	95.6	92.0
<b>LF (%)</b>	97.9	101.8	102.3	102.1	91.2	99.6	101.8	102.0	100.2	29.9	57.6	95.0	90.0
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6	38.5	63.2	95.3	91.3
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	54.8	33.6	4.4	8.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.7	33.6	0.0	7.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	1.1	0.0	4.4	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1966      **Lifetime Generation:** 145623.4 GW(e).h  
**Date of First Criticality:** 07 Jan 1970      **Cumulative Energy Availability Factor:** 71.3%  
**Date of Grid Connection:** 13 Apr 1970      **Cumulative Load Factor:** 63.7%  
**Date of Commercial Operation:** 09 Jun 1970      **Cumulative Unit Capability Factor:** 77.3%  
**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 (%)
1982	5123.1	772.0	93.0	76.2	92.4	67.3	75.8	59.2	8094	92.4
1983	3402.2	772.0	59.2	75.0	58.9	66.6	50.3	58.6	5076	57.9
1984	4468.4	772.0	72.9	74.8	72.9	67.1	65.9	59.1	6402	72.9
1985	3106.0	772.0	54.5	73.5	54.5	66.2	45.9	58.2	4678	53.4
1986	4655.7	772.0	77.2	73.7	77.2	66.9	68.8	58.9	6761	77.2
1987	3362.6	772.0	61.0	73.0	61.0	66.6	49.7	58.3	5342	61.0
1988	4325.2	772.0	78.9	73.3	78.9	67.3	63.8	58.6	6931	78.9
1989	4751.7	772.0	80.2	73.7	80.2	67.9	70.3	59.2	7023	80.2
1990	4116.9	772.0	67.6	73.4	67.6	67.9	60.9	59.3	5920	67.6
1991	2984.2	772.0	58.0	72.6	58.0	67.4	44.1	58.6	5031	57.4
1992	4185.8	772.0	84.5	73.2	84.5	68.2	61.7	58.7	7419	84.5
1993	3058.6	772.0	54.7	72.4	54.7	67.6	45.2	58.2	4790	54.7
1994	4086.1	772.0	66.3	72.1	66.3	67.6	60.4	58.3	5808	66.3
1995	1890.5	772.0	33.5	70.6	33.5	66.2	28.0	57.1	2938	33.5
1996	2161.4	772.0	42.5	69.5	42.5	65.3	31.9	56.1	3731	42.5
1997	5578.4	772.0	89.4	70.3	89.4	66.2	82.5	57.1	7738	88.3
1998	5632.9	772.0	85.6	70.8	85.6	66.9	83.3	58.0	7496	85.6
1999	6229.5	772.0	92.7	71.5	92.7	67.8	92.1	59.2	8122	92.7
2000	6867.4	772.0	99.6	72.5	99.6	68.8	101.3	60.5	8747	99.6
2001	6072.7	772.0	91.2	73.1	91.2	69.5	89.8	61.5	8005	91.4
2002	7527.5	850.0	100.0	74.0	100.0	70.6	101.1	62.8	8760	100.0
2003	6703.1	850.0	92.0	74.6	92.0	71.3	90.0	63.7	7999	91.3

## US-237 DRESDEN-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
30 Sep	33.0	26.0	UF	A15	B PHASE CABLE OF REACTOR FEED PUMP MOTOR SHUNTED TO SHIELDING.
14 Oct	693.0	545.4	PF	C21	REFUELING OUTAGE.
12 Dec	35.0	27.5	UF	A41	FORCED OUTAGE DUE TO FAILURE OF THE STATOR WATER COOLING TEMPERATURE CONTROL VALVE.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		68			612	
B. Refuelling without a maintenance					21	
C. Inspection, maintenance or repair combined with refuelling	693			1408		
D. Inspection, maintenance or repair without refuelling				68	2	
E. Testing of plant systems or components				11	8	
H. Nuclear regulatory requirements					5	
J. Grid failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					75	3
Subtotal	693	68	0	1487	723	3
Total		761			2213	

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		12
12. Reactor I&C Systems		88
13. Reactor Auxiliary Systems		12
14. Safety Systems		24
15. Reactor Cooling Systems	33	110
31. Turbine and auxiliaries		151
32. Feedwater and Main Steam System		28
35. All other I&C Systems		24
41. Main Generator Systems	35	23
42. Electrical Power Supply Systems		20
XX. Miscellaneous Systems		14
Total	68	506

# US-249 DRESDEN-3

**Operator:** EXELON (Exelon Nuclear Co.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 850.0 MW(e)  
**Design Net Capacity:** 794.0 MW(e)  
**Design Discharge Burnup:** 20950 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6963.9 GW(e).h  
**Energy Availability Factor:** 94.2%  
**Load Factor:** 93.5%  
**Operating Factor:** 93.7%  
**Energy Unavailability Factor:** 5.8%  
**Total Off-line Time:** 554 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	627.5	579.0	603.9	617.9	635.6	449.1	649.4	646.8	616.9	651.8	585.5	300.5	6963.9
<b>EAF (%)</b>	100.0	100.0	96.7	100.0	100.0	78.2	100.0	100.0	100.0	100.0	100.0	55.7	94.2
<b>UCF (%)</b>	100.0	100.0	96.7	100.0	100.0	78.2	100.0	100.0	100.0	100.0	100.0	55.7	94.2
<b>LF (%)</b>	99.2	101.4	95.5	101.1	100.5	73.4	102.7	102.3	100.8	102.9	95.7	47.5	93.5
<b>OF (%)</b>	100.0	100.0	96.4	100.0	100.0	76.4	100.0	100.0	100.0	100.0	100.0	52.0	93.7
<b>EUf (%)</b>	0.0	0.0	3.3	0.0	0.0	21.8	0.0	0.0	0.0	0.0	0.0	44.3	5.8
<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	44.3	3.8
<b>UCLF (%)</b>	0.0	0.0	3.4	0.0	0.0	21.8	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1966  
**Date of First Criticality:** 31 Jan 1971  
**Date of Grid Connection:** 22 Jul 1971  
**Date of Commercial Operation:** 16 Nov 1971

**Lifetime Generation:** 137869.9 GW(e).h  
**Cumulative Energy Availability Factor:** 68.9%  
**Cumulative Load Factor:** 62.5%  
**Cumulative Unit Capability Factor:** 77.2%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	3896.4	773.0	64.3	67.5	63.8	64.2	57.5	59.0	5562	63.5
1983	4159.7	773.0	73.1	67.9	73.1	64.9	61.4	59.2	6401	73.1
1984	2135.5	773.0	37.7	65.6	37.7	62.8	31.5	57.1	3309	37.7
1985	4401.3	773.0	75.6	66.3	75.6	63.7	65.0	57.6	6618	75.5
1986	1498.3	773.0	28.1	63.8	28.1	61.4	22.1	55.3	2456	28.0
1987	4395.5	773.0	75.3	64.5	75.3	62.2	64.9	55.9	6591	75.2
1988	4168.4	773.0	71.5	64.9	71.5	62.8	61.4	56.2	6278	71.5
1989	5119.5	773.0	82.6	65.9	82.6	63.9	75.6	57.3	7235	82.6
1990	5149.8	773.0	83.0	66.8	83.0	64.9	76.1	58.3	7272	83.0
1991	2584.2	773.0	59.9	66.5	59.9	64.6	38.2	57.3	5247	59.9
1992	3077.1	773.0	61.1	66.2	61.1	64.5	45.3	56.7	5364	61.1
1993	4969.0	773.0	80.4	66.8	80.4	65.2	73.4	57.5	7040	80.4
1994	1666.4	773.0	34.4	65.4	34.3	63.8	24.6	56.0	3009	34.3
1995	3477.3	773.0	59.5	65.2	59.5	63.7	51.4	55.8	5209	59.5
1996	2962.1	773.0	48.9	64.5	48.9	63.1	43.6	55.4	4273	48.6
1997	4046.2	773.0	68.5	64.7	68.6	63.3	59.8	55.5	5900	67.4
1998	6234.6	773.0	93.1	65.7	93.1	64.4	92.1	56.9	8157	93.1
1999	6130.0	773.0	91.1	66.6	91.1	65.3	90.5	58.1	7978	91.1
2000	6365.1	773.0	93.8	67.6	93.8	66.3	93.7	59.3	8243	93.8
2001	6466.0	773.0	95.4	68.5	95.4	67.3	95.5	60.5	8359	95.4
2002	6060.9	792.0	90.5	69.2	90.5	68.0	87.4	61.4	7915	90.4
2003	6963.9	850.0	94.2	70.1	94.2	68.9	93.5	62.5	8206	93.7

## US-249 DRESDEN-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
29 Mar	27.0	21.2	UF1	A11	A PNEUMATIC LEAK WAS IDENTIFIED IN THE DRYWELL. THE LEAK COULD NOT BE REPAIRED WITH THE PLANT ONLINE. RX REMAINED CRITICAL.
11 Jun	170.0	133.3	UF1	A41	HYDROGEN LEAK WAS DETECTED ON THE GENERATOR STATOR COOLING SYSTEM. THE LEAK WAS REPAIRED AND THE UNIT RETURNED TO SERVICE.
06 Dec	357.0	279.9	PF	D16	MAINTENANCE OUTAGE TO PERFORM MODIFICATIONS TO THE STEAM DRYER.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		197			743	
B. Refuelling without a maintenance					27	
C. Inspection, maintenance or repair combined with refuelling				1478		
D. Inspection, maintenance or repair without refuelling	357			76		
E. Testing of plant systems or components				1	6	
H. Nuclear regulatory requirements				10	1	1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				10	11	1
Subtotal	357	197	0	1575	788	2
Total		554			2365	

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	27	7
12. Reactor I&C Systems		20
13. Reactor Auxiliary Systems		3
14. Safety Systems		63
15. Reactor Cooling Systems		62
17. Safety I&C Systems (excluding reactor I&C)		74
31. Turbine and auxiliaries		214
32. Feedwater and Main Steam System		70
33. Circulating Water System		7
35. All other I&C Systems		2
41. Main Generator Systems	170	13
42. Electrical Power Supply Systems		100
XX. Miscellaneous Systems		79
Total	197	714

# US-331 DUANE ARNOLD-1

**Operator:** NUCMAN (NUCLEAR MANAGEMENT CO.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 565.0 MW(e)  
**Design Net Capacity:** 538.0 MW(e)  
**Design Discharge Burnup:** 16600 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3998.6 GW(e).h  
**Energy Availability Factor:** 83.8%  
**Load Factor:** 80.8%  
**Operating Factor:** 82.3%  
**Energy Unavailability Factor:** 16.2%  
**Total Off-line Time:** 1551 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	426.1	177.1	316.2	132.6	428.2	412.4	421.2	419.0	414.5	428.8	51.9	370.4	3998.6
<b>EAF (%)</b>	100.0	52.4	73.3	42.9	100.0	100.0	100.0	100.0	100.0	100.0	41.8	90.0	83.8
<b>UCF (%)</b>	100.0	52.4	73.3	42.9	100.0	100.0	100.0	100.0	100.0	100.0	41.8	90.0	83.8
<b>LF (%)</b>	101.4	46.7	75.2	32.6	101.9	101.4	100.2	99.7	101.9	101.9	12.8	88.1	80.8
<b>OF (%)</b>	100.0	48.2	74.1	34.5	100.0	100.0	100.0	100.0	100.0	100.0	38.8	86.8	82.3
<b>EUf (%)</b>	0.0	47.6	26.7	57.1	0.0	0.0	0.0	0.0	0.0	0.0	58.2	10.0	16.2
<b>PUf (%)</b>	0.0	0.0	26.7	57.1	0.0	0.0	0.0	0.0	0.0	0.0	32.3	0.0	9.6
<b>UCLF (%)</b>	0.0	47.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.0	10.0	6.6
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1970  
**Date of First Criticality:** 23 Mar 1974  
**Date of Grid Connection:** 19 May 1974  
**Date of Commercial Operation:** 01 Feb 1975

**Lifetime Generation:** 94112.9 GW(e).h  
**Cumulative Energy Availability Factor:** 75.2%  
**Cumulative Load Factor:** 70.5%  
**Cumulative Unit Capability Factor:** 77.1%  
**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	2280.4	515.0	74.2	61.3	74.2	61.1	50.5	53.2	6543	74.7
1983	2324.3	515.0	61.8	61.4	61.8	61.2	51.5	53.0	5503	62.8
1984	2717.6	515.0	72.2	62.6	72.2	62.4	60.1	53.8	6402	72.9
1985	1940.5	515.0	52.6	61.6	52.6	61.4	43.0	52.7	4711	53.8
1986	3192.8	515.0	81.5	63.4	81.5	63.2	70.8	54.3	7495	85.6
1987	2546.6	515.0	62.0	63.3	62.0	63.1	56.4	54.5	5513	62.9
1988	3520.2	520.0	72.3	64.0	72.3	63.9	77.1	56.3	7128	81.1
1989	3143.6	536.0	62.5	63.9	62.4	63.7	67.0	57.1	6561	74.9
1990	3021.0	538.0	74.7	64.6	74.7	64.5	64.1	57.5	6498	74.2
1991	4146.8	532.0	93.9	66.5	93.9	66.4	89.0	59.6	8217	93.8
1992	3434.6	515.0	80.5	67.3	80.5	67.2	75.9	60.5	7112	81.0
1993	3241.4	515.0	76.6	67.8	76.5	67.7	71.8	61.1	6755	77.1
1994	4108.4	515.0	92.0	69.1	92.0	69.0	91.1	62.7	8078	92.2
1995	3737.0	515.0	82.4	69.7	82.4	69.7	82.8	63.7	7253	82.8
1996	3938.5	520.0	89.9	70.7	89.9	70.6	86.2	64.8	7906	90.0
1997	4155.5	520.0	92.7	71.7	92.7	71.6	91.2	66.0	8125	92.8
1998	3839.2	520.0	85.2	72.3	85.2	72.2	84.3	66.8	7477	85.4
1999	3649.0	520.0	83.0	72.7	83.0	72.7	80.1	67.3	7267	83.0
2000	4455.7	520.0	97.4	73.7	97.4	73.7	97.5	68.6	8553	97.4
2001	3860.6	523.0	85.4	74.2	85.4	74.1	84.3	69.2	7473	85.3
2002	4581.1	563.0	95.1	75.0	93.6	74.9	92.9	70.1	8147	93.0
2003	3998.6	565.0	83.8	75.4	83.8	75.2	80.8	70.5	7209	82.3

# US-331 DUANE ARNOLD-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Feb	347.5	180.7	UF	A32	CONDENSER TUBE PUNCTURE DUE TO IMPACT FROM A FAILED DEFLECTOR PLATE.
23 Mar	662.7	344.6	PF	C21	REFUELING OUTAGE.
03 Nov	86.4	44.9	PF	D32	CONDENSER TUBE LEAK REPAIR.
07 Nov	59.4	30.9	UF	A13	REACTOR WATER CONDUCTIVITY INCREASE DUE TO RESIN INTRUSION - LER PENDING.
18 Nov	166.0	86.3	PF	D32	REPAIR CONDENSER IN LEAKAGE.
25 Nov	225.8	117.4	UF	A32	DEGRADING CONDENSER VACUUM DUE TO AIR IN LEAKAGE LER PENDING.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		632			465	
B. Refuelling without a maintenance					51	
C. Inspection, maintenance or repair combined with refuelling	662			921		
D. Inspection, maintenance or repair without refuelling	252			261	0	
E. Testing of plant systems or components				24	3	
H. Nuclear regulatory requirements				54	21	11
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				10	48	5
Subtotal	914	632	0	1270	588	16
Total		1546			1874	

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

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		5
13. Reactor Auxiliary Systems	59	12
14. Safety Systems		20
15. Reactor Cooling Systems		273
17. Safety I&C Systems (excluding reactor I&C)		7
31. Turbine and auxiliaries		51
32. Feedwater and Main Steam System	573	22
35. All other I&C Systems		2
41. Main Generator Systems		7
42. Electrical Power Supply Systems		22
XX. Miscellaneous Systems		2
Total	632	423

# US-341 ENRICO FERMI-2

**Operator:** DETED (DETROIT EDISON CO.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1089.0 MW(e)  
**Design Net Capacity:** 1093.0 MW(e)  
**Design Discharge Burnup:** 23500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8127.8 GW(e).h  
**Energy Availability Factor:** 85.3%  
**Load Factor:** 85.2%  
**Operating Factor:** 85.4%  
**Energy Unavailability Factor:** 14.7%  
**Total Off-line Time:** 1281 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	792.7	739.5	716.3	0.0	515.1	794.2	815.0	649.5	636.7	829.6	808.1	831.1	8127.8
<b>EAF (%)</b>	96.5	100.0	90.1	0.0	70.7	100.0	100.0	82.2	83.3	100.0	100.0	100.0	85.3
<b>UCF (%)</b>	96.5	100.0	90.1	0.0	70.7	100.0	100.0	82.2	83.3	100.0	100.0	100.0	85.3
<b>LF (%)</b>	97.8	101.0	88.4	0.0	63.6	101.3	100.6	80.2	81.2	102.3	103.1	102.6	85.2
<b>OF (%)</b>	96.5	100.0	90.9	0.0	70.4	100.0	100.0	82.5	83.6	100.0	100.0	100.0	85.4
<b>EUF (%)</b>	3.5	0.0	9.9	100.0	29.3	0.0	0.0	17.8	16.7	0.0	0.0	0.0	14.7
<b>PUF (%)</b>	0.0	0.0	9.9	100.0	29.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5
<b>UCLF (%)</b>	3.5	0.0	0.0	0.0	0.0	0.0	0.0	17.8	16.7	0.0	0.0	0.0	3.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1969  
**Date of First Criticality:** 21 Jun 1985  
**Date of Grid Connection:** 21 Sep 1986  
**Date of Commercial Operation:** 23 Jan 1988

**Lifetime Generation:** 104597.4 GW(e).h  
**Cumulative Energy Availability Factor:** 74.2%  
**Cumulative Load Factor:** 70.7%  
**Cumulative Unit Capability Factor:** 78.2%  
**Cumulative Energy Unavailability Factor:** 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 (%)
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	79.2	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	71.8	64.7	71.7	64.7	58.8	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	70.4	64.7	63.7	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	100.2	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	74.3	85.3	74.2	85.2	70.7	7479	85.4



## US-341 ENRICO FERMI-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	25.4	28.2	UF3	A12	CONTD OF FORCED OUTAGE DUE TO INSTRUMENT POWER SUPPLY MODULAR POWER UNIT 3 VOLTAGE REGULATOR FAILURE.
29 Mar	1006.8	1118.6	PF	C21	REFUELLING OUTAGE.
14 Aug	129.5	143.9	UF4	J42	AUTOMATIC REACTOR SCRAM ON TURBINE CONTROL VALVE FAST CLOSURE SIGNAL FOLLOWING A LOSS OF OFFSITE POWER DUE TO REGIONAL TRANSMISSION GRID FAILURE.
05 Sep	118.0	131.1	UF2	A13	REACTOR SHUTDOWN TO REPAIR PRESSURE SEAL LEAK ON REACTOR WATER CLEANUP SYSTEM RETURN CHECK VALVE G3300F120.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		143		13	1225	
B. Refuelling without a maintenanc					12	
C. Inspection, maintenance or repair combined with refuelling	1006			644		
D. Inspection, maintenance or repair without refuelling				247	2	
H. Nuclear regulatory requirement					3	
J. Grid failure or grid unavailabilit		129				
K. Load-following (frequency contro reserve shutdown due to reduced energ demand)					1	
Subtotal	1006	272	0	904	1243	0
Total		1278			2147	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	25	29
13. Reactor Auxiliary System:	118	66
14. Safety Systems		21
15. Reactor Cooling System:		27
17. Safety I&C Systems (excluding reactor I&C		26
31. Turbine and auxiliaries:		619
32. Feedwater and Main Steam Syster		7
33. Circulating Water System:		3
35. All other I&C Systems:		21
41. Main Generator System:		207
42. Electrical Power Supply System:		122
XX. Miscellaneous Systems:		70
Total	143	1218

# US-348 FARLEY-1

**Operator:** SOUTH (Southern Nuclear Operating Co.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 830.0 MW(e)  
**Design Net Capacity:** 829.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6609.9 GW(e).h  
**Energy Availability Factor:** 90.3%  
**Load Factor:** 90.9%  
**Operating Factor:** 90.3%  
**Energy Unavailability Factor:** 9.7%  
**Total Off-line Time:** 851 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	633.5	570.1	557.6	0.0	513.8	602.1	620.0	620.1	606.9	633.5	613.7	638.6	6609.9
<b>EAF (%)</b>	100.0	100.0	90.3	0.0	92.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.3
<b>UCF (%)</b>	100.0	100.0	90.3	0.0	92.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.3
<b>LF (%)</b>	102.6	102.2	90.3	0.0	83.2	100.7	100.4	100.4	101.6	102.4	102.7	103.4	90.9
<b>OF (%)</b>	100.0	100.0	90.3	0.0	91.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.3
<b>EUf (%)</b>	0.0	0.0	9.7	100.0	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.7
<b>PUf (%)</b>	0.0	0.0	9.7	100.0	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.7
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1970      **Lifetime Generation:** 149025.8 GW(e).h  
**Date of First Criticality:** 09 Aug 1977      **Cumulative Energy Availability Factor:** 81.3%  
**Date of Grid Connection:** 18 Aug 1977      **Cumulative Load Factor:** 79.2%  
**Date of Commercial Operation:** 01 Dec 1977      **Cumulative Unit Capability Factor:** 77.2%  
**Cumulative Energy Unavailability Factor:** 18.7%

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 (%)
1982	5233.3	804.0	79.3	60.1	79.3	59.2	74.3	56.3	6936	79.2
1983	5268.6	804.0	77.7	63.0	77.7	62.3	74.8	59.4	6832	78.0
1984	5432.7	804.0	78.5	65.2	78.5	64.6	76.9	61.9	6920	78.8
1985	5868.7	816.0	84.3	67.6	84.3	67.0	82.1	64.4	7378	84.2
1986	5738.6	827.0	82.4	69.2	82.4	68.8	79.2	66.1	7247	82.7
1987	6444.9	825.0	93.7	71.7	93.7	71.3	89.2	68.4	8201	93.6
1988	5908.2	813.0	83.8	72.8	83.8	72.4	82.7	69.7	7363	83.8
1989	6022.6	824.0	86.0	73.9	86.0	73.6	83.4	70.9	7520	85.8
1990	6908.6	824.0	99.1	75.9	99.1	75.6	95.7	72.8	8681	99.1
1991	5416.1	814.0	78.9	76.1	78.4	75.8	76.0	73.0	6870	78.4
1992	5667.9	812.0	81.0	76.4	81.0	76.1	79.5	73.4	7119	81.0
1993	6873.9	812.0	97.3	77.7	97.3	77.4	96.6	74.9	8522	97.3
1994	6059.8	812.0	86.1	78.2	86.1	77.9	85.2	75.5	7546	86.1
1995	5752.0	812.0	82.4	78.4	82.4	78.2	80.9	75.8	7220	82.4
1996	7142.3	812.0	99.5	79.5	99.5	79.3	100.1	77.1	8740	99.5
1997	5434.0	821.0	77.7	79.5	77.7	79.2	75.6	77.0	6803	77.7
1998	5237.9	822.0	74.8	79.2	74.8	79.0	72.7	76.8	6539	74.6
1999	7226.5	847.0	99.3	80.2	99.3	80.0	97.4	77.8	8695	99.3
2000	5204.1	828.0	76.8	80.0	76.8	79.8	71.6	77.5	6775	77.1
2001	6392.5	833.0	88.3	80.4	88.3	80.2	87.6	77.9	7736	88.3
2002	7221.8	833.0	98.7	81.1	98.7	80.9	99.0	78.8	8641	98.6
2003	6609.9	830.0	90.3	81.5	90.3	81.3	90.9	79.2	7909	90.3

# US-348 FARLEY-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
29 Mar	851.1	709.0	PF	C21	REFUELING OUTAGE.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1977 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					271	
B. Refuelling without a maintenance					16	
C. Inspection, maintenance or repair combined with refuelling	851			1118		
D. Inspection, maintenance or repair without refuelling				74		
E. Testing of plant systems or components				2	0	
H. Nuclear regulatory requirements					9	13
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					3	6
Subtotal	851	0	0	1194	299	19
Total		851			1512	

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

System	2003 Hours Lost	1977 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		10
13. Reactor Auxiliary Systems		1
14. Safety Systems		4
15. Reactor Cooling Systems		8
16. Steam generation systems		19
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		127
32. Feedwater and Main Steam System		18
35. All other I&C Systems		1
41. Main Generator Systems		6
42. Electrical Power Supply Systems		64
XX. Miscellaneous Systems		1
Total	0	262

# US-364 FARLEY-2

**Operator:** SOUTH (Southern Nuclear Operating Co.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 839.0 MW(e)  
**Design Net Capacity:** 829.0 MW(e)  
**Design Discharge Burnup:** 15200 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7379.4 GW(e).h  
**Energy Availability Factor:** 99.2%  
**Load Factor:** 100.4%  
**Operating Factor:** 99.2%  
**Energy Unavailability Factor:** 0.8%  
**Total Off-line Time:** 73 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	645.1	580.2	639.0	614.5	626.1	605.1	585.5	621.1	605.5	635.3	577.1	645.0	7379.4
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	95.7	100.0	100.0	100.0	94.5	100.0	99.2
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	95.7	100.0	100.0	100.0	94.5	100.0	99.2
<b>LF (%)</b>	103.3	102.9	102.4	101.9	100.3	100.2	93.8	99.5	100.2	101.6	95.5	103.3	100.4
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	95.6	100.0	100.0	100.0	94.4	100.0	99.2
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.0	5.5	0.0	0.8
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0	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	5.5	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1970  
**Date of First Criticality:** 05 May 1981  
**Date of Grid Connection:** 25 May 1981  
**Date of Commercial Operation:** 30 Jul 1981

**Lifetime Generation:** 135898.4 GW(e).h  
**Cumulative Energy Availability Factor:** 86.1%  
**Cumulative Load Factor:** 83.4%  
**Cumulative Unit Capability Factor:** 77.4%  
**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 (%)
1982	5311.3	814.0	79.4	79.4	79.4	79.4	74.5	74.5	6931	79.1
1983	5984.1	814.0	87.7	83.6	87.7	83.6	83.9	79.2	7696	87.9
1984	6618.9	814.0	94.4	87.2	94.2	87.1	92.6	83.7	8276	94.2
1985	5474.2	809.0	77.8	84.9	77.4	84.7	77.2	82.1	6813	77.8
1986	5959.9	829.0	85.2	84.9	85.2	84.8	82.1	82.1	7455	85.1
1987	4910.4	824.0	73.0	82.9	73.0	82.8	68.0	79.7	6396	73.0
1988	6550.4	823.0	100.0	85.4	90.6	85.3	90.6	81.3	8039	91.5
1989	5621.6	830.0	80.5	84.8	80.5	84.7	77.3	80.8	7037	80.3
1990	5277.0	828.0	71.8	83.3	71.8	83.2	72.8	79.9	6478	73.9
1991	6739.9	824.0	96.0	84.6	95.6	84.5	93.4	81.2	8376	95.6
1992	5409.9	824.0	79.5	84.1	79.5	84.0	74.7	80.6	6987	79.5
1993	5248.5	822.0	75.8	83.4	75.8	83.3	72.9	80.0	6644	75.8
1994	7147.2	822.0	98.9	84.6	98.9	84.5	99.3	81.5	8660	98.9
1995	5091.4	822.0	79.7	84.3	79.7	84.2	70.7	80.7	6984	79.7
1996	5741.3	822.0	81.5	84.1	81.5	84.0	79.5	80.6	7160	81.5
1997	7280.9	822.0	100.0	85.1	100.0	85.0	101.1	81.9	8760	100.0
1998	6271.4	824.0	85.8	85.1	85.8	85.1	86.9	82.2	7514	85.8
1999	5356.2	852.0	82.7	85.0	82.7	84.9	71.8	81.6	7242	82.7
2000	7362.6	839.0	99.5	85.8	99.4	85.7	99.9	82.6	8736	99.5
2001	5777.7	842.0	79.0	85.4	79.0	85.4	78.3	82.4	6921	79.0
2002	6463.4	842.0	87.7	85.5	87.7	85.5	87.6	82.6	7682	87.7
2003	7379.4	839.0	99.2	86.2	99.2	86.1	100.4	83.4	8687	99.2

## US-364 FARLEY-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
25 Jul	32.2	27.1	PF	D41	THE UNIT WAS REMOVED FROM THE GRID FOR A PLANNED REPAIR OF A MAIN GENERATOR HYDROGEN LEAK.
10 Nov	39.6	33.3	UF4	A12	REACTOR TRIP DUE TO REACTOR PROTECTION SYSTEM INDICATING A REACTOR COOLANT PUMP TRIP.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		39			182	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling				917		
D. Inspection, maintenance or repair without refuelling	32			29		
E. Testing of plant systems or component				9		
J. Grid failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				10	5	3
Subtotal	32	39	0	965	201	3
Total		71			1169	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	39	20
13. Reactor Auxiliary System:		11
14. Safety Systems		24
15. Reactor Cooling System:		55
16. Steam generation system:		21
17. Safety I&C Systems (excluding reactor I&C)		4
31. Turbine and auxiliaries:		17
32. Feedwater and Main Steam System		8
35. All other I&C Systems:		1
41. Main Generator System:		6
42. Electrical Power Supply System:		1
Total	39	168

# US-333 FITZPATRICK

**Operator:** ENTERGY (ENTERGY NUCLEAR)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 813.0 MW(e)  
**Design Net Capacity:** 821.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6966.0 GW(e).h  
**Energy Availability Factor:** 96.2%  
**Load Factor:** 97.8%  
**Operating Factor:** 96.3%  
**Energy Unavailability Factor:** 3.8%  
**Total Off-line Time:** 325 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	607.1	477.7	440.4	609.1	628.6	606.6	620.6	533.7	581.7	628.3	602.3	629.9	6966.0
<b>EAF (%)</b>	100.0	90.0	76.1	100.0	100.0	100.0	100.0	88.1	100.0	100.0	100.0	100.0	96.2
<b>UCF (%)</b>	100.0	90.0	76.1	100.0	100.0	100.0	100.0	88.1	100.0	100.0	100.0	100.0	96.2
<b>LF (%)</b>	100.4	87.4	72.8	104.2	103.9	103.6	102.6	88.2	99.4	103.7	102.9	104.1	97.8
<b>OF (%)</b>	100.0	90.2	76.7	100.0	100.0	100.0	100.0	88.4	100.0	100.0	100.0	100.0	96.3
<b>EUf (%)</b>	0.0	10.0	23.9	0.0	0.0	0.0	0.0	11.9	0.0	0.0	0.0	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	10.0	23.9	0.0	0.0	0.0	0.0	11.9	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1968      **Lifetime Generation:** 138456.3 GW(e).h  
**Date of First Criticality:** 17 Nov 1974      **Cumulative Energy Availability Factor:** 73.1%  
**Date of Grid Connection:** 01 Feb 1975      **Cumulative Load Factor:** 70.4%  
**Date of Commercial Operation:** 28 Jul 1975      **Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	4959.7	810.0	75.3	64.4	75.3	64.3	69.9	61.2	6570	75.0
1983	4634.3	810.0	70.7	65.2	70.7	65.2	65.3	61.7	6183	70.6
1984	4899.4	810.0	76.9	66.6	76.9	66.5	68.9	62.5	6745	76.8
1985	4166.5	810.0	64.1	66.3	64.1	66.3	58.7	62.1	5576	63.7
1986	6015.6	797.0	90.5	68.5	90.5	68.5	86.2	64.3	7931	90.5
1987	4198.3	795.0	67.1	68.4	67.1	68.4	60.3	64.0	5891	67.2
1988	4356.9	780.0	66.5	68.3	66.5	68.2	63.6	64.0	5844	66.5
1989	6155.3	757.0	90.3	69.8	90.3	69.7	92.8	65.9	7944	90.7
1990	4601.9	782.0	68.4	69.7	68.4	69.6	67.2	66.0	6045	69.0
1991	3376.8	780.0	56.0	68.8	56.0	68.8	49.4	65.0	4534	51.8
1992	0.0	780.0	0.0	64.8	0.0	64.8	0.0	61.2	0	0.0
1993	4746.5	780.0	71.6	65.2	71.6	65.2	69.5	61.7	6301	71.9
1994	4972.6	774.0	81.9	66.0	81.9	66.0	73.3	62.3	7224	82.5
1995	4804.0	777.0	71.6	66.3	71.6	66.3	70.6	62.7	6336	72.3
1996	5290.4	765.0	79.3	66.9	79.2	66.9	78.7	63.4	7036	80.1
1997	6624.6	799.0	96.3	68.3	94.9	68.2	94.6	64.9	8310	94.9
1998	4930.5	785.0	75.2	68.6	75.2	68.5	71.7	65.2	6613	75.5
1999	6567.4	799.0	93.5	69.7	93.5	69.6	93.8	66.4	8205	93.7
2000	6024.8	813.0	86.6	70.3	86.6	70.3	84.4	67.1	7617	86.7
2001	7090.5	813.0	98.6	71.5	98.6	71.4	99.6	68.4	8639	98.6
2002	6595.0	813.0	92.4	72.3	92.4	72.2	92.6	69.3	8112	92.6
2003	6966.0	813.0	96.2	73.2	96.2	73.1	97.8	70.4	8435	96.3

## US-366 HATCH-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Mar	701.4	610.2	PF	C21	REFUELING OUTAGE.
30 Mar	0.2	0.2	PF	E31	SHIFT MANUALLY TRIPPED THE MAIN TURBINE FOR TESTING.
21 Jun	5.8	5.0	UF	A41	MAIN GENERATOR WAS REMOVED FROM THE GRID TO REPAIR A LEAK ON A FILTER IN THE STATOR COOLING WATER SYSTEM. THE LEAK WAS REPAIRED AND THE MAIN GENERATOR WAS RE-TIED TO THE GRID.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1978 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		5			254	
B. Refuelling without a maintenance					50	
C. Inspection, maintenance or repair combined with refuelling	701			1147		
D. Inspection, maintenance or repair without refuelling				142	2	
E. Testing of plant systems or components	0			12	103	
H. Nuclear regulatory requirements				3		6
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				0	47	
Subtotal	701	5	0	1304	456	6
Total		706			1766	

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

System	2003 Hours Lost	1978 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		7
12. Reactor I&C Systems		18
14. Safety Systems		6
15. Reactor Cooling Systems		62
21. Fuel Handling and Storage Facilities		31
31. Turbine and auxiliaries		30
32. Feedwater and Main Steam System		45
33. Circulating Water System		2
41. Main Generator Systems	5	30
42. Electrical Power Supply Systems		16
Total	5	247

# US-333 FITZPATRICK

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
21 Feb	65.1	54.7	UF	K99	N/A
19 Mar	172.1	144.5	UF	A32	FORCED SHUTDOWN TO REPAIR A STEAM LEAK IN THE FEEDWATER SYSTEM.
14 Aug	86.0	72.2	UF	A42	SCRAM WAS CAUSED BY GRID INSTABILITY.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1975 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		258			463	
B. Refuelling without a maintenance					64	
C. Inspection, maintenance or repair combined with refuelling				1267		
D. Inspection, maintenance or repair without refuelling				273		
E. Testing of plant systems or components				3	1	
H. Nuclear regulatory requirements					2	147
J. Grid failure or grid unavailability						2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)		65		5	24	4
Subtotal	0	323	0	1548	554	153
Total		323			2255	

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

System	2003 Hours Lost	1975 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		19
13. Reactor Auxiliary Systems		9
14. Safety Systems		97
15. Reactor Cooling Systems		59
31. Turbine and auxiliaries		75
32. Feedwater and Main Steam System	172	38
35. All other I&C Systems		7
41. Main Generator Systems		23
42. Electrical Power Supply Systems	86	53
XX. Miscellaneous Systems		22
Total	258	405



# US-285 FORT CALHOUN-1

**Operator:** OPPD (OMAHA PUBLIC POWER DISTRICT)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 478.0 MW(e)  
**Design Net Capacity:** 478.0 MW(e)  
**Design Discharge Burnup:** 27900 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3510.1 GW(e).h  
**Energy Availability Factor:** 86.8%  
**Load Factor:** 83.8%  
**Operating Factor:** 86.7%  
**Energy Unavailability Factor:** 13.2%  
**Total Off-line Time:** 1164 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	364.9	328.7	284.1	346.3	360.8	341.5	337.7	345.7	128.2	1.2	305.2	365.8	3510.1
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	36.9	5.9	99.4	100.0	86.8
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	36.9	5.9	99.5	100.0	86.8
<b>LF (%)</b>	102.6	102.3	79.9	100.7	101.5	99.2	95.0	97.2	37.3	0.3	88.7	102.8	83.8
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	39.6	2.7	99.4	100.0	86.7
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	63.1	94.1	0.6	0.0	13.2
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	63.1	94.1	0.6	0.0	13.2
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1968      **Lifetime Generation:** 92571.2 GW(e).h  
**Date of First Criticality:** 06 Aug 1973      **Cumulative Energy Availability Factor:** 79.1%  
**Date of Grid Connection:** 25 Aug 1973      **Cumulative Load Factor:** 74.6%  
**Date of Commercial Operation:** 20 Jun 1974      **Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	3482.1	478.0	89.8	71.2	89.8	71.2	83.2	66.2	7856	89.7
1983	2749.9	461.0	73.1	71.4	73.1	71.4	68.1	66.4	6404	73.1
1984	2331.8	478.0	60.1	70.3	60.1	70.3	55.5	65.3	5262	59.9
1985	3066.3	478.0	73.7	70.6	73.7	70.6	73.2	66.0	6454	73.7
1986	3605.6	478.0	94.3	72.6	94.3	72.6	86.1	67.8	8263	94.3
1987	3060.6	478.0	74.7	72.8	74.7	72.8	73.1	68.2	6531	74.6
1988	2627.4	478.0	74.0	72.9	74.0	72.9	62.6	67.8	6496	74.0
1989	3296.0	478.0	87.8	73.9	87.8	73.9	78.7	68.5	7589	86.6
1990	2417.2	478.0	62.1	73.1	62.1	73.1	57.7	67.8	5420	61.9
1991	3249.0	478.0	92.9	74.3	92.9	74.3	77.6	68.4	7946	90.7
1992	2537.1	478.0	64.9	73.8	64.9	73.8	60.4	68.0	5683	64.7
1993	3102.2	478.0	80.0	74.1	80.0	74.1	74.1	68.3	6996	79.9
1994	4118.7	478.0	99.5	75.4	99.5	75.4	98.4	69.8	8711	99.4
1995	3365.6	478.0	82.4	75.7	82.4	75.7	80.4	70.3	7204	82.2
1996	3128.7	478.0	78.5	75.9	78.5	75.9	74.5	70.5	6886	78.4
1997	3818.2	478.0	92.9	76.6	92.9	76.6	91.2	71.4	8131	92.8
1998	3396.6	478.0	82.2	76.8	82.2	76.9	81.1	71.8	7195	82.1
1999	3584.4	478.0	88.9	77.3	88.9	77.3	85.6	72.4	7785	88.9
2000	3898.1	478.0	93.2	78.0	93.2	78.0	92.8	73.2	8185	93.2
2001	3524.1	478.0	88.0	78.3	88.0	78.3	84.2	73.6	7702	87.9
2002	3808.5	478.0	92.0	78.8	92.1	78.8	91.0	74.2	8061	92.0
2003	3510.1	478.0	86.8	79.1	86.8	79.1	83.8	74.6	7596	86.7

# US-285 FORT CALHOUN-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
12 Sep	1160.0	552.2	PF	C21	REFUELING OUTAGE
02 Nov	4.0	1.9	PF	E41	MAIN GENERATOR OVERSPEED TESTING.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1973 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					190	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1160			1284		
D. Inspection, maintenance or repair without refuelling				73	15	
E. Testing of plant systems or components	4			32		
G. Major back-fitting, refurbishment or upgrading activities without refuelling						0
H. Nuclear regulatory requirements						5
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				6	17	0
Subtotal	1164	0	0	1395	223	5
Total		1164			1623	

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

System	2003 Hours Lost	1973 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		13
13. Reactor Auxiliary Systems		7
14. Safety Systems		16
15. Reactor Cooling Systems		56
16. Steam generation systems		5
31. Turbine and auxiliaries		18
32. Feedwater and Main Steam System		17
42. Electrical Power Supply Systems		43
XX. Miscellaneous Systems		7
Total	0	182

# US-416 GRAND GULF-1

**Operator:** ENTERGY (ENTERGY NUCLEAR)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1207.0 MW(e)  
**Design Net Capacity:** 1250.0 MW(e)  
**Design Discharge Burnup:** 28000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 10902.5 GW(e).h  
**Energy Availability Factor:** 97.9%  
**Load Factor:** 103.1%  
**Operating Factor:** 97.9%  
**Energy Unavailability Factor:** 2.1%  
**Total Off-line Time:** 186 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	913.5	834.8	958.6	725.8	939.5	910.2	945.8	943.5	905.5	951.1	918.9	955.3	10902.5
<b>EAF (%)</b>	95.0	100.0	100.0	79.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.9
<b>UCF (%)</b>	95.0	100.0	100.0	79.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.9
<b>LF (%)</b>	101.7	102.9	106.7	83.6	104.6	104.7	105.3	105.1	104.2	105.8	105.7	106.4	103.1
<b>OF (%)</b>	94.9	100.0	100.0	79.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.9
<b>EUf (%)</b>	5.0	0.0	0.0	20.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	5.0	0.0	0.0	20.6	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1974      **Lifetime Generation:** 163002.6 GW(e).h  
**Date of First Criticality:** 18 Aug 1982      **Cumulative Energy Availability Factor:** 85.9%  
**Date of Grid Connection:** 20 Oct 1984      **Cumulative Load Factor:** 86.1%  
**Date of Commercial Operation:** 01 Jul 1985      **Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1984	165.0	1192.0	0.0	0.0	87.8	100.0	1.7	0.0	702	8.4
1985	4316.4	1108.0	0.0	0.0	79.2	100.0	44.5	0.0	5042	57.6
1986	4098.1	1108.0	60.5	60.5	60.5	60.5	42.2	42.2	5326	60.8
1987	7727.0	1130.0	80.9	70.8	80.9	70.8	78.1	60.3	7098	81.0
1988	9591.0	1142.0	93.8	78.6	93.8	78.6	95.6	72.3	8250	93.9
1989	7846.3	1142.0	76.9	78.2	76.9	78.2	78.4	73.8	6815	77.8
1990	7404.0	1142.0	76.6	77.9	76.6	77.9	74.0	73.9	6765	77.2
1991	9118.7	1142.0	89.6	79.8	88.3	79.6	91.2	76.8	8035	91.7
1992	8171.1	1143.0	81.1	80.0	81.1	79.8	81.4	77.4	7163	81.5
1993	7898.5	1143.0	77.6	79.7	77.6	79.5	78.9	77.6	6845	78.1
1994	9614.8	1143.0	94.5	81.4	94.5	81.2	96.0	79.7	8284	94.6
1995	7809.7	1153.0	77.7	81.0	77.7	80.9	77.3	79.4	6829	78.0
1996	9224.7	1175.0	87.7	81.6	87.7	81.5	89.4	80.4	7696	87.6
1997	10817.6	1200.0	100.0	83.2	99.9	83.1	102.9	82.3	8760	100.0
1998	9190.8	1200.0	87.5	83.6	87.5	83.5	87.4	82.7	7641	87.2
1999	8428.4	1204.0	79.3	83.3	79.3	83.1	79.9	82.5	6944	79.3
2000	10694.6	1208.0	99.2	84.4	98.3	84.2	100.8	83.8	8634	98.3
2001	9924.0	1210.0	92.3	84.9	91.8	84.7	93.6	84.4	8040	91.8
2002	10059.5	1207.0	93.8	85.4	92.9	85.2	95.1	85.1	8139	92.9
2003	10902.5	1207.0	97.9	86.1	97.9	85.9	103.1	86.1	8574	97.9

# US-416 GRAND GULF-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
30 Jan	37.1	44.9	UF5	A32	REACTOR MANUALLY SCRAMMED WHEN A SHORT-CIRCUIT CAUSED ISOLATION OF CONDENSATE DEMINERALIZER INLET AND OUTLET VALVES, WHICH CAUSED LOSS OF CONDENSATE BOOSTER PUMPS, CONDENSATE PUMPS, AND FEED PUMPS.
24 Apr	147.8	178.8	UF4	N42	REACTOR SCRAM AT 0948 FOLLOWING PARTIAL LOSS OF OFFSITE POWER WHEN HIGH WIND CAUSED FAILURE OF DISCONNECT AND LOSS OF 500 KV LINE.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		37			262	
B. Refuelling without a maintenance					37	
C. Inspection, maintenance or repair combined with refuelling				731	23	
D. Inspection, maintenance or repair without refuelling				119	3	
E. Testing of plant systems or components				0	0	
H. Nuclear regulatory requirements					2	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					43	15
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)		147				
Subtotal	0	184	0	850	370	15
Total		184			1235	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		7
13. Reactor Auxiliary Systems		30
14. Safety Systems		2
15. Reactor Cooling Systems		48
17. Safety I&C Systems (excluding reactor I&C)		15
31. Turbine and auxiliaries		30
32. Feedwater and Main Steam System	37	17
33. Circulating Water System		3
35. All other I&C Systems		6
41. Main Generator Systems		15
42. Electrical Power Supply Systems		46
XX. Miscellaneous Systems		32
Total	37	251

# US-261 H.B. ROBINSON-2

**Operator:** PROGRESS (Progress Energy Corporation)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 710.0 MW(e)  
**Design Net Capacity:** 700.0 MW(e)  
**Design Discharge Burnup:** 25400 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6439.9 GW(e).h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 103.5%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 0 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	558.6	500.9	557.2	533.5	541.6	522.4	535.0	534.7	520.2	547.9	529.7	558.3	6439.9
<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>	105.8	105.0	105.5	104.5	102.5	102.2	101.3	101.2	101.8	103.6	103.6	105.7	103.5
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1967      **Lifetime Generation:** 142872.2 GW(e).h  
**Date of First Criticality:** 20 Sep 1970      **Cumulative Energy Availability Factor:** 75.4%  
**Date of Grid Connection:** 26 Sep 1970      **Cumulative Load Factor:** 73.8%  
**Date of Commercial Operation:** 07 Mar 1971      **Cumulative Unit Capability Factor:** 77.2%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	2268.4	665.0	47.9	74.1	47.9	71.8	38.9	66.8	4278	48.8
1983	3347.5	665.0	75.5	74.2	75.5	72.1	57.5	66.1	6609	75.4
1984	224.3	665.0	7.0	69.1	7.0	67.2	3.8	61.4	615	7.0
1985	5239.9	665.0	87.6	70.4	87.6	68.6	89.9	63.4	7697	87.9
1986	4799.6	665.0	79.7	71.0	79.7	69.3	82.4	64.6	7028	80.2
1987	4235.5	665.0	70.3	71.0	70.3	69.4	72.7	65.1	6224	71.1
1988	3182.4	665.0	64.2	70.6	64.2	69.1	54.5	64.5	5717	65.1
1989	2790.5	665.0	45.5	69.2	45.5	67.8	47.9	63.6	4107	46.9
1990	3319.2	665.0	63.1	68.9	63.1	67.6	57.0	63.2	5614	64.1
1991	4792.2	672.0	80.2	69.5	80.1	68.2	81.4	64.2	7048	80.5
1992	4062.9	683.0	66.2	69.3	66.2	68.1	67.7	64.3	5812	66.2
1993	4193.3	683.0	70.1	69.3	70.1	68.2	70.1	64.6	6137	70.1
1994	4655.1	683.0	78.2	69.7	78.2	68.6	77.8	65.2	6845	78.1
1995	5033.8	683.0	84.0	70.3	84.0	69.3	84.1	66.0	7356	84.0
1996	5460.1	683.0	88.2	71.0	88.2	70.0	91.0	67.0	7745	88.2
1997	6197.6	683.0	98.9	72.1	98.9	71.2	103.6	68.4	8662	98.9
1998	5505.6	683.0	88.5	72.7	88.5	71.8	92.0	69.3	7751	88.5
1999	5684.5	683.0	91.5	73.4	91.4	72.5	95.0	70.2	8009	91.4
2000	6237.1	683.0	99.6	74.3	99.6	73.5	104.0	71.4	8750	99.6
2001	5515.0	683.0	90.4	74.9	90.4	74.0	92.2	72.1	7919	90.4
2002	5606.1	683.0	90.9	75.4	90.9	74.6	93.7	72.8	7960	90.9
2003	6439.9	710.0	100.0	76.2	100.0	75.4	103.5	73.8	8760	100.0

## US-261 H.B. ROBINSON-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					578	
B. Refuelling without a maintenance					68	
C. Inspection, maintenance or repair combined with refuelling				1246		
D. Inspection, maintenance or repair without refuelling				46		
E. Testing of plant systems or components				0	0	
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling				2		
H. Nuclear regulatory requirements					124	19
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					42	1
Subtotal	0	0	0	1294	812	20
Total		0			2126	

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		43
13. Reactor Auxiliary Systems		3
14. Safety Systems		40
15. Reactor Cooling Systems		72
16. Steam generation systems		135
31. Turbine and auxiliaries		102
32. Feedwater and Main Steam System		43
35. All other I&C Systems		0
41. Main Generator Systems		0
42. Electrical Power Supply Systems		93
XX. Miscellaneous Systems		16
Total	0	547

# US-321 HATCH-1

**Operator:** SOUTH (Southern Nuclear Operating Co.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 856.0 MW(e)  
**Design Net Capacity:** 777.0 MW(e)  
**Design Discharge Burnup:** 19800 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7146.9 GW(e).h  
**Energy Availability Factor:** 96.3%  
**Load Factor:** 95.3%  
**Operating Factor:** 96.3%  
**Energy Unavailability Factor:** 3.7%  
**Total Off-line Time:** 322 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	651.1	578.8	649.2	300.4	599.0	620.7	639.4	632.6	618.6	606.1	614.7	636.4	7146.9
<b>EAF (%)</b>	100.0	100.0	100.0	59.9	95.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.3
<b>UCF (%)</b>	100.0	100.0	100.0	59.9	95.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.3
<b>LF (%)</b>	102.2	100.6	101.9	48.8	94.1	100.7	100.4	99.3	100.4	95.0	99.7	99.9	95.3
<b>OF (%)</b>	100.0	100.0	100.0	59.9	95.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.3
<b>EUf (%)</b>	0.0	0.0	0.0	40.1	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7
<b>PUf (%)</b>	0.0	0.0	0.0	40.1	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1968  
**Date of First Criticality:** 12 Sep 1974  
**Date of Grid Connection:** 11 Nov 1974  
**Date of Commercial Operation:** 31 Dec 1975

**Lifetime Generation:** 144987.8 GW(e).h  
**Cumulative Energy Availability Factor:** 77.7%  
**Cumulative Load Factor:** 74.9%  
**Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	2893.9	758.0	49.4	60.3	49.4	60.3	43.6	56.7	4313	49.2
1983	3968.9	764.0	71.5	61.8	71.5	61.7	59.3	57.0	6240	71.2
1984	3609.2	752.0	62.5	61.8	62.3	61.8	54.6	56.7	5473	62.3
1985	4761.4	752.0	76.5	63.3	76.5	63.3	72.3	58.3	6694	76.4
1986	3645.4	768.0	59.0	62.9	59.0	62.9	54.2	57.9	5162	58.9
1987	5080.7	750.0	80.4	64.4	80.4	64.3	77.3	59.5	7043	80.4
1988	4115.8	756.0	66.0	64.5	66.0	64.5	62.0	59.7	5802	66.1
1989	6479.7	757.0	100.0	67.0	97.7	67.0	97.7	62.4	8760	100.0
1990	4103.4	753.0	65.1	66.9	65.1	66.9	62.2	62.4	5722	65.3
1991	4707.5	741.0	74.6	67.4	74.0	67.3	72.5	63.1	6530	74.5
1992	6157.2	741.0	96.1	69.1	96.1	69.0	94.6	64.9	8444	96.1
1993	4956.7	737.0	78.4	69.6	78.4	69.5	76.8	65.5	6913	78.9
1994	5512.2	741.0	85.8	70.4	85.8	70.4	84.9	66.5	7542	86.1
1995	6465.8	741.0	100.0	71.9	99.6	71.8	99.6	68.2	8760	100.0
1996	5726.7	788.0	87.8	72.7	87.8	72.6	82.7	68.9	7666	87.3
1997	6009.0	800.0	87.9	73.4	87.9	73.4	85.7	69.7	7637	87.2
1998	6951.8	800.0	99.9	74.6	99.9	74.6	99.2	71.1	8751	99.9
1999	5968.8	808.0	82.2	75.0	82.1	74.9	84.3	71.7	7153	81.7
2000	6413.4	860.0	86.2	75.5	86.2	75.4	84.9	72.3	7530	85.7
2001	7496.2	863.0	99.1	76.5	99.1	76.5	99.2	73.4	8689	99.2
2002	6627.1	856.0	88.8	77.0	88.8	77.0	88.4	74.0	7778	88.8
2003	7146.9	856.0	96.3	77.8	96.3	77.7	95.3	74.9	8438	96.3

# US-321 HATCH-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
19 Apr	321.8	275.5	PF	D31	SHIFT MANUALLY TRIPPED THE MAIN TURBINE AND INSERTED A MANUAL SCRAM FOLLOWING A LOAD REDUCTION FROM APPROXIMATELY 44% OF RATED THERMAL POWER. THE UNIT WAS SHUTDOWN TO REPAIR AN ELECTRICAL GROUND ASSOCIATED WITH THE B REACTOR RECIRCULATION SYSTEM.
02 May	0.2	0.2	PF	E41	SHIFT MANUALLY TRIPPED THE MAIN TURBINE FOR TESTING OF THE MAIN GENERATOR REVERSE POWER RELAY.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1976 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					422	0
B. Refuelling without a maintenance					24	
C. Inspection, maintenance or repair combined with refuelling				1243		
D. Inspection, maintenance or repair without refuelling	321			94	0	
E. Testing of plant systems or components	0			0	3	
H. Nuclear regulatory requirements						0
J. Grid failure or grid unavailability						2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				3	58	
<b>Subtotal</b>	<b>321</b>	<b>0</b>	<b>0</b>	<b>1340</b>	<b>507</b>	<b>2</b>
<b>Total</b>		<b>321</b>			<b>1849</b>	

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

System	2003 Hours Lost	1976 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		23
13. Reactor Auxiliary Systems		53
14. Safety Systems		41
15. Reactor Cooling Systems		57
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		77
32. Feedwater and Main Steam System		77
33. Circulating Water System		1
35. All other I&C Systems		10
41. Main Generator Systems		34
42. Electrical Power Supply Systems		17
XX. Miscellaneous Systems		11
<b>Total</b>	<b>0</b>	<b>404</b>



# US-366 HATCH-2

**Operator:** SOUTH (Southern Nuclear Operating Co.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 870.0 MW(e)  
**Design Net Capacity:** 784.0 MW(e)  
**Design Discharge Burnup:** 16780 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6962.5 GW(e).h  
**Energy Availability Factor:** 91.9%  
**Load Factor:** 91.1%  
**Operating Factor:** 91.9%  
**Energy Unavailability Factor:** 8.1%  
**Total Off-line Time:** 708 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	655.0	581.1	11.8	621.3	641.2	605.5	637.5	640.6	622.1	650.6	630.3	665.5	6962.5
<b>EAF (%)</b>	100.0	100.0	5.7	100.0	100.0	99.2	100.0	100.0	100.0	100.0	100.0	100.0	91.9
<b>UCF (%)</b>	100.0	100.0	5.7	100.0	100.0	99.2	100.0	100.0	100.0	100.0	100.0	100.0	91.9
<b>LF (%)</b>	101.2	99.4	1.8	99.3	99.1	96.7	98.5	99.0	99.3	100.4	99.1	101.3	91.1
<b>OF (%)</b>	100.0	100.0	5.6	100.0	100.0	99.2	100.0	100.0	100.0	100.0	100.0	100.0	91.9
<b>EUF (%)</b>	0.0	0.0	94.3	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	8.1
<b>PUF (%)</b>	0.0	0.0	94.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.8	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1972      **Lifetime Generation:** 129173.3 GW(e).h  
**Date of First Criticality:** 04 Jul 1978      **Cumulative Energy Availability Factor:** 79.6%  
**Date of Grid Connection:** 22 Sep 1978      **Cumulative Load Factor:** 75.6%  
**Date of Commercial Operation:** 05 Sep 1979      **Cumulative Unit Capability Factor:** 77.3%  
**Cumulative Energy Unavailability Factor:** 20.4%

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	3734.2	771.0	63.9	67.9	63.9	67.3	55.3	58.6	5588	63.8
1983	3817.2	771.0	66.1	67.4	66.1	67.0	56.5	58.1	5774	65.9
1984	1893.5	748.0	26.7	59.5	26.7	59.1	28.8	52.4	2833	32.3
1985	5376.1	748.0	82.7	63.3	82.6	62.9	82.0	57.2	7239	82.6
1986	3618.7	777.0	70.4	64.3	70.4	64.0	53.2	56.6	6169	70.4
1987	5755.6	761.0	95.7	68.2	95.7	68.0	86.3	60.3	8388	95.8
1988	4254.5	768.0	65.7	67.9	65.7	67.7	63.1	60.6	5917	67.4
1989	4147.2	768.0	68.6	68.0	68.6	67.8	61.6	60.7	6155	70.3
1990	6527.8	766.0	98.7	70.8	98.7	70.6	97.3	64.0	8649	98.7
1991	4932.2	761.0	74.4	71.1	74.4	70.9	74.0	64.9	6656	76.0
1992	4692.4	764.0	74.5	71.3	74.5	71.2	69.9	65.3	6668	75.9
1993	4999.7	757.0	87.5	72.5	87.4	72.3	75.4	66.0	7734	88.3
1994	5275.6	765.0	85.2	73.3	85.2	73.2	78.7	66.8	7534	86.0
1995	5055.5	768.0	77.5	73.6	77.4	73.5	75.1	67.3	6888	78.6
1996	7021.7	809.0	98.4	75.1	98.4	75.0	98.8	69.3	8639	98.3
1997	6033.6	818.0	86.4	75.8	86.4	75.7	84.2	70.2	7560	86.3
1998	5829.9	821.0	82.8	76.2	82.8	76.1	81.1	70.8	7247	82.7
1999	7073.6	855.0	93.3	77.1	93.3	77.0	94.4	72.1	8173	93.3
2000	6900.3	873.0	89.7	77.8	89.6	77.7	90.0	73.0	7884	89.8
2001	6584.5	878.0	86.3	78.2	86.3	78.1	85.6	73.7	7618	87.0
2002	7423.3	870.0	97.3	79.1	97.3	79.1	97.4	74.8	8544	97.5
2003	6962.5	872.0	91.9	79.7	91.9	79.6	91.1	75.6	8052	91.9

# US-354 HOPE CREEK-1

**Operator:** PSEG (PUBLIC SERVICE ELECTRIC & GAS CO.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1049.0 MW(e)  
**Design Net Capacity:** 1067.0 MW(e)  
**Design Discharge Burnup:** 28500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7260.6 GW(e).h  
**Energy Availability Factor:** 81.5%  
**Load Factor:** 79.0%  
**Operating Factor:** 81.5%  
**Energy Unavailability Factor:** 18.5%  
**Total Off-line Time:** 1623 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	791.3	718.8	409.8	352.7	389.8	743.3	785.2	781.9	480.5	641.2	761.7	404.4	7260.6
<b>EAF (%)</b>	100.0	100.0	61.6	46.6	58.3	100.0	100.0	100.0	66.4	88.7	100.0	57.4	81.5
<b>UCF (%)</b>	100.0	100.0	61.6	46.6	58.3	100.0	100.0	100.0	66.4	88.7	100.0	57.4	81.5
<b>LF (%)</b>	101.4	102.0	52.5	46.8	49.9	98.4	100.6	100.2	63.6	82.1	100.8	51.8	79.0
<b>OF (%)</b>	100.0	100.0	61.6	49.4	55.6	100.0	100.0	100.0	66.4	88.7	100.0	57.4	81.5
<b>EU (%)</b>	0.0	0.0	38.4	53.4	41.7	0.0	0.0	0.0	33.6	11.3	0.0	42.6	18.5
<b>PU (%)</b>	0.0	0.0	22.6	53.4	41.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.8
<b>UCLF (%)</b>	0.0	0.0	15.9	0.0	0.0	0.0	0.0	0.0	33.6	11.3	0.0	42.6	8.7
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Mar 1976      **Lifetime Generation:** 127009.7 GW(e).h  
**Date of First Criticality:** 28 Jun 1986      **Cumulative Energy Availability Factor:** 84.8%  
**Date of Grid Connection:** 01 Aug 1986      **Cumulative Load Factor:** 82.2%  
**Date of Commercial Operation:** 20 Dec 1986      **Cumulative Unit Capability Factor:** 78.1%  
**Cumulative Energy Unavailability Factor:** 15.2%

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	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	97.3	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	86.0	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	1038.0	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

# US-354 HOPE CREEK-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
07 Mar	168.0	176.2	PF	D33	RECIRC PUMP SEAL REPLACEMENT.
16 Mar	118.0	123.8	UF	A31	TURBINE BYPASS VALVE.
15 Apr	693.0	727.0	PF	C21	REFUELING OUTAGE.
14 May	1.0	1.0	PF	E31	TURBINE OVERSPEED TEST REACTOR REMAINED CRITICAL.
19 Sep	242.0	253.9	UF4	A32	REACTOR SCRAM DUE TO ELECTRICAL TRANSIENT AND FEED PUMP FAILURE.
04 Oct	84.0	88.1	UF	A31	CONTROL INTERCEPT VALVE HYDRAULIC OIL LEAK
05 Dec	317.0	332.5	UF	A13	REPAIR STEAM SEAL EVAPORATOR STEAM LEAK AND REACTOR WATER CLEANUP STEAM LEAK.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		761			238	
B. Refuelling without a maintenance					22	
C. Inspection, maintenance or repair combined with refuelling	693			880		
D. Inspection, maintenance or repair without refuelling	168			89		
E. Testing of plant systems or components	1			0		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					8	
Subtotal	862	761	0	969	268	0
Total		1623			1237	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems	317	24
15. Reactor Cooling Systems		49
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries	202	29
32. Feedwater and Main Steam System	242	33
33. Circulating Water System		3
41. Main Generator Systems		29
42. Electrical Power Supply Systems		45
Total	761	220

# US-247 INDIAN POINT-2

**Operator:** ENTERGY (ENTERGY NUCLEAR)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 951.0 MW(e)  
**Design Net Capacity:** 873.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8370.8 GW(e).h  
**Energy Availability Factor:** 98.1%  
**Load Factor:** 100.4%  
**Operating Factor:** 98.1%  
**Energy Unavailability Factor:** 1.9%  
**Total Off-line Time:** 163 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	725.6	660.3	724.5	651.1	726.9	707.5	717.4	577.4	697.2	734.8	711.4	736.9	8370.8
<b>EAF (%)</b>	100.0	100.0	100.0	93.4	100.0	100.0	100.0	84.1	100.0	100.0	100.0	100.0	98.1
<b>UCF (%)</b>	100.0	100.0	100.0	93.4	100.0	100.0	100.0	84.2	100.0	100.0	100.0	100.0	98.1
<b>LF (%)</b>	102.5	103.3	102.4	97.3	102.2	102.8	100.9	81.2	101.3	103.2	103.4	103.6	100.4
<b>OF (%)</b>	100.0	100.0	100.0	93.6	100.0	100.0	100.0	84.3	100.0	100.0	100.0	100.0	98.1
<b>EUf (%)</b>	0.0	0.0	0.0	6.6	0.0	0.0	0.0	15.9	0.0	0.0	0.0	0.0	1.9
<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	6.6	0.0	0.0	0.0	15.9	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1966  
**Date of First Criticality:** 22 May 1973  
**Date of Grid Connection:** 26 Jun 1973  
**Date of Commercial Operation:** 15 Aug 1974

**Lifetime Generation:** 152832.7 GW(e).h  
**Cumulative Energy Availability Factor:** 67.5%  
**Cumulative Load Factor:** 65.5%  
**Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 32.5%

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 (%)
1982	4458.6	862.0	65.0	57.4	65.0	57.0	59.0	54.9	5726	65.4
1983	5895.3	859.0	83.5	60.3	83.5	60.0	78.3	57.5	7354	83.9
1984	2891.6	864.0	48.4	59.1	48.4	58.8	38.1	55.6	4552	51.8
1985	6665.0	855.0	95.5	62.4	95.5	62.1	89.0	58.6	8382	95.7
1986	3827.4	855.0	52.6	61.6	52.6	61.3	51.1	58.0	4924	56.2
1987	5149.6	852.0	69.8	62.2	69.7	62.0	69.0	58.8	6331	72.3
1988	6064.0	856.0	81.0	63.5	81.0	63.3	80.6	60.4	7247	82.5
1989	4476.9	856.0	60.4	63.3	60.3	63.1	59.7	60.3	5556	63.4
1990	5222.1	886.0	64.3	63.4	64.3	63.2	67.3	60.8	5779	66.0
1991	3873.4	929.0	51.2	62.6	51.2	62.5	47.6	59.9	4495	51.3
1992	7880.6	939.0	96.7	64.7	96.7	64.5	95.5	62.1	8494	96.7
1993	5931.7	941.0	75.3	65.3	75.3	65.1	72.0	62.6	6570	75.0
1994	7634.6	941.0	100.0	67.1	92.6	67.0	92.6	64.2	8760	100.0
1995	4896.9	941.0	63.6	67.0	63.6	66.8	59.4	64.0	5533	63.2
1996	7831.8	941.0	94.2	68.3	94.2	68.2	94.7	65.5	8261	94.0
1997	3179.7	936.0	41.7	67.1	41.7	66.9	38.8	64.3	3639	41.5
1998	2512.5	932.0	30.9	65.5	30.9	65.4	30.8	62.8	2698	30.8
1999	7300.4	937.0	87.6	66.4	87.6	66.3	88.9	63.9	7665	87.5
2000	1062.3	941.0	12.5	64.2	12.5	64.1	12.9	61.8	1099	12.5
2001	7792.7	941.0	96.2	65.5	96.2	65.4	94.5	63.1	8429	96.2
2002	7556.6	941.0	90.3	66.4	90.2	66.3	91.7	64.2	7931	90.5
2003	8370.8	952.0	98.1	67.6	98.1	67.5	100.4	65.5	8597	98.1

## US-247 INDIAN POINT-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
28 Apr	45.2	43.9	UF4	A41	REACTOR TRIP DUE TO TURBINE GENERATOR TRIP AS A RESULT OF A MAIN GENERATOR OVER FREQUENCY TRIP CAUSED BY LOSS OF OFFSITE LOAD.
03 Aug	59.5	57.7	UF4	N41	REACTOR TRIP INITIATED BY A TURBINE TRIP (TT) ON AUTO STOP OIL. THE TT WAS CAUSED BY A GENERATOR TRIP ON OVER-FREQUENCY DUE TO A LOSS OF ELECTRICAL LOAD AS A RESULT OF A LIGHTNING STRIKE ON THE TOWER OF 345KV FEEDER W93.
14 Aug	56.7	55.0	UF4	K17	REACTOR TRIP ON LOW REACTOR COOLANT PUMP (RCP) LOOP FLOW DUE TO A TRIP OF A RCP BREAKER AS A RESULT OF UNDER-FREQUENCY DUE TO AN UNSTABLE POWER TRANSMISSION GRID. REACTOR TRIP INITIATED A TURBINE TRIP.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1973 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		45			1118	
B. Refuelling without a maintenance					9	
C. Inspection, maintenance or repair combined with refuelling				1178		
D. Inspection, maintenance or repair without refuelling				224		
E. Testing of plant systems or components				28		
H. Nuclear regulatory requirements				5	2	
J. Grid failure or grid unavailability						7
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)		56		98	13	0
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)		59				
Subtotal	0	160	0	1533	1142	7
Total		160			2682	

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

System	2003 Hours Lost	1973 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		59
13. Reactor Auxiliary Systems		10
14. Safety Systems		11
15. Reactor Cooling Systems		72
16. Steam generation systems		93
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		71
32. Feedwater and Main Steam System		382
35. All other I&C Systems		3
41. Main Generator Systems	45	50
42. Electrical Power Supply Systems		264
XX. Miscellaneous Systems		0
Total	45	1020

# US-286 INDIAN POINT-3

**Operator:** ENTERGY (ENTERGY NUCLEAR)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 979.0 MW(e)  
**Design Net Capacity:** 965.0 MW(e)  
**Design Discharge Burnup:** 33250 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7608.4 GW(e).h  
**Energy Availability Factor:** 88.4%  
**Load Factor:** 88.7%  
**Operating Factor:** 88.4%  
**Energy Unavailability Factor:** 11.6%  
**Total Off-line Time:** 1012 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	706.5	670.8	667.4	37.4	739.3	590.7	736.7	544.6	713.9	741.6	718.2	741.3	7608.4
<b>EAF (%)</b>	95.8	100.0	90.3	15.2	100.0	83.3	100.0	75.6	100.0	100.0	100.0	100.0	88.4
<b>UCF (%)</b>	95.8	100.0	90.3	15.2	100.0	83.3	100.0	75.6	100.0	100.0	100.0	100.0	88.4
<b>LF (%)</b>	97.0	102.0	91.6	5.3	101.5	83.8	101.1	74.8	101.3	101.7	101.9	101.8	88.7
<b>OF (%)</b>	95.8	100.0	90.3	15.4	100.0	83.3	100.0	75.7	100.0	100.0	100.0	100.0	88.4
<b>EUf (%)</b>	4.2	0.0	9.7	84.8	0.0	16.7	0.0	24.4	0.0	0.0	0.0	0.0	11.6
<b>PUf (%)</b>	0.0	0.0	9.7	76.2	0.0	15.1	0.0	0.0	0.0	0.0	0.0	0.0	8.3
<b>UCLF (%)</b>	4.2	0.0	0.0	8.6	0.0	1.7	0.0	24.4	0.0	0.0	0.0	0.0	3.3
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1968  
**Date of First Criticality:** 06 Apr 1976  
**Date of Grid Connection:** 27 Apr 1976  
**Date of Commercial Operation:** 30 Aug 1976

**Lifetime Generation:** 136578.7 GW(e).h  
**Cumulative Energy Availability Factor:** 62.4%  
**Cumulative Load Factor:** 59.0%  
**Cumulative Unit Capability Factor:** 77.2%  
**Cumulative Energy Unavailability Factor:** 37.6%

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	1436.1	891.0	22.5	55.5	22.5	55.5	18.4	47.8	1967	22.5		
1983	60.7	934.0	2.4	47.9	2.4	47.9	0.7	41.0	229	2.6		
1984	6041.7	965.0	76.2	51.5	76.2	51.5	71.3	44.9	6703	76.3		
1985	4728.5	965.0	65.5	53.1	65.5	53.1	55.9	46.2	5782	66.0		
1986	5525.6	959.0	72.9	55.1	72.9	55.2	65.8	48.2	6431	73.4		
1987	4850.6	950.0	60.5	55.6	60.5	55.6	58.3	49.1	5396	61.6		
1988	6711.9	965.0	81.9	57.9	81.9	57.9	79.2	51.7	7217	82.2		
1989	4968.7	965.0	59.7	58.0	59.7	58.0	58.8	52.2	5279	60.3		
1990	5031.8	965.0	60.8	58.2	60.8	58.2	59.5	52.8	5374	61.3		
1991	7300.8	965.0	88.8	60.3	88.8	60.3	86.4	55.1	7577	86.5		
1992	4760.6	965.0	59.1	60.2	59.2	60.2	56.2	55.1	5248	59.7		
1993	1192.6	965.0	13.4	57.4	13.4	57.4	14.1	52.7	1292	14.7		
1994	0.0	965.0	0.0	54.2	0.0	54.2	0.0	49.7	0	0.0		
1995	1471.5	965.0	18.1	52.3	18.2	52.3	17.4	48.0	1696	19.4		
1996	5872.5	965.0	72.4	53.3	72.4	53.3	69.3	49.1	6390	72.7		
1997	4337.3	965.0	57.4	53.5	57.4	53.5	51.3	49.2	4650	53.1		
1998	7656.5	965.0	93.6	55.3	93.6	55.3	90.6	51.1	8197	93.6		
1999	7269.2	965.0	87.4	56.8	87.4	56.7	86.0	52.6	7659	87.4		
2000	8432.2	965.0	97.9	58.5	97.9	58.5	99.5	54.6	8600	97.9		
2001	7940.2	965.0	92.8	59.9	92.8	59.9	93.9	56.2	8130	92.8		
2002	8432.6	966.0	98.3	61.4	98.3	61.4	99.7	57.9	8611	98.3		
2003	7608.4	979.0	88.4	62.4	88.4	62.4	88.7	59.0	7748	88.4		

## US-286 INDIAN POINT-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
13 Jan	30.9	30.4	UF5	A33	REACTOR MANUALLY TRIPPED DUE TO HIGH MAIN CONDENSER DIFFERENTIAL PRESSURE. THIS WAS CAUSED BY THE LOSS OF THE NO. 35 CIRCULATING WATER PUMP (CWP) WHILE THE NO. 36 CWP WAS OUT OF SERVICE FOR SCHEDULED MAINTENANCE.
29 Mar	614.5	604.7	PF	C21	REFUELING OUTAGE.
24 Apr	2.8	2.7	PF	E31	MANUALLY SECURED THE MAIN TURBINE GENERATOR IN ORDER TO FACILITATE THE PERFORMANCE OF SURVEILLANCE TEST 3PT-V21, TURBINE GENERATOR OVERSPEED TRIP TEST.
25 Apr	33.2	32.6	UF	A31	MANUALLY SECURED THE MAIN TURBINE GENERATOR IN ORDER TO FACILITATE REPAIRS TO MAIN TURBINE CONTROL VALVE #34.
29 Apr	28.6	28.1	UF5	P31	MANUALLY SCRAMMED THE REACTOR DUE TO INDICATION OF A FIRE AT HIGH PRESSURE TURBINE BEARING #2
22 Jun	12.0	11.8	UF4	A42	AUTOMATIC REACTOR SHUTDOWN DUE TO A FAILURE OF 345KV OUTPUT BREAKER NO. 3 LOCATED IN THE BUCHANAN SWITCHYARD.
23 Jun	107.9	106.2	PF	D11	TRANSITIONED TO SCHEDULED OUTAGE IN ORDER TO REPAIR NO.5 INCORE INSTRUMENT TUBE SEAL (CONSEAL) WHICH HAD BEEN PREVIOUSLY IDENTIFIED LEAKING.
14 Aug	180.9	178.0	UF4	J42	REACTOR TRIP ON LOW REACTOR COOLANT PUMP (RCP) LOOP FLOW DUE TO TRIP OF RCP BREAKER AS A RESULT OF UNDERFREQUENCY DUE TO AN UNSTABLE POWER TRANSMISSION GRID. REACTOR TRIP INITIATED A TURBINE TRIP.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1976 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		76			1506	
B. Refuelling without a maintenance					5	
C. Inspection, maintenance or repair combined with refuelling	614			1243		
D. Inspection, maintenance or repair without refuelling	107			305	1	
E. Testing of plant systems or components	2			2	12	
J. Grid failure or grid unavailability		180				0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					15	
P. Fire		28				
Subtotal	723	284	0	1550	1539	0
Total		1007			3089	

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

System	2003 Hours Lost	1976 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		19
13. Reactor Auxiliary Systems		11
14. Safety Systems		731
15. Reactor Cooling Systems		44
16. Steam generation systems		88
31. Turbine and auxiliaries	33	125
32. Feedwater and Main Steam System		63
33. Circulating Water System	30	
41. Main Generator Systems		375
42. Electrical Power Supply Systems	12	37
XX. Miscellaneous Systems		3
Total	75	1496

# US-305 KEWAUNEE

**Operator:** NUCMAN (NUCLEAR MANAGEMENT CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 511.0 MW(e)  
**Design Net Capacity:** 535.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4159.1 GW(e).h  
**Energy Availability Factor:** 90.5%  
**Load Factor:** 91.7%  
**Operating Factor:** 90.1%  
**Energy Unavailability Factor:** 9.5%  
**Total Off-line Time:** 867 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	395.0	340.6	393.5	40.0	233.4	383.8	395.7	398.3	388.4	402.5	390.5	397.3	4159.1
<b>EAF (%)</b>	100.0	100.0	100.0	12.2	71.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.5
<b>UCF (%)</b>	100.0	100.0	100.0	12.2	71.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.5
<b>LF (%)</b>	103.9	99.2	103.5	10.9	60.8	103.3	103.1	101.8	102.6	102.7	103.1	101.5	91.7
<b>OF (%)</b>	100.0	100.0	100.0	13.2	67.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.1
<b>EUf (%)</b>	0.0	0.0	0.0	87.8	28.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5
<b>PUf (%)</b>	0.0	0.0	0.0	87.8	28.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 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:** 110130.0 GW(e).h  
**Cumulative Energy Availability Factor:** 83.5%  
**Cumulative Load Factor:** 83.1%  
**Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	3824.9	514.0	87.4	79.9	87.4	79.9	84.9	78.9	7669	87.5
1983	3706.9	510.0	83.7	80.3	83.7	80.3	83.0	79.3	7334	83.7
1984	3810.0	503.0	85.3	80.8	85.3	80.8	86.2	80.0	7527	85.7
1985	3699.2	503.0	81.8	80.9	81.8	80.9	84.0	80.3	7213	82.3
1986	3854.7	503.0	85.3	81.3	85.3	81.3	87.5	80.9	7514	85.8
1987	4008.6	503.0	88.8	81.8	88.8	81.8	91.0	81.7	7809	89.1
1988	3914.8	503.0	87.1	82.2	87.1	82.2	88.6	82.2	7679	87.4
1989	3741.8	503.0	83.9	82.3	83.9	82.3	84.9	82.3	7390	84.4
1990	3900.8	503.0	87.2	82.6	87.2	82.6	88.5	82.7	7668	87.5
1991	3674.8	507.0	80.3	82.5	80.3	82.5	82.7	82.7	7247	82.7
1992	3938.1	511.0	87.3	82.7	87.3	82.7	87.7	83.0	7682	87.5
1993	3816.9	511.0	86.0	82.9	86.0	82.9	85.3	83.1	7548	86.2
1994	3961.5	511.0	88.2	83.2	88.2	83.2	88.5	83.4	7738	88.3
1995	3793.4	511.0	87.1	83.4	87.1	83.4	84.7	83.4	7645	87.3
1996	3171.1	511.0	71.3	82.8	71.3	82.8	70.6	82.9	6299	71.7
1997	2363.8	511.0	55.5	81.6	55.5	81.6	52.8	81.6	4866	55.5
1998	3705.4	511.0	86.6	81.8	86.6	81.8	82.8	81.6	7584	86.6
1999	4424.7	511.0	100.0	82.6	100.0	82.6	98.8	82.3	8760	100.0
2000	3799.9	511.0	88.5	82.8	88.5	82.8	84.7	82.4	7760	88.3
2001	3461.7	511.0	80.1	82.7	80.1	82.7	77.3	82.2	7009	80.0
2002	4468.7	511.0	97.3	83.2	97.3	83.2	99.8	82.8	8514	97.2
2003	4159.1	518.0	90.5	83.5	90.5	83.5	91.7	83.1	7893	90.1



# US-305 KEWAUNEE

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
04 Apr	865.4	431.0	PF	C21	REFUELING OUTAGE. G1 WAS OPENED 05/11 AT 1428. AN OUTAGE WAS TAKEN TO PERFORM THE TURBINE OVERSPEED TRIP TEST. G1 WAS CLOSED FOR THE FINAL TIME 05/11 AT 1513.
11 May	0.8	0.4	PF	E31	

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					133	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	865			1090		
D. Inspection, maintenance or repair without refuelling				79		
E. Testing of plant systems or components	0			2		
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling				2		
H. Nuclear regulatory requirements					1	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					1	1
Subtotal	865	0	0	1173	138	1
Total		865			1312	

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

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		14
12. Reactor I&C Systems		3
14. Safety Systems		0
15. Reactor Cooling Systems		16
16. Steam generation systems		4
31. Turbine and auxiliaries		31
32. Feedwater and Main Steam System		29
33. Circulating Water System		8
35. All other I&C Systems		1
42. Electrical Power Supply Systems		20
XX. Miscellaneous Systems		1
Total	0	127

# US-373 LASALLE-1

**Operator:** EXELON (Exelon Nuclear Co.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1111.0 MW(e)  
**Design Net Capacity:** 1078.0 MW(e)  
**Design Discharge Burnup:** 26500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9739.0 GW(e).h  
**Energy Availability Factor:** 99.5%  
**Load Factor:** 100.1%  
**Operating Factor:** 99.5%  
**Energy Unavailability Factor:** 0.5%  
**Total Off-line Time:** 44 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	830.5	796.7	825.9	772.2	790.7	824.8	842.7	818.4	813.3	855.0	744.2	824.7	9739.0
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.9	100.0	99.5
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.9	100.0	99.5
<b>LF (%)</b>	100.5	106.7	99.9	96.7	95.7	103.1	101.9	99.0	101.7	103.3	93.0	99.8	100.1
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.9	100.0	99.5
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1	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	6.1	0.0	0.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1973      **Lifetime Generation:** 125231.1 GW(e).h  
**Date of First Criticality:** 21 Jun 1982      **Cumulative Energy Availability Factor:** 69.7%  
**Date of Grid Connection:** 04 Sep 1982      **Cumulative Load Factor:** 66.8%  
**Date of Commercial Operation:** 01 Jan 1984      **Cumulative Unit Capability Factor:** 77.7%  
**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 (%)
1982	460.8	1058.0	0.0	0.0	5.1	100.0	5.0	0.0	1858	21.4
1983	1639.8	1078.0	0.0	0.0	52.9	100.0	17.4	0.0	3087	35.2
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	57.5	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	102.9	61.0	8784	100.0
2001	9850.4	1113.0	99.4	66.8	99.4	66.7	101.0	63.4	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

# US-373 LASALLE-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
27 Nov	43.6	49.1	PF	D41	SCHEDULED SHUTDOWN TO REPAIR HYDROGEN LEAK ON THE MAIN GENERATOR. REPAIRS WERE COMPLETED.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					562	
B. Refuelling without a maintenance					46	
C. Inspection, maintenance or repair combined with refuelling				1241		
D. Inspection, maintenance or repair without refuelling	43			531		
E. Testing of plant systems or component				77	1	
H. Nuclear regulatory requirement					255	
J. Grid failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					20	
Subtotal	43	0	0	1849	884	2
Total		43			2735	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		43
12. Reactor I&C Systems		31
13. Reactor Auxiliary System:		6
14. Safety Systems		57
15. Reactor Cooling System:		162
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries:		137
32. Feedwater and Main Steam System		23
33. Circulating Water System		11
35. All other I&C Systems:		6
41. Main Generator System:		17
42. Electrical Power Supply System:		43
Total	0	538

# US-374 LASALLE-2

**Operator:** EXELON (Exelon Nuclear Co.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1111.0 MW(e)  
**Design Net Capacity:** 1078.0 MW(e)  
**Design Discharge Burnup:** 26800 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8709.1 GW(e).h  
**Energy Availability Factor:** 88.4%  
**Load Factor:** 89.5%  
**Operating Factor:** 88.6%  
**Energy Unavailability Factor:** 11.6%  
**Total Off-line Time:** 998 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	390.5	158.4	816.4	848.6	870.3	826.3	678.0	844.2	732.3	860.6	835.1	848.2	8709.1
<b>EAF (%)</b>	51.8	25.6	100.0	100.0	100.0	100.0	84.3	100.0	94.5	100.0	100.0	100.0	88.4
<b>UCF (%)</b>	51.8	25.6	100.0	100.0	100.0	100.0	84.4	100.0	94.5	100.0	100.0	100.0	88.4
<b>LF (%)</b>	47.2	21.2	98.8	106.2	105.3	103.3	82.0	102.1	91.5	104.0	104.4	102.6	89.5
<b>OF (%)</b>	52.7	26.8	100.0	100.0	100.0	100.0	84.5	100.0	94.6	100.0	100.0	100.0	88.6
<b>EUf (%)</b>	48.2	74.4	0.0	0.0	0.0	0.0	15.7	0.0	5.5	0.0	0.0	0.0	11.6
<b>PUF (%)</b>	36.1	74.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.8
<b>UCLF (%)</b>	12.0	0.0	0.0	0.0	0.0	0.0	15.7	0.0	5.5	0.0	0.0	0.0	2.8
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1973      **Lifetime Generation:** 118307.4 GW(e).h  
**Date of First Criticality:** 10 Mar 1984      **Cumulative Energy Availability Factor:** 67.8%  
**Date of Grid Connection:** 20 Apr 1984      **Cumulative Load Factor:** 66.1%  
**Date of Commercial Operation:** 19 Oct 1984      **Cumulative Unit Capability Factor:** 77.8%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1984	2735.7	1039.0	0.0	0.0	96.9	100.0	33.4	0.0	4058	51.5
1985	3477.0	1036.0	41.8	41.8	41.8	41.8	38.3	38.3	3698	42.2
1986	5727.8	1036.0	75.0	58.4	74.6	58.2	63.1	50.7	6533	74.6
1987	4573.3	1036.0	53.1	56.6	53.1	56.5	50.4	50.6	4699	53.6
1988	5662.8	1036.0	75.1	61.3	75.1	61.2	62.2	53.5	6593	75.1
1989	6506.8	1036.0	75.1	64.0	75.1	63.9	71.7	57.2	6591	75.2
1990	6216.8	1036.0	70.0	65.0	70.0	65.0	68.5	59.0	6162	70.3
1991	8712.4	1036.0	95.3	69.4	95.3	69.3	96.0	64.3	8357	95.4
1992	5797.9	1036.0	66.3	69.0	66.3	68.9	63.7	64.2	5850	66.6
1993	5859.2	1036.0	66.1	68.7	66.1	68.6	64.6	64.3	5825	66.5
1994	8428.9	1036.0	92.4	71.0	92.4	71.0	92.9	67.1	8101	92.5
1995	5905.7	1036.0	66.5	70.6	66.5	70.6	65.1	66.9	5855	66.8
1996	5642.3	1036.0	64.5	70.1	64.5	70.1	62.0	66.5	5649	64.3
1997	0.0	1036.0	0.0	64.7	0.0	64.7	0.0	61.4	0	0.0
1998	0.0	1036.0	0.0	60.1	0.0	60.1	0.0	57.0	0	0.0
1999	6632.3	1036.0	71.1	60.8	71.1	60.8	73.1	58.1	6231	71.1
2000	9040.4	1072.0	93.1	62.9	93.1	62.9	96.0	60.6	8229	93.7
2001	9683.4	1113.0	97.2	65.1	97.2	65.0	99.3	63.0	8515	97.2
2002	8995.6	1111.0	92.1	66.7	92.1	66.6	92.4	64.7	8078	92.2
2003	8709.1	1111.0	88.4	67.9	88.4	67.8	89.5	66.1	7762	88.6

## US-374 LASALLE-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
10 Jan	88.0	99.5	UF5	A32	MANUAL SCRAM DUE TO LOW REACTOR WATER LEVEL FOLLOWING THE TRIP OF THE 2B CONDENSATE/CONDENSATE BOOSTER PUMP ON INSTANTANEOUS OVERCURRENT. THE CONDENSATE PUMP MOTOR WAS REPAIRED AND THE UNIT WAS RETURNED TO SERVICE ON 01/14/03.
21 Jan	755.5	854.5	PF	C21	REFUELING OUTAGE.
07 Jul	114.4	129.4	UF	A42	MAIN TRANSFORMER B-PHASE DISCONNECT REPAIRED.
13 Sep	38.6	43.7	UF	A42	THE GENERATOR WAS TAKEN OFFLINE TO REPLACE FAILED MASTER TRIP SOLENOID. THE REACTOR REMAINED CRITICAL.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		241			332	
B. Refuelling without a maintenance					10	
C. Inspection, maintenance or repair combined with refuelling	755			1423		
D. Inspection, maintenance or repair without refuelling				233		
E. Testing of plant systems or components				2		
H. Nuclear regulatory requirements					558	
J. Grid failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				60	28	
Subtotal	755	241	0	1718	928	1
Total		996			2647	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		83
12. Reactor I&C Systems		83
15. Reactor Cooling Systems		22
31. Turbine and auxiliaries		37
32. Feedwater and Main Steam System	88	2
35. All other I&C Systems		16
42. Electrical Power Supply Systems	153	24
XX. Miscellaneous Systems		20
Total	241	287

# US-352 LIMERICK-1

**Operator:** EXELON (Exelon Nuclear Co.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1134.0 MW(e)  
**Design Net Capacity:** 1055.0 MW(e)  
**Design Discharge Burnup:** 28500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 10057.5 GW(e).h  
**Energy Availability Factor:** 99.0%  
**Load Factor:** 101.2%  
**Operating Factor:** 99.0%  
**Energy Unavailability Factor:** 1.0%  
**Total Off-line Time:** 88 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	880.4	794.0	874.5	720.1	865.2	826.5	848.2	845.1	820.1	869.4	840.1	873.9	10057.5
<b>EAF (%)</b>	100.0	100.0	100.0	87.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.0
<b>UCF (%)</b>	100.0	100.0	100.0	87.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.0
<b>LF (%)</b>	104.4	104.2	103.6	88.3	102.5	101.2	100.5	100.2	100.4	102.9	102.9	103.6	101.2
<b>OF (%)</b>	100.0	100.0	100.0	87.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.0
<b>EUf (%)</b>	0.0	0.0	0.0	12.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
<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	12.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1970      **Lifetime Generation:** 143417.2 GW(e).h  
**Date of First Criticality:** 22 Dec 1984      **Cumulative Energy Availability Factor:** 87.8%  
**Date of Grid Connection:** 13 Apr 1985      **Cumulative Load Factor:** 83.3%  
**Date of Commercial Operation:** 01 Feb 1986      **Cumulative Unit Capability Factor:** 78.1%  
**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	1160.9	1055.0	0.0	0.0	55.8	100.0	13.0	0.0	2552	30.2
1986	7210.6	1055.0	0.0	0.0	80.2	100.0	78.0	0.0	7022	80.2
1987	5341.3	1055.0	67.7	67.7	67.7	67.7	57.8	57.8	5924	67.6
1988	6674.8	1055.0	96.4	82.1	96.4	82.1	72.0	64.9	8470	96.4
1989	5244.3	1055.0	69.4	77.8	69.4	77.8	56.7	62.2	5638	64.4
1990	5633.1	1055.0	65.3	74.7	65.3	74.7	61.0	61.9	5724	65.3
1991	8133.8	1055.0	91.8	78.1	91.8	78.1	88.0	67.1	8043	91.8
1992	6239.6	1055.0	69.6	76.7	69.6	76.7	67.3	67.1	6115	69.6
1993	8745.5	1055.0	98.5	79.8	98.5	79.8	94.6	71.1	8626	98.5
1994	7858.0	1055.0	89.5	81.0	89.5	81.0	85.0	72.8	7840	89.5
1995	8147.5	1055.0	91.1	82.1	91.1	82.1	88.2	74.5	7973	91.0
1996	8141.6	1096.0	88.8	82.8	88.8	82.8	84.6	75.6	7758	88.3
1997	9227.5	1105.0	97.5	84.2	97.5	84.2	95.3	77.4	8534	97.4
1998	7449.1	1112.0	81.6	84.0	81.6	84.0	76.5	77.3	7061	80.6
1999	9744.0	1134.0	98.0	85.1	98.0	85.1	98.1	79.0	8588	98.0
2000	8988.1	1139.0	90.9	85.6	90.9	85.6	89.8	79.8	7982	90.9
2001	10133.1	1143.0	99.7	86.6	99.7	86.6	101.2	81.4	8735	99.7
2002	9286.8	1134.0	94.1	87.1	94.1	87.1	93.5	82.1	8244	94.1
2003	10057.5	1134.0	99.0	87.8	99.0	87.8	101.2	83.3	8672	99.0

# US-352 LIMERICK-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
23 Apr	87.9	99.7	UF4	A15	1F38 REACTOR SCRAM DUE TO LOSS OF RFP SUCTION PRESSURE.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		87			194	
C. Inspection, maintenance or repair combined with refuelling				825		
D. Inspection, maintenance or repair without refuelling				165	0	
E. Testing of plant systems or components				29	2	
H. Nuclear regulatory requirements				130		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				138	47	
Subtotal	0	87	0	1287	243	0
Total		87			1530	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		5
13. Reactor Auxiliary Systems		11
14. Safety Systems		17
15. Reactor Cooling Systems	87	39
21. Fuel Handling and Storage Facilities		9
31. Turbine and auxiliaries		59
32. Feedwater and Main Steam System		11
41. Main Generator Systems		3
42. Electrical Power Supply Systems		21
XX. Miscellaneous Systems		15
Total	87	190

# US-353 LIMERICK-2

**Operator:** EXELON (Exelon Nuclear Co.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1134.0 MW(e)  
**Design Net Capacity:** 1055.0 MW(e)  
**Design Discharge Burnup:** 28500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9387.1 GW(e).h  
**Energy Availability Factor:** 94.2%  
**Load Factor:** 94.5%  
**Operating Factor:** 94.2%  
**Energy Unavailability Factor:** 5.8%  
**Total Off-line Time:** 508 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	872.8	756.2	256.0	799.3	849.6	827.0	848.6	774.3	812.1	870.3	842.7	878.1	9387.1
<b>EAF (%)</b>	100.0	100.0	35.4	100.0	100.0	100.0	100.0	96.4	100.0	100.0	100.0	100.0	94.2
<b>UCF (%)</b>	100.0	100.0	35.4	100.0	100.0	100.0	100.0	96.4	100.0	100.0	100.0	100.0	94.2
<b>LF (%)</b>	103.5	99.2	30.3	98.0	100.7	101.3	100.6	91.8	99.5	103.0	103.2	104.1	94.5
<b>OF (%)</b>	100.0	100.0	35.3	100.0	100.0	100.0	100.0	96.4	100.0	100.0	100.0	100.0	94.2
<b>EUf (%)</b>	0.0	0.0	64.6	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0	0.0	5.8
<b>PUF (%)</b>	0.0	0.0	64.1	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	0.5	0.0	0.0	0.0	0.0	3.6	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1970      **Lifetime Generation:** 121018.5 GW(e).h  
**Date of First Criticality:** 12 Aug 1989      **Cumulative Energy Availability Factor:** 91.8%  
**Date of Grid Connection:** 01 Sep 1989      **Cumulative Load Factor:** 89.6%  
**Date of Commercial Operation:** 08 Jan 1990      **Cumulative Unit Capability Factor:** 78.8%  
**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 (%)
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	84.8	82.3	84.9	80.8	82.4	7289	83.2
1994	8571.5	1055.0	98.8	87.7	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



## US-353 LIMERICK-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
03 Mar	3.6	4.1	UF4	A31	THE TURBINE WAS MANUALLY TRIPPED DUE TO HIGH VIBRATION, WHICH RESULTED IN AN AUTOMATIC SCRAM OF THE REACTOR.
03 Mar	476.7	540.6	PF	C21	REFUELING OUTAGE.
01 Aug	27.0	30.6	UF	A41	2M32 STATOR WATER COOLING SYSTEM REPAIR

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1990 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		30			153	
B. Refuelling without a maintenance					20	
C. Inspection, maintenance or repair combined with refuelling	476			403		
D. Inspection, maintenance or repair without refuelling				79		
E. Testing of plant systems or components				0		
J. Grid failure or grid unavailability						4
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					10	
Subtotal	476	30	0	482	183	4
Total		506			669	

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

System	2003 Hours Lost	1990 to 2003 Average Hours Lost Per Year
15. Reactor Cooling Systems		9
17. Safety I&C Systems (excluding reactor I&C)		6
31. Turbine and auxiliaries	3	81
32. Feedwater and Main Steam System		12
35. All other I&C Systems		12
41. Main Generator Systems	27	10
42. Electrical Power Supply Systems		10
Total	30	140

# US-369 MCGUIRE-1

Operator: DUKE (DUKE POWER CO.)

Contractor: WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Maximum Net Capacity at the beginning of 2003: 1100.0 MW(e)  
 Design Net Capacity: 1180.0 MW(e)  
 Design Discharge Burnup: 36000 MW.d/t

## 2. Production Summary 2003

Energy Production: 9912.5 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. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	844.4	778.2	861.9	815.8	845.1	812.9	828.6	816.1	798.4	835.5	817.8	857.7	9912.5
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
LF (%)	103.2	105.3	105.3	103.1	103.3	102.6	101.3	99.7	100.8	102.0	103.3	104.8	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. 2003 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Apr 1971      Lifetime Generation: 160978.3 GW(e).h  
 Date of First Criticality: 08 Aug 1981      Cumulative Energy Availability Factor: 78.3%  
 Date of Grid Connection: 12 Sep 1981      Cumulative Load Factor: 73.7%  
 Date of Commercial Operation: 01 Dec 1981      Cumulative Unit Capability Factor: 77.4%  
    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 (%)
1982	4302.3	1180.0	81.6	81.6	81.6	81.6	41.6	41.6	7043	80.4
1983	4650.0	1180.0	57.3	69.4	57.3	69.4	45.0	43.3	4852	55.4
1984	6434.3	1180.0	78.1	72.3	69.3	69.4	62.1	49.6	6011	68.4
1985	6780.1	1180.0	77.1	73.5	77.1	71.3	65.6	53.6	6747	77.0
1986	5181.1	1150.0	56.2	70.1	56.2	68.4	51.4	53.2	4912	56.1
1987	7352.9	1150.0	76.7	71.2	76.7	69.7	73.0	56.4	6713	76.6
1988	7406.4	1129.0	77.0	72.0	77.0	70.7	74.7	58.9	6763	77.0
1989	7807.2	1129.0	84.5	73.5	84.5	72.4	78.9	61.4	7187	82.0
1990	4755.3	1129.0	56.9	71.7	56.9	70.7	48.1	59.9	4718	53.9
1991	6851.1	1129.0	71.5	71.7	71.4	70.8	69.3	60.8	6259	71.4
1992	7485.3	1129.0	77.9	72.3	77.9	71.4	75.5	62.2	6839	77.9
1993	5537.1	1129.0	58.2	71.1	58.2	70.3	56.0	61.6	5095	58.2
1994	6877.3	1129.0	71.9	71.2	71.9	70.5	69.5	62.2	6291	71.8
1995	8860.2	1129.0	91.6	72.6	91.6	71.9	89.6	64.2	8017	91.5
1996	8558.3	1129.0	89.5	73.7	89.5	73.1	86.3	65.6	7858	89.5
1997	7011.3	1129.0	72.7	73.7	72.7	73.1	70.9	65.9	6361	72.6
1998	8822.6	1119.0	90.0	74.6	90.0	74.1	90.0	67.3	7889	90.1
1999	8593.3	1100.0	86.6	75.2	86.6	74.7	89.2	68.5	7584	86.6
2000	9995.0	1100.0	99.5	76.5	99.5	76.0	103.4	70.3	8741	99.5
2001	8684.9	1100.0	88.0	77.0	88.0	76.6	90.1	71.2	7708	88.0
2002	9100.8	1100.0	91.8	77.7	91.8	77.3	94.4	72.3	8042	91.8
2003	9912.5	1100.0	100.0	78.7	100.0	78.3	102.9	73.7	8760	100.0

# US-369 MCGUIRE-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					582	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling				951		
D. Inspection, maintenance or repair without refuelling				173	46	
E. Testing of plant systems or components				21		
H. Nuclear regulatory requirements					11	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				18	5	33
Subtotal	0	0	0	1163	648	33
Total	0			1844		

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems		19
13. Reactor Auxiliary Systems		26
14. Safety Systems		34
15. Reactor Cooling Systems		68
16. Steam generation systems		101
21. Fuel Handling and Storage Facilities		41
31. Turbine and auxiliaries		67
32. Feedwater and Main Steam System		154
41. Main Generator Systems		6
42. Electrical Power Supply Systems		17
XX. Miscellaneous Systems		32
Total	0	573

# US-370 MCGUIRE-2

**Operator:** DUKE (DUKE POWER CO.)

**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1100.0 MW(e)  
**Design Net Capacity:** 1180.0 MW(e)  
**Design Discharge Burnup:** 36000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9027.8 GW(e).h  
**Energy Availability Factor:** 91.6%  
**Load Factor:** 93.7%  
**Operating Factor:** 91.6%  
**Energy Unavailability Factor:** 8.4%  
**Total Off-line Time:** 736 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	832.9	777.2	846.8	828.3	829.5	814.8	831.7	824.8	124.1	633.4	825.8	858.4	9027.8
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	13.3	85.2	100.0	100.0	91.6
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	13.3	85.2	100.0	100.0	91.6
<b>LF (%)</b>	101.8	105.1	103.5	104.7	101.4	102.9	101.6	100.8	15.7	77.3	104.3	104.9	93.7
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	16.5	81.9	100.0	100.0	91.6
<b>EUAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	86.7	14.8	0.0	0.0	8.4
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	86.7	8.7	0.0	0.0	7.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1971      **Lifetime Generation:** 157515.9 GW(e).h  
**Date of First Criticality:** 08 May 1983      **Cumulative Energy Availability Factor:** 82.1%  
**Date of Grid Connection:** 23 May 1983      **Cumulative Load Factor:** 80.5%  
**Date of Commercial Operation:** 01 Mar 1984      **Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1984	6557.8	1171.0	0.0	0.0	85.7	100.0	63.8	0.0	6086	69.3
1985	5609.3	1180.0	61.0	61.0	61.0	61.0	54.3	54.3	5171	59.0
1986	6216.6	1150.0	64.5	62.8	64.5	62.8	61.7	57.9	5601	63.9
1987	7577.4	1150.0	80.2	68.5	80.2	68.5	75.2	63.6	6954	79.4
1988	8058.0	1129.0	82.3	71.9	82.3	71.9	81.3	68.0	7229	82.3
1989	7418.3	1129.0	78.4	73.2	78.4	73.2	75.0	69.4	6867	78.4
1990	6496.2	1129.0	69.5	72.6	69.5	72.6	65.7	68.8	5873	67.0
1991	9516.0	1129.0	97.6	76.1	97.6	76.1	96.2	72.6	8548	97.6
1992	6785.0	1129.0	70.0	75.3	70.0	75.4	68.4	72.1	6141	69.9
1993	6821.1	1129.0	72.8	75.1	72.8	75.1	69.0	71.8	6378	72.8
1994	8660.0	1129.0	88.0	76.4	88.0	76.4	87.6	73.3	7708	88.0
1995	9090.0	1129.0	93.0	77.9	93.0	77.9	91.9	75.0	8144	93.0
1996	7265.1	1129.0	74.6	77.6	74.6	77.6	73.3	74.9	6543	74.5
1997	6648.4	1129.0	71.0	77.1	71.0	77.1	67.2	74.3	6214	70.9
1998	9928.3	1119.0	99.5	78.7	99.5	78.7	101.3	76.2	8715	99.5
1999	8596.7	1100.0	90.5	79.4	90.5	79.4	89.2	77.0	7927	90.5
2000	8452.4	1100.0	88.3	80.0	88.3	80.0	87.5	77.7	7757	88.3
2001	9878.0	1100.0	99.3	81.1	99.3	81.1	102.5	79.1	8698	99.3
2002	8913.5	1100.0	90.7	81.6	90.7	81.6	92.5	79.8	7940	90.6
2003	9027.8	1100.0	91.6	82.1	91.6	82.1	93.7	80.5	8024	91.6

## US-370 MCGUIRE-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
05 Sep	688.8	757.6	PF	C21	REFUELING OUTAGE.
04 Oct	9.0	9.9	UF3	A15	OUTAGE DELAY OF 0.38 DAYS DUE TO 2A REACTOR COOLANT FILTER VENT VALVE LEAK.
05 Oct	6.0	6.6	UF3	A15	OUTAGE DELAY OF 0.25 DAYS DUE TO REACTOR COOLANT SYSTEM CLEAN-UP EXTENDED.
05 Oct	7.0	7.7	UF3	A14	OUTAGE DELAY OF 0.29 DAYS DUE TO UPPER CONTAINMENT CONTAMINATION.
05 Oct	6.0	6.6	UF3	A17	OUTAGE DELAY OF 0.25 DAYS DUE TO REACTOR COOLANT SYSTEM LEVEL INSTRUMENTATION PROBLEM.
05 Oct	7.0	7.7	UF3	A12	OUTAGE DELAY OF 0.29 DAYS DUE TO N32 AND N36 NEUTRON DETECTOR PROBLEMS.
06 Oct	9.0	9.9	UF3	A13	OUTAGE DELAY OF 0.30 DAYS DUE TO 2ND 15B RESIDUAL HEAT REMOVAL VALVE FAILED.
06 Oct	0.7	0.8	PF	E31	TURBINE OVERSPEED TRIP TEST.
06 Oct	1.9	2.0	UF3	E42	OUTAGE DELAY OF 0.08 DAYS DUE TO ZERO POWER PHYSICS TESTING DELAYS.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		44		1	324	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	688			1040		
D. Inspection, maintenance or repair without refuelling				121	0	
E. Testing of plant systems or components	0	1		0	0	
H. Nuclear regulatory requirements					14	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				0	5	
Subtotal	688	45	0	1162	347	0
Total		733			1509	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems	7	25
13. Reactor Auxiliary Systems	9	26
14. Safety Systems	7	20
15. Reactor Cooling Systems	15	95
16. Steam generation systems		18
17. Safety I&C Systems (excluding reactor I&C)	6	3
21. Fuel Handling and Storage Facilities		2
31. Turbine and auxiliaries		5
32. Feedwater and Main Steam System		50
41. Main Generator Systems		36
42. Electrical Power Supply Systems		10
XX. Miscellaneous Systems		1
Total	44	294

# US-336 MILLSTONE-2

**Operator:** DOMIN (DOMINION VIRGINIA POWER)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 871.0 MW(e)  
**Design Net Capacity:** 870.0 MW(e)  
**Design Discharge Burnup:** 22000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6109.8 GW(e).h  
**Energy Availability Factor:** 80.9%  
**Load Factor:** 80.3%  
**Operating Factor:** 80.9%  
**Energy Unavailability Factor:** 19.1%  
**Total Off-line Time:** 1677 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	655.5	592.0	230.9	631.6	655.1	595.0	649.2	643.0	624.4	200.3	0.4	632.5	6109.8
<b>EAF (%)</b>	100.0	100.0	37.8	100.0	100.0	100.0	100.0	100.0	100.0	32.1	1.2	100.0	80.9
<b>UCF (%)</b>	100.0	100.0	37.8	100.0	100.0	100.0	100.0	100.0	100.0	32.1	1.2	100.0	80.9
<b>LF (%)</b>	101.2	101.1	35.6	100.9	101.1	94.9	100.2	99.2	99.6	31.1	0.1	98.2	80.3
<b>OF (%)</b>	100.0	100.0	37.6	100.0	100.0	100.0	100.0	100.0	100.0	32.2	1.7	100.0	80.9
<b>EUf (%)</b>	0.0	0.0	62.2	0.0	0.0	0.0	0.0	0.0	0.0	67.9	98.8	0.0	19.1
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	67.9	87.0	0.0	12.9
<b>UCLF (%)</b>	0.0	0.0	62.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.8	0.0	6.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1969      **Lifetime Generation:** 125095.5 GW(e).h  
**Date of First Criticality:** 17 Oct 1975      **Cumulative Energy Availability Factor:** 61.2%  
**Date of Grid Connection:** 09 Nov 1975      **Cumulative Load Factor:** 59.4%  
**Date of Commercial Operation:** 26 Dec 1975      **Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	5015.6	864.0	70.5	69.8	70.5	67.9	66.3	66.4	6183	70.6
1983	2474.4	861.0	34.1	65.2	34.1	63.5	32.8	62.0	2993	34.2
1984	6608.3	860.0	93.4	68.4	93.4	67.0	87.5	65.0	8209	93.5
1985	3515.6	841.0	59.4	67.5	47.7	65.0	47.7	63.2	4322	49.3
1986	5164.9	857.0	72.5	68.0	72.5	65.7	68.8	63.7	6352	72.5
1987	6892.5	857.0	93.3	70.1	93.3	68.1	91.8	66.1	8177	93.3
1988	5735.9	860.0	77.2	70.7	77.2	68.8	75.9	66.9	6810	77.5
1989	4763.6	863.0	66.8	70.4	66.8	68.6	63.0	66.6	5705	65.1
1990	5309.9	863.0	72.8	70.6	72.8	68.9	70.2	66.9	6389	72.9
1991	3948.1	863.0	55.3	69.6	55.3	68.1	52.2	65.9	4820	55.0
1992	2725.0	870.0	36.1	67.6	36.1	66.1	35.7	64.1	3187	36.3
1993	6295.9	873.0	84.8	68.5	84.8	67.2	82.3	65.1	7431	84.8
1994	3676.5	873.0	49.0	67.5	49.0	66.2	48.1	64.2	4289	49.0
1995	2740.5	873.0	37.4	66.0	37.4	64.7	35.8	62.8	3273	37.4
1996	1046.5	871.0	13.7	63.4	13.7	62.2	13.7	60.4	1222	13.9
1997	0.0	871.0	0.0	60.5	0.0	59.4	0.0	57.6	0	0.0
1998	0.0	871.0	0.0	57.8	0.0	56.7	0.0	55.0	0	0.0
1999	4433.2	870.0	60.6	57.9	60.6	56.9	58.2	55.1	5310	60.6
2000	6268.5	872.0	83.7	59.0	83.7	58.0	81.8	56.2	7353	83.7
2001	7284.0	871.0	98.0	60.5	98.0	59.5	95.5	57.8	8587	98.0
2002	6209.3	870.0	83.2	61.3	83.2	60.4	81.5	58.7	7285	83.2
2003	6109.8	869.0	80.9	62.0	80.9	61.2	80.3	59.4	7083	80.9

## US-336 MILLSTONE-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
07 Mar	464.0	403.2	UF	A12	A TEST SELECTOR SWITCH FAILED DURING REACTOR PROTECTION SYSTEM TRIP LOGIC TESTING. THE FAILED SWITCH HAS BEEN REPLACED.
11 Oct	1127.0	979.4	PF	C21	REFUELING OUTAGE.
18 Nov	10.9	9.5	UF	A31	MAIN TURBINE -GENERATOR TRIP DUE TO VIBRATION OF MAIN TURBINE. REACTOR REMAINED CRITICAL.
27 Nov	15.9	13.8	UF	A31	MANUAL REACTOR AND TURBINE TRIP FROM 25% POWER DUE TO VIBRATION OF MAIN TURBINE.
27 Nov	1.2	1.0	PF	E31	MAIN TURBINE OVERSPEED TEST. REACTOR REMAINED CRITICAL.
28 Nov	39.7	34.5	UF5	A31	MAIN TURBINE-GENERATOR TRIP DUE TO VIBRATION OF MAIN TURBINE. REACTOR REMAINED CRITICAL, BUT WAS LATER MANUALLY TRIPPED DURING STARTUP OF MAIN TURBINE.
30 Nov	17.9	15.6	UF	A31	MAIN TURBINE-GENERATOR TRIP DUE TO VIBRATION OF MAIN TURBINE. REACTOR REMAINED CRITICAL.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1975 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		548			605	
B. Refuelling without a maintenance					32	
C. Inspection, maintenance or repair combined with refuelling	1127			1372		
D. Inspection, maintenance or repair without refuelling				56		
E. Testing of plant systems or components	1			11	250	
H. Nuclear regulatory requirements					712	38
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				29	8	36
Subtotal	1128	548	0	1468	1607	74
Total		1676			3149	

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

System	2003 Hours Lost	1975 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems	464	38
13. Reactor Auxiliary Systems		15
14. Safety Systems		13
15. Reactor Cooling Systems		145
16. Steam generation systems		110
31. Turbine and auxiliaries	84	78
32. Feedwater and Main Steam System		111
33. Circulating Water System		5
41. Main Generator Systems		2
42. Electrical Power Supply Systems		67
XX. Miscellaneous Systems		0
Total	548	585

# US-423 MILLSTONE-3

**Operator:** DOMIN (DOMINION VIRGINIA POWER)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1130.0 MW(e)  
**Design Net Capacity:** 1159.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 10005.7 GW(e).h  
**Energy Availability Factor:** 99.6%  
**Load Factor:** 101.1%  
**Operating Factor:** 99.6%  
**Energy Unavailability Factor:** 0.4%  
**Total Off-line Time:** 31 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	795.7	776.3	859.3	830.3	858.2	827.8	851.2	846.3	821.6	855.0	824.9	859.0	10005.7
<b>EAF (%)</b>	95.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6
<b>UCF (%)</b>	95.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7
<b>LF (%)</b>	94.6	102.2	102.2	102.2	102.1	101.7	101.3	100.7	101.0	101.6	101.4	102.2	101.1
<b>OF (%)</b>	95.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6
<b>EUf (%)</b>	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
<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>	4.1	0.0	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1974      **Lifetime Generation:** 120195.3 GW(e).h  
**Date of First Criticality:** 23 Jan 1986      **Cumulative Energy Availability Factor:** 70.0%  
**Date of Grid Connection:** 12 Feb 1986      **Cumulative Load Factor:** 67.4%  
**Date of Commercial Operation:** 23 Apr 1986      **Cumulative Unit Capability Factor:** 78.1%  
**Cumulative Energy Unavailability Factor:** 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 (%)
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	70.2	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	83.3	59.6	7329	83.7
2000	10125.7	1151.0	100.0	65.6	100.0	65.6	100.2	62.5	8784	100.0
2001	8169.7	1146.0	84.3	66.8	84.3	66.8	81.4	63.8	7392	84.4
2002	8746.2	1133.0	89.0	68.2	89.0	68.2	88.1	65.3	7803	89.1
2003	10005.7	1130.0	99.7	70.0	99.6	70.0	101.1	67.4	8729	99.6



## US-423 MILLSTONE-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	30.4	34.8	UF	A41	THE UNIT CONTINUED RAISING REACTOR POWER AFTER REPAIRING EQUIPMENT WHICH CAUSED A SHUTDOWN IN DEC. DUE TO PROBLEMS WITH THE TURBINE MAIN GENERATOR.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		30			729	
B. Refuelling without a maintenance					9	
C. Inspection, maintenance or repair combined with refuelling	754					
D. Inspection, maintenance or repair without refuelling	90					
E. Testing of plant systems or components	2					
H. Nuclear regulatory requirements					515	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					541	
Subtotal	0	30	0	846	1794	0
Total		30			2640	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		29
14. Safety Systems		264
15. Reactor Cooling Systems		53
17. Safety I&C Systems (excluding reactor I&C)		14
31. Turbine and auxiliaries		14
32. Feedwater and Main Steam System		27
33. Circulating Water System		7
41. Main Generator Systems	30	12
42. Electrical Power Supply Systems		8
XX. Miscellaneous Systems		224
Total	30	658

# US-263 MONTICELLO

**Operator:** NUCMAN (NUCLEAR MANAGEMENT CO.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 578.0 MW(e)  
**Design Net Capacity:** 545.0 MW(e)  
**Design Discharge Burnup:** 22700 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4592.5 GW(e).h  
**Energy Availability Factor:** 90.7%  
**Load Factor:** 90.7%  
**Operating Factor:** 91.0%  
**Energy Unavailability Factor:** 9.3%  
**Total Off-line Time:** 791 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	436.5	393.2	437.9	345.6	50.5	369.1	424.3	420.3	416.4	436.0	424.9	437.8	4592.5
<b>EAF (%)</b>	100.0	100.0	100.0	82.8	16.0	90.9	100.0	100.0	100.0	100.0	100.0	100.0	90.7
<b>UCF (%)</b>	100.0	100.0	100.0	82.8	16.0	90.9	100.0	100.0	100.0	100.0	100.0	100.0	90.7
<b>LF (%)</b>	101.5	101.2	101.8	83.2	11.7	88.7	98.7	97.7	100.1	101.3	102.1	101.8	90.7
<b>OF (%)</b>	100.0	100.0	100.0	83.4	18.3	91.1	100.0	100.0	100.0	100.0	100.0	100.0	91.0
<b>EUf (%)</b>	0.0	0.0	0.0	17.2	84.0	9.1	0.0	0.0	0.0	0.0	0.0	0.0	9.3
<b>PUf (%)</b>	0.0	0.0	0.0	17.2	84.0	9.1	0.0	0.0	0.0	0.0	0.0	0.0	9.3
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1967      **Lifetime Generation:** 121246.8 GW(e).h  
**Date of First Criticality:** 10 Dec 1970      **Cumulative Energy Availability Factor:** 80.8%  
**Date of Grid Connection:** 05 Mar 1971      **Cumulative Load Factor:** 78.3%  
**Date of Commercial Operation:** 30 Jun 1971      **Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1982	2425.1	525.0	62.2	80.8	62.2	74.6	52.7	72.0	5543	63.3
1983	4147.7	525.0	96.3	82.0	96.3	76.4	90.2	73.5	8438	96.3
1984	279.1	525.0	9.2	76.6	9.2	71.3	6.1	68.5	808	9.2
1985	4287.0	536.0	91.6	77.6	91.6	72.8	91.3	70.1	8028	91.6
1986	3379.9	536.0	78.8	77.7	78.8	73.2	72.0	70.2	6926	79.1
1987	3535.6	536.0	80.2	77.9	80.2	73.6	75.3	70.5	7051	80.5
1988	4573.6	536.0	99.7	79.2	99.7	75.1	97.1	72.1	8759	99.7
1989	2650.4	536.0	74.7	78.9	74.7	75.1	56.4	71.2	6578	75.1
1990	4505.9	536.0	96.0	79.8	96.0	76.2	96.0	72.5	8414	96.1
1991	3596.5	536.0	79.6	79.8	79.6	76.4	76.6	72.7	6996	79.9
1992	4453.7	536.0	97.0	80.6	97.0	77.4	94.6	73.7	8527	97.1
1993	3864.4	536.0	83.4	80.7	83.4	77.6	82.3	74.1	7322	83.6
1994	3956.2	536.0	85.5	80.9	85.6	78.0	84.3	74.6	7508	85.7
1995	4756.3	536.0	100.0	81.7	100.0	78.9	101.3	75.7	8760	100.0
1996	3872.9	541.0	84.8	81.8	84.7	79.1	81.5	75.9	7443	84.7
1997	3661.6	544.0	75.2	81.6	75.2	79.0	76.8	75.9	6609	75.4
1998	4118.9	553.0	87.7	81.8	87.7	79.3	85.0	76.3	7659	87.4
1999	4649.3	578.0	92.4	82.2	92.4	79.8	91.8	76.9	8092	92.4
2000	4251.4	578.0	83.5	82.3	83.5	79.9	83.7	77.1	7332	83.5
2001	3880.6	578.0	76.9	82.1	76.9	79.8	76.6	77.1	6774	77.3
2002	5015.6	578.0	98.3	82.6	98.4	80.5	99.1	77.9	8620	98.4
2003	4592.5	578.0	90.7	82.9	90.7	80.8	90.7	78.3	7969	91.0

# US-263 MONTICELLO

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
26 Apr	725.7	433.2	PF	C21	REFUELING OUTAGE.
14 Jun	63.6	38.0	PF	D35	SHUTDOWN TO FIX LEAKING SAFETY RELIEF VALVES AND CONDENSER AIR IN-LEAKAGE

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					251	
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling	725			1021		
D. Inspection, maintenance or repair without refuelling	63			125		
E. Testing of plant systems or components				0	1	
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling				0	2	
H. Nuclear regulatory requirements						9
J. Grid failure or grid unavailability					0	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				1	100	
Subtotal	788	0	0	1147	360	9
Total	788			1516		

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		12
12. Reactor I&C Systems		17
13. Reactor Auxiliary Systems		11
14. Safety Systems		20
15. Reactor Cooling Systems		26
16. Steam generation systems		3
17. Safety I&C Systems (excluding reactor I&C)		4
31. Turbine and auxiliaries		26
32. Feedwater and Main Steam System		59
33. Circulating Water System		0
35. All other I&C Systems		6
41. Main Generator Systems		15
42. Electrical Power Supply Systems		22
XX. Miscellaneous Systems		24
Total	0	245

# US-220 NINE MILE POINT-1

**Operator:** CONST (CONSTELLATION NUCLEAR GROUP)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 565.0 MW(e)  
**Design Net Capacity:** 620.0 MW(e)  
**Design Discharge Burnup:** 15000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4361.4 GW(e).h  
**Energy Availability Factor:** 83.6%  
**Load Factor:** 88.1%  
**Operating Factor:** 84.2%  
**Energy Unavailability Factor:** 16.4%  
**Total Off-line Time:** 1387 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	457.8	310.5	203.0	13.6	410.6	427.7	439.4	369.7	434.0	438.8	398.0	458.3	4361.4
<b>EAF (%)</b>	100.0	74.1	39.7	9.2	94.1	100.0	100.0	84.4	100.0	100.0	100.0	100.0	83.6
<b>UCF (%)</b>	100.0	74.1	39.7	9.2	94.1	100.0	100.0	84.4	100.0	100.0	100.0	100.0	83.6
<b>LF (%)</b>	108.9	81.8	48.3	3.3	97.7	105.1	104.5	88.0	106.7	104.2	97.8	109.0	88.1
<b>OF (%)</b>	100.0	76.3	45.2	9.2	91.8	100.0	100.0	85.8	100.0	100.0	100.0	100.0	84.2
<b>EUF (%)</b>	0.0	25.9	60.3	90.8	5.9	0.0	0.0	15.6	0.0	0.0	0.0	0.0	16.4
<b>PUF (%)</b>	0.0	25.9	60.3	74.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.2
<b>UCLF (%)</b>	0.0	0.0	0.0	16.3	5.9	0.0	0.0	15.6	0.0	0.0	0.0	0.0	3.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1965      **Lifetime Generation:** 116094.6 GW(e).h  
**Date of First Criticality:** 05 Sep 1969      **Cumulative Energy Availability Factor:** 66.8%  
**Date of Grid Connection:** 09 Nov 1969      **Cumulative Load Factor:** 65.4%  
**Date of Commercial Operation:** 01 Dec 1969      **Cumulative Unit Capability Factor:** 77.3%  
**Cumulative Energy Unavailability Factor:** 33.2%

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	1134.8	610.0	21.5	73.2	21.5	62.6	21.2	60.0	1872	21.4
1983	2802.0	610.0	56.2	72.0	56.2	62.1	52.4	59.4	4925	56.2
1984	3635.2	610.0	71.6	72.0	71.6	62.8	67.8	60.0	6316	71.9
1985	4932.3	610.0	96.4	73.5	96.4	64.9	92.3	62.0	8441	96.4
1986	3146.9	610.0	65.0	73.0	64.9	64.9	58.9	61.9	5722	65.3
1987	4615.2	610.0	92.8	74.1	92.8	66.5	86.4	63.2	8130	92.8
1988	0.0	610.0	0.0	70.2	0.0	62.9	0.0	59.9	0	0.0
1989	0.0	610.0	0.0	66.6	0.0	59.8	0.0	56.9	0	0.0
1990	1316.7	612.0	34.2	65.1	34.2	58.5	24.6	55.3	3043	34.7
1991	3873.5	615.0	78.2	65.7	78.2	59.4	71.9	56.1	6853	78.2
1992	2930.1	615.0	57.4	65.3	57.4	59.4	54.2	56.0	5052	57.5
1993	4353.4	615.0	84.1	66.1	84.1	60.4	80.8	57.0	7370	84.1
1994	4918.0	565.0	95.4	67.2	95.4	61.7	99.4	58.6	8390	95.8
1995	4127.6	565.0	82.9	67.8	82.9	62.5	83.4	59.5	7381	84.3
1996	4676.2	565.0	92.0	68.6	92.0	63.5	94.2	60.7	8133	92.6
1997	2698.6	565.0	51.8	68.0	51.8	63.1	54.5	60.5	4620	52.7
1998	4846.0	565.0	92.3	68.8	92.3	64.0	97.9	61.7	8085	92.3
1999	3564.9	565.0	68.4	68.8	68.4	64.2	72.0	62.0	6162	70.3
2000	4681.8	565.0	91.0	69.5	91.0	65.0	94.3	63.0	8060	91.8
2001	4378.0	565.0	83.5	69.9	83.5	65.6	88.5	63.8	7376	84.2
2002	4904.6	565.0	92.9	70.6	92.9	66.3	99.1	64.8	8194	93.5
2003	4361.4	565.0	83.6	70.9	83.6	66.8	88.1	65.4	7373	84.2

# US-220 NINE MILE POINT-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
13 Feb	158.3	98.3	PF	D15	THE UNIT WAS SHUTDOWN TO REPAIR LEAKING EMERGENCY CONDENSER ISOLATION VALVES.
15 Mar	952.6	591.6	PF	C21	REFUELLING OUTAGE.
23 Apr	5.1	3.2	PF	E31	THE GENERATOR WAS REMOVED FROM SERVICE TO PERFORM TURBINE OVERSPEED TRIP TESTING. THE REACTOR REMAINED CRITICAL.
24 Apr	2.6	1.6	PF	E31	THE GENERATOR WAS REMOVED FROM SERVICE TO COMPLETE THE TURBINE OVERSPEED TRIP TESTING. THE REACTOR REMAINED CRITICAL.
26 Apr	160.2	99.5	UF	A32	THE UNIT WAS SHUTDOWN TO REPAIR #13 FEEDWATER PUMP CLUTCH.
14 Aug	105.9	65.8	UF4	A31	REACTOR SCRAM DUE TO REACTOR PROTECTIVE SYSTEM TURBINE TRIP (LOAD REJECT/OFFSITE GRID INSTABILITY).

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		266		0	814	
B. Refuelling without a maintenance outage					34	
C. Inspection, maintenance or repair combined with refuelling	952			1363		
D. Inspection, maintenance or repair without refuelling	158			144		
E. Testing of plant systems or components	7			3	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				2		
H. Nuclear regulatory requirement				1	4	6
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				5	162	
Subtotal	1117	266	0	1518	1014	6
Total		1383			2538	

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		14
12. Reactor I&C Systems		38
13. Reactor Auxiliary System:		31
14. Safety Systems		67
15. Reactor Cooling System:		377
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries:	105	44
32. Feedwater and Main Steam System:	160	58
35. All other I&C Systems:		0
41. Main Generator System:		19
42. Electrical Power Supply System:		34
Total	265	684

# US-410 NINE MILE POINT-2

**Operator:** CONST (CONSTELLATION NUCLEAR GROUP)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1119.0 MW(e)  
**Design Net Capacity:** 1100.0 MW(e)  
**Design Discharge Burnup:** 24000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9566.9 GW(e).h  
**Energy Availability Factor:** 96.4%  
**Load Factor:** 97.6%  
**Operating Factor:** 96.4%  
**Energy Unavailability Factor:** 3.6%  
**Total Off-line Time:** 312 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	864.0	779.3	856.0	830.2	814.3	802.7	632.1	648.9	815.4	854.2	826.6	843.3	9566.9
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	73.8	83.8	100.0	100.0	100.0	100.0	96.4
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	73.8	83.8	100.0	100.0	100.0	100.0	96.4
<b>LF (%)</b>	103.8	103.6	102.8	103.2	97.8	99.6	75.9	77.9	101.2	102.5	102.6	101.3	97.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	75.0	83.1	100.0	100.0	100.0	100.0	96.4
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	26.2	16.2	0.0	0.0	0.0	0.0	3.6
<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	26.2	16.2	0.0	0.0	0.0	0.0	3.6
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1975  
**Date of First Criticality:** 23 May 1987  
**Date of Grid Connection:** 08 Aug 1987  
**Date of Commercial Operation:** 11 Mar 1988

**Lifetime Generation:** 113988.6 GW(e).h  
**Cumulative Energy Availability Factor:** 80.8%  
**Cumulative Load Factor:** 77.8%  
**Cumulative Unit Capability Factor:** 78.5%  
**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 (%)
1988	2540.6	1040.0	0.0	0.0	57.4	100.0	28.1	0.0	2800	32.2
1989	4288.3	1068.0	56.5	56.5	56.4	56.4	45.8	45.8	4824	55.1
1990	4140.4	1082.0	54.4	55.4	54.4	55.4	43.7	44.8	4697	53.6
1991	6562.9	1092.0	75.1	62.0	75.1	62.0	68.6	52.8	6484	74.0
1992	5145.0	1075.0	61.9	62.0	61.8	62.0	54.5	53.2	5169	58.8
1993	7191.1	1048.0	82.2	66.0	82.2	65.9	78.3	58.1	7195	82.1
1994	8355.9	994.0	93.9	70.3	93.9	70.3	96.0	64.0	8243	94.1
1995	7253.7	1061.0	78.9	71.5	78.9	71.5	78.0	66.0	6848	78.2
1996	8698.5	1106.0	89.8	73.9	89.7	73.9	89.5	69.1	7811	88.9
1997	8878.0	1105.0	94.9	76.3	94.9	76.3	91.7	71.7	8279	94.5
1998	7307.2	1105.0	80.8	76.8	80.8	76.8	75.5	72.1	7028	80.2
1999	8782.3	1128.0	89.1	78.0	89.1	77.9	88.9	73.7	7810	89.2
2000	8001.5	1123.0	81.7	78.3	81.7	78.3	81.1	74.3	7204	82.0
2001	8858.8	1119.0	90.7	79.3	90.7	79.3	90.4	75.6	7964	90.9
2002	8417.5	1119.0	85.1	79.7	85.1	79.7	85.9	76.3	7473	85.3
2003	9566.9	1119.0	96.4	80.8	96.4	80.8	97.6	77.8	8448	96.4

## US-410 NINE MILE POINT-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
24 Jul	235.9	267.7	UF4	A32	FAILURE OF A FEEDWATER CONTROL CIRCUIT POWER SUPPLY RESULTED IN REACTOR TRANSIENT AND EVENTUAL SCRAM (OPRM SAFETY TRIP). EXTENT OF CONDITION INDICATED TWO ADDITIONAL POWER SUPPLIES. EACH POWER SUPPLY WAS REPLACED WITH A PAIR OF POWER SUPPLIES.
14 Aug	75.5	85.7	UF	J42	OFFSITE POWER GRID DISTURBANCES.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		235			511	
B. Refuelling without a maintenance					26	
C. Inspection, maintenance or repair combined with refuelling				820		
D. Inspection, maintenance or repair without refuelling				403	2	
E. Testing of plant systems or components				3		
J. Grid failure or grid unavailability		75				
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					59	
Subtotal	0	310	0	1226	598	0
Total		310			1824	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
13. Reactor Auxiliary Systems		0
14. Safety Systems		15
15. Reactor Cooling Systems		83
17. Safety I&C Systems (excluding reactor I&C)		5
31. Turbine and auxiliaries		42
32. Feedwater and Main Steam System	235	64
33. Circulating Water System		20
35. All other I&C Systems		68
41. Main Generator Systems		44
42. Electrical Power Supply Systems		89
Total	235	430

# US-338 NORTH ANNA-1

**Operator:** DOMIN (DOMINION VIRGINIA POWER)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 925.0 MW(e)  
**Design Net Capacity:** 907.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6519.9 GW(e).h  
**Energy Availability Factor:** 82.2%  
**Load Factor:** 80.5%  
**Operating Factor:** 82.2%  
**Energy Unavailability Factor:** 17.8%  
**Total Off-line Time:** 1560 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	657.5	389.1	0.0	229.1	692.2	444.6	689.6	688.3	669.3	695.2	671.6	693.5	6519.9
<b>EAF (%)</b>	100.0	78.6	0.0	39.7	100.0	67.1	100.0	100.0	100.0	100.0	100.0	100.0	82.2
<b>UCF (%)</b>	100.0	78.6	0.0	39.8	100.0	67.1	100.0	100.0	100.0	100.0	100.0	100.0	82.2
<b>LF (%)</b>	95.5	62.6	0.0	34.5	100.6	66.8	100.2	100.0	100.5	100.9	100.8	100.8	80.5
<b>OF (%)</b>	100.0	78.6	0.0	39.6	100.0	66.9	100.0	100.0	100.0	100.0	100.0	100.0	82.2
<b>EUf (%)</b>	0.0	21.4	100.0	60.3	0.0	32.9	0.0	0.0	0.0	0.0	0.0	0.0	17.8
<b>PUf (%)</b>	0.0	21.4	100.0	57.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.9
<b>UCLF (%)</b>	0.0	0.0	0.0	2.4	0.0	32.9	0.0	0.0	0.0	0.0	0.0	0.0	2.9
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1971      **Lifetime Generation:** 153809.1 GW(e).h  
**Date of First Criticality:** 05 Apr 1978      **Cumulative Energy Availability Factor:** 79.4%  
**Date of Grid Connection:** 17 Apr 1978      **Cumulative Load Factor:** 76.3%  
**Date of Commercial Operation:** 06 Jun 1978      **Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1982	2397.9	865.0	34.7	60.3	34.7	60.3	31.6	54.9	3027	34.6
1983	5310.4	872.0	71.6	62.5	71.6	62.5	69.5	57.8	6277	71.7
1984	3784.8	883.0	50.3	60.5	50.3	60.5	48.8	56.3	4425	50.4
1985	5798.9	892.0	77.9	63.0	77.9	63.0	74.2	58.9	6820	77.9
1986	6310.7	893.0	83.7	65.6	83.7	65.6	80.7	61.7	7327	83.6
1987	3568.9	913.0	52.1	64.1	52.1	64.1	44.6	59.7	4523	51.6
1988	6897.3	915.0	88.6	66.6	88.6	66.6	85.8	62.4	7760	88.3
1989	4303.3	915.0	57.8	65.8	57.8	65.8	53.7	61.6	4978	56.8
1990	7233.5	912.0	99.6	68.7	99.6	68.7	90.5	64.1	8726	99.6
1991	5625.8	911.0	75.2	69.2	75.2	69.2	70.5	64.6	6549	74.8
1992	5358.1	858.0	81.5	70.0	81.5	70.0	71.1	65.0	7225	82.3
1993	5692.6	890.0	73.5	70.3	73.5	70.3	73.0	65.5	6444	73.6
1994	6795.7	900.0	91.5	71.6	91.6	71.6	86.2	66.9	8012	91.5
1995	7839.2	896.0	99.7	73.3	99.7	73.3	99.9	68.8	8733	99.7
1996	6945.5	893.0	91.0	74.3	91.0	74.2	88.5	69.9	7985	90.9
1997	7157.5	893.0	91.3	75.1	91.3	75.1	91.5	71.0	7992	91.2
1998	7217.1	893.0	92.4	76.0	92.4	76.0	92.3	72.1	8091	92.4
1999	8124.5	893.0	100.0	77.2	100.0	77.1	103.9	73.6	8760	100.0
2000	7213.1	893.0	91.1	77.8	91.1	77.8	92.0	74.5	7997	91.0
2001	7120.8	925.0	91.5	78.4	91.5	78.4	87.9	75.1	8010	91.4
2002	8164.3	925.0	100.0	79.3	100.0	79.3	100.8	76.2	8760	100.0
2003	6519.9	925.0	82.2	79.5	82.2	79.4	80.5	76.3	7200	82.2



# US-338 NORTH ANNA-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
23 Feb	1304.3	1206.5	PF	C21	REFUELING OUTAGE.
19 Apr	17.2	15.9	UF	A11	FAILURE OF INTERFACE DIAPHRAGM CAUSED #2,4 THROTTLE VALVES TO DRIFT CLOSED.
11 Jun	237.2	219.4	UF4	A42	MAIN TRANSFORMER LOCK-OUT RELAY TURBINE TRIP/RX TRIP.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1978 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		254			472	
B. Refuelling without a maintenance					5	
C. Inspection, maintenance or repair combined with refuelling	1304			1058		
D. Inspection, maintenance or repair without refuelling				127		
E. Testing of plant systems or components				12	4	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				0	2	
Subtotal	1304	254	0	1197	483	0
Total		1558			1680	

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

System	2003 Hours Lost	1978 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	17	17
12. Reactor I&C Systems		3
13. Reactor Auxiliary Systems		9
14. Safety Systems		22
15. Reactor Cooling Systems		55
16. Steam generation systems		136
31. Turbine and auxiliaries		64
32. Feedwater and Main Steam System		19
33. Circulating Water System		4
41. Main Generator Systems		11
42. Electrical Power Supply Systems	237	98
Total	254	438

# US-339 NORTH ANNA-2

**Operator:** DOMIN (DOMINION VIRGINIA POWER)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 917.0 MW(e)  
**Design Net Capacity:** 907.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7262.8 GW(e).h  
**Energy Availability Factor:** 90.8%  
**Load Factor:** 90.4%  
**Operating Factor:** 90.8%  
**Energy Unavailability Factor:** 9.2%  
**Total Off-line Time:** 810 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	0.0	545.5	670.5	642.9	686.1	660.3	681.3	680.7	656.7	686.0	665.5	687.5	7262.8
<b>EAF (%)</b>	0.0	93.5	97.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.8
<b>UCF (%)</b>	0.0	93.5	97.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.8
<b>LF (%)</b>	0.0	88.5	98.3	97.5	100.6	100.0	99.9	99.8	99.5	100.4	100.8	100.8	90.4
<b>OF (%)</b>	0.0	93.3	98.5	98.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.8
<b>EUf (%)</b>	100.0	6.5	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.2
<b>PUf (%)</b>	100.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0
<b>UCLF (%)</b>	0.0	0.0	2.8	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1970      **Lifetime Generation:** 148299.2 GW(e).h  
**Date of First Criticality:** 12 Jun 1980      **Cumulative Energy Availability Factor:** 84.2%  
**Date of Grid Connection:** 25 Aug 1980      **Cumulative Load Factor:** 81.0%  
**Date of Commercial Operation:** 14 Dec 1980      **Cumulative Unit Capability Factor:** 77.4%  
**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 (%)
1982	4047.2	890.0	57.4	67.8	57.3	67.8	51.9	62.5	4990	57.0
1983	5802.5	890.0	80.8	72.1	80.7	72.1	74.4	66.5	7052	80.5
1984	4717.2	890.0	67.1	70.9	67.1	70.9	60.3	64.9	5896	67.1
1985	6813.6	892.0	94.2	75.6	94.2	75.6	87.2	69.4	8252	94.2
1986	6022.1	893.0	82.3	76.7	82.2	76.7	77.0	70.7	7208	82.3
1987	5653.4	905.0	77.4	76.8	77.4	76.8	71.3	70.8	6783	77.4
1988	7884.0	915.0	99.2	79.7	99.2	79.6	98.1	74.3	8708	99.1
1989	5896.5	915.0	80.2	79.7	80.2	79.7	73.6	74.2	6887	78.6
1990	5976.6	910.0	80.0	79.7	80.0	79.7	75.0	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	76.5	7237	82.4
1993	6225.2	909.0	83.6	81.6	83.6	81.6	78.2	76.7	7303	83.4
1994	7490.3	887.0	97.2	82.7	97.2	82.7	96.4	78.1	8517	97.2
1995	6031.7	892.0	80.8	82.6	80.8	82.6	77.2	78.0	7086	80.9
1996	6121.5	897.0	78.1	82.3	78.1	82.3	77.7	78.0	6859	78.1
1997	7834.8	897.0	99.8	83.3	99.7	83.4	99.7	79.3	8738	99.7
1998	7086.1	897.0	92.2	83.8	91.9	83.8	90.2	79.9	8049	91.9
1999	7185.1	897.0	91.7	84.3	91.7	84.2	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	84.6	77.4	84.6	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	81.0	7950	90.8

## US-339 NORTH ANNA-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	788.1	722.7	PF	C21	CONT'D REFUELING OUTAGE/REACTOR VESSEL HEAD REPLACEMENT OUTAGE.
31 Mar	20.8	19.1	UF	A42	FAILURE OF 2-FW-FCY-2498 (FUSE) DRIVER CARD FOR 2-FW-FCV-2498.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1980 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		20			265	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling	788			851		
D. Inspection, maintenance or repair without refuelling				88		
E. Testing of plant systems or components				3		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					74	0
Subtotal	788	20	0	942	353	0
Total		808			1295	

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

System	2003 Hours Lost	1980 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		3
13. Reactor Auxiliary Systems		3
14. Safety Systems		17
15. Reactor Cooling Systems		13
16. Steam generation systems		45
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		10
32. Feedwater and Main Steam System		21
33. Circulating Water System		0
41. Main Generator Systems		55
42. Electrical Power Supply Systems	20	91
Total	20	260

# US-269 OCONEE-1

**Operator:** DUKE (DUKE POWER CO.)  
**Contractor:** B&W (BABCOCK & WILCOX CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 846.0 MW(e)  
**Design Net Capacity:** 887.0 MW(e)  
**Design Discharge Burnup:** 32000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5258.6 GW(e).h  
**Energy Availability Factor:** 71.8%  
**Load Factor:** 71.0%  
**Operating Factor:** 71.8%  
**Energy Unavailability Factor:** 28.2%  
**Total Off-line Time:** 2472 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	644.1	582.4	621.0	622.7	633.7	621.2	639.0	608.6	285.9	0.0	0.0	0.0	5258.6
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	63.3	0.0	0.0	0.0	71.8
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	63.3	0.0	0.0	0.0	71.8
<b>LF (%)</b>	102.3	102.4	98.7	102.4	100.7	102.0	101.5	96.7	46.9	0.0	0.0	0.0	71.0
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	63.5	0.0	0.0	0.0	71.8
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.7	100.0	100.0	100.0	28.2
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.7	100.0	100.0	29.0	22.2
<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	71.0	6.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1967      **Lifetime Generation:** 168746.7 GW(e).h  
**Date of First Criticality:** 19 Apr 1973      **Cumulative Energy Availability Factor:** 76.2%  
**Date of Grid Connection:** 06 May 1973      **Cumulative Load Factor:** 74.1%  
**Date of Commercial Operation:** 15 Jul 1973      **Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	5152.8	860.0	73.5	68.1	73.5	61.4	68.4	59.6	6335	72.3
1983	5672.0	860.0	78.4	69.1	78.4	63.1	75.3	61.1	6804	77.7
1984	6173.7	860.0	83.5	70.4	83.6	64.9	81.7	63.0	7312	83.2
1985	7066.0	860.0	96.3	72.5	96.2	67.5	93.8	65.5	8424	96.2
1986	4793.9	860.0	70.2	72.4	70.2	67.7	63.6	65.4	5870	67.0
1987	5031.1	860.0	76.8	72.7	76.8	68.4	66.8	65.5	6693	76.4
1988	7192.2	846.0	99.5	74.4	99.5	70.4	96.8	67.5	8742	99.5
1989	5943.1	846.0	83.0	75.0	82.9	71.2	80.2	68.3	7264	82.9
1990	6454.8	846.0	88.5	75.7	88.5	72.2	87.1	69.4	7751	88.5
1991	6022.5	846.0	82.7	76.1	82.7	72.7	81.3	70.0	7245	82.7
1992	6277.7	846.0	85.3	76.6	85.3	73.4	84.5	70.8	7494	85.3
1993	6525.1	846.0	89.4	77.2	89.4	74.2	88.0	71.6	7833	89.4
1994	6088.7	846.0	83.4	77.5	83.4	74.6	82.2	72.1	7302	83.4
1995	6360.5	846.0	86.1	77.9	86.1	75.1	85.8	72.7	7537	86.0
1996	5567.0	846.0	75.2	77.8	75.2	75.1	74.9	72.8	6606	75.2
1997	3194.2	846.0	51.3	76.7	51.3	74.1	43.1	71.6	4482	51.2
1998	5996.4	846.0	82.8	76.9	82.8	74.5	80.9	72.0	7255	82.8
1999	6212.6	846.0	85.1	77.3	85.1	74.9	83.8	72.4	7383	84.3
2000	6312.7	846.0	84.8	77.5	84.8	75.3	84.9	72.9	7445	84.8
2001	6962.6	846.0	94.0	78.1	94.0	75.9	94.0	73.6	8210	93.7
2002	6607.5	846.0	88.9	78.5	88.9	76.4	89.2	74.2	7788	88.9
2003	5258.6	846.0	71.8	78.3	71.8	76.2	71.0	74.1	6288	71.8

# US-269 OCONEE-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
20 Sep	1943.9	1644.5	PF	C21	REFUELING AND SG/RX HEAD REPLACEMENT
09 Dec	96.0	81.2	UF3	A14	OUTAGE DELAY OF 4 DAYS DUE TO LOW PRESSURE INJECTION CROSSOVER MODIFICATION.
13 Dec	120.0	101.5	UF3	A16	OUTAGE DELAY OF 5 DAYS DUE TO STEAM GENERATOR REPLACEMENT ACTIVITIES.
18 Dec	24.0	20.3	UF3	A31	OUTAGE DELAY OF 1 DAY DUE TO HIGH TURBINE VIBRATIONS.
19 Dec	288.1	243.7	UF3	A15	OUTAGE DELAY OF 12.01 DAYS DUE TO REACTOR COOLANT PUMP SEAL O-RING LEAKING

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1973 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		528			625	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	1943			878		
D. Inspection, maintenance or repair without refuelling				171	3	
E. Testing of plant systems or components				26	1	
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling				0		
H. Nuclear regulatory requirements				3	0	37
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					0	0
Subtotal	1943	528	0	1078	631	37
Total		2471			1746	

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

System	2003 Hours Lost	1973 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		51
12. Reactor I&C Systems		73
13. Reactor Auxiliary Systems		3
14. Safety Systems	96	44
15. Reactor Cooling Systems	288	126
16. Steam generation systems	120	178
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries	24	55
32. Feedwater and Main Steam System		23
41. Main Generator Systems		10
42. Electrical Power Supply Systems		18
XX. Miscellaneous Systems		23
Total	528	604

# US-270 OCONEE-2

**Operator:** DUKE (DUKE POWER CO.)  
**Contractor:** B&W (BABCOCK & WILCOX CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 846.0 MW(e)  
**Design Net Capacity:** 887.0 MW(e)  
**Design Discharge Burnup:** 32000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7568.7 GW(e).h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 102.1%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 0 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	647.3	585.2	647.7	623.5	646.3	619.5	641.6	637.8	613.4	640.2	624.0	642.5	7568.7
<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>	102.8	102.9	102.9	102.5	102.7	101.7	101.9	101.3	100.7	101.6	102.4	102.1	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	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1967      **Lifetime Generation:** 169265.7 GW(e).h  
**Date of First Criticality:** 11 Nov 1973      **Cumulative Energy Availability Factor:** 79.5%  
**Date of Grid Connection:** 05 Dec 1973      **Cumulative Load Factor:** 77.0%  
**Date of Commercial Operation:** 09 Sep 1974      **Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	3447.7	860.0	53.5	64.8	53.5	63.8	45.8	60.0	4580	52.3
1983	5147.0	860.0	73.3	65.7	73.2	64.9	68.3	60.9	6348	72.5
1984	7298.0	860.0	100.0	69.2	96.6	68.4	96.6	64.5	8784	100.0
1985	5060.0	860.0	76.3	69.8	76.3	69.1	67.2	64.7	6654	76.0
1986	5803.1	860.0	81.4	70.8	81.4	70.1	77.0	65.8	7169	81.8
1987	6228.7	860.0	98.0	72.8	98.0	72.3	82.7	67.1	8565	97.8
1988	5540.0	846.0	78.3	73.2	78.3	72.7	74.5	67.6	6880	78.3
1989	6013.1	846.0	83.1	73.9	83.1	73.4	81.1	68.5	7272	83.0
1990	6269.4	846.0	85.3	74.6	85.3	74.1	84.6	69.5	7469	85.3
1991	7427.9	846.0	100.0	76.0	100.0	75.6	100.2	71.3	8760	100.0
1992	5946.9	846.0	80.9	76.3	80.9	75.9	80.0	71.7	7103	80.9
1993	6236.3	846.0	84.0	76.7	83.9	76.3	84.1	72.4	7352	83.9
1994	6148.5	846.0	83.3	77.0	83.3	76.7	83.0	72.9	7292	83.2
1995	6973.9	846.0	94.3	77.8	94.3	77.5	94.1	73.9	8263	94.3
1996	4432.0	846.0	60.4	77.1	60.4	76.7	59.6	73.3	5304	60.4
1997	5876.8	846.0	79.7	77.2	79.7	76.8	79.3	73.5	6974	79.6
1998	5654.7	846.0	77.4	77.2	77.4	76.9	76.3	73.6	6776	77.4
1999	6257.6	846.0	84.2	77.5	84.2	77.2	84.4	74.1	7374	84.2
2000	7499.5	846.0	100.0	78.3	100.0	78.0	100.9	75.1	8784	100.0
2001	6688.4	846.0	89.5	78.7	89.5	78.5	90.3	75.6	7836	89.5
2002	6611.1	846.0	88.4	79.1	88.4	78.8	89.2	76.1	7743	88.4
2003	7568.7	846.0	100.0	79.8	100.0	79.5	102.1	77.0	8760	100.0

## US-270 OCONEE-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1975 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure				0	638	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling				909		
D. Inspection, maintenance or repair without refuelling				73	2	
E. Testing of plant systems or components				6	1	
H. Nuclear regulatory requirements				0		35
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					0	
Subtotal	0	0	0	988	642	35
Total		0			1665	

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

System	2003 Hours Lost	1975 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		48
12. Reactor I&C Systems		71
13. Reactor Auxiliary Systems		5
14. Safety Systems		53
15. Reactor Cooling Systems		117
16. Steam generation systems		132
31. Turbine and auxiliaries		176
32. Feedwater and Main Steam System		9
33. Circulating Water System		2
41. Main Generator Systems		5
42. Electrical Power Supply Systems		16
Total	0	634

# US-287 OCONEE-3

**Operator:** DUKE (DUKE POWER CO.)  
**Contractor:** B&W (BABCOCK & WILCOX CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 846.0 MW(e)  
**Design Net Capacity:** 887.0 MW(e)  
**Design Discharge Burnup:** 32000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6318.0 GW(e).h  
**Energy Availability Factor:** 85.2%  
**Load Factor:** 85.3%  
**Operating Factor:** 85.2%  
**Energy Unavailability Factor:** 14.8%  
**Total Off-line Time:** 1293 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	646.8	585.2	642.8	439.1	0.0	222.5	638.6	634.6	609.2	636.7	619.0	643.5	6318.0
<b>EAF (%)</b>	100.0	100.0	100.0	83.3	0.0	40.5	100.0	100.0	100.0	100.0	100.0	100.0	85.2
<b>UCF (%)</b>	100.0	100.0	100.0	83.3	0.0	40.5	100.0	100.0	100.0	100.0	100.0	100.0	85.3
<b>LF (%)</b>	102.8	102.9	102.1	72.2	0.0	36.5	101.5	100.8	100.0	101.0	101.6	102.2	85.3
<b>OF (%)</b>	100.0	100.0	100.0	83.6	0.0	40.1	100.0	100.0	100.0	100.0	100.0	100.0	85.2
<b>EUf (%)</b>	0.0	0.0	0.0	16.7	100.0	59.5	0.0	0.0	0.0	0.0	0.0	0.0	14.8
<b>PUf (%)</b>	0.0	0.0	0.0	16.7	96.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.6
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	3.4	59.5	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1967      **Lifetime Generation:** 165367.1 GW(e).h  
**Date of First Criticality:** 05 Sep 1974      **Cumulative Energy Availability Factor:** 78.0%  
**Date of Grid Connection:** 18 Sep 1974      **Cumulative Load Factor:** 76.2%  
**Date of Commercial Operation:** 16 Dec 1974      **Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	2128.4	860.0	33.5	64.9	33.5	63.5	28.3	61.8	2826	32.3
1983	7099.1	860.0	96.5	68.4	96.5	67.2	94.2	65.4	8436	96.3
1984	5355.5	860.0	74.2	69.0	74.2	67.9	70.9	66.0	6474	73.7
1985	4860.8	860.0	69.7	69.0	69.7	68.0	64.5	65.8	6071	69.3
1986	6064.3	860.0	90.0	70.8	90.0	69.9	80.5	67.0	7781	88.8
1987	5094.4	860.0	69.8	70.7	69.8	69.9	67.6	67.1	6068	69.3
1988	5965.8	846.0	81.9	71.5	81.9	70.7	80.3	68.0	7190	81.9
1989	6337.4	846.0	86.6	72.5	86.6	71.8	85.5	69.2	7585	86.6
1990	7427.8	846.0	99.5	74.1	99.5	73.5	100.2	71.1	8712	99.5
1991	5594.6	846.0	86.6	74.9	86.6	74.2	75.5	71.3	6691	76.4
1992	5448.2	846.0	75.5	74.9	75.5	74.3	73.3	71.4	6634	75.5
1993	7393.8	846.0	98.7	76.1	98.7	75.6	99.8	72.9	8647	98.7
1994	5670.8	846.0	77.5	76.2	77.5	75.7	76.5	73.1	6781	77.4
1995	6467.8	846.0	87.1	76.7	87.1	76.2	87.3	73.8	7625	87.0
1996	5454.0	846.0	73.2	76.6	73.2	76.1	73.4	73.7	6429	73.2
1997	4652.6	846.0	64.7	76.0	64.6	75.6	62.8	73.3	5633	64.3
1998	5786.4	846.0	80.1	76.2	80.1	75.8	78.1	73.5	7026	80.2
1999	7369.5	846.0	99.0	77.1	99.0	76.7	99.4	74.5	8676	99.0
2000	6577.8	846.0	88.0	77.5	88.0	77.1	88.5	75.0	7729	88.0
2001	5398.5	846.0	72.6	77.3	72.6	76.9	72.8	75.0	6355	72.5
2002	7465.5	846.0	99.2	78.1	99.2	77.7	100.7	75.9	8688	99.2
2003	6318.0	846.0	85.3	78.4	85.2	78.0	85.3	76.2	7467	85.2



## US-287 OCONEE-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
26 Apr	840.0	710.6	PF	C21	REFUELING OUTAGE.
31 May	131.0	110.9	UF3	A11	OUTAGE DELAY OF 0.92 DAYS DUE TO CHROMATE CONTAMINATION IN REACTOR BUILDING.
05 Jun	132.0	111.7	UF3	A42	OUTAGE DELAY OF 5.50 DAYS DUE TO POWER OPERATED RELIEF BLOCK VALVE 3RC4 LEAK.
11 Jun	30.0	25.4	UF3	A31	OUTAGE DELAY OF 1.25 DAYS DUE TO REHEATER STEAM SUPPLY VALVE CONTROL PROBLEM.
12 Jun	18.5	15.7	UF3	A11	OUTAGE DELAY OF 0.77 DAYS DUE TO REACTOR VESSEL HEAD REMOVAL PROBLEM.
13 Jun	47.0	39.8	UF3	A21	OUTAGE DELAY OF 1.96 DAYS DUE TO PROBLEM LOADING FUEL ASSEMBLES.
15 Jun	24.0	20.3	UF3	A31	OUTAGE DELAY OF 1 DAY DUE TO TURBINE LUBE OIL SYSTEM.
16 Jun	13.3	11.3	UF3	A12	OUTAGE DELAY OF 0.56 DAYS DUE TO CONTROL DRIVE SYSTEM RELAY PROBLEM.
16 Jun	13.0	11.0	UF3	A34	OUTAGE DELAY OF 0.54 DAYS DUE TO LOW PRESSURE SERVICE WATER VALVE CONTROL SYSTEM.
16 Jun	4.0	3.4	UF3	A11	OUTAGE DELAY OF 0.17 DAYS DUE TO REACTOR BUILDING POLAR CRANE.
28 Jun	39.3	33.2	UF	A31	BALANCE TURBINE DUE TO VIBRATION.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1975 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		452		4	573	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	839			908		
D. Inspection, maintenance or repair without refuelling				136	0	
E. Testing of plant systems or components				6	5	
H. Nuclear regulatory requirements					95	39
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				0	17	0
Subtotal	839	452	0	1054	693	39
Total		1291			1786	

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

System	2003 Hours Lost	1975 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	153	12
12. Reactor I&C Systems	13	102
13. Reactor Auxiliary Systems		43
14. Safety Systems		28
15. Reactor Cooling Systems		81
16. Steam generation systems		158
21. Fuel Handling and Storage Facilities	47	0
31. Turbine and auxiliaries	93	75
32. Feedwater and Main Steam System		20
41. Main Generator Systems		6
42. Electrical Power Supply Systems	132	2
XX. Miscellaneous Systems	13	20
Total	451	547

# US-219 OYSTER CREEK

**Operator:** AMERGEN (AMERGEN ENERGY Co.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 619.0 MW(e)  
**Design Net Capacity:** 650.0 MW(e)  
**Design Discharge Burnup:** 16500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5256.3 GW(e).h  
**Energy Availability Factor:** 96.7%  
**Load Factor:** 96.9%  
**Operating Factor:** 96.7%  
**Energy Unavailability Factor:** 3.3%  
**Total Off-line Time:** 292 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	473.4	403.2	463.9	457.2	352.2	449.0	454.3	364.2	447.3	470.1	445.2	476.2	5256.3
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	76.9	100.0	100.0	83.9	100.0	100.0	100.0	100.0	96.7
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	76.9	100.0	100.0	83.9	100.0	100.0	100.0	100.0	96.7
<b>LF (%)</b>	102.8	96.9	100.7	102.7	76.5	100.8	98.6	79.1	100.4	101.9	99.9	103.4	96.9
<b>OF (%)</b>	100.0	100.0	100.0	100.0	76.9	100.0	100.0	83.9	100.0	100.0	100.0	100.0	96.7
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	23.1	0.0	0.0	16.1	0.0	0.0	0.0	0.0	3.3
<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	23.1	0.0	0.0	16.1	0.0	0.0	0.0	0.0	3.3
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1964      **Lifetime Generation:** 123212.4 GW(e).h  
**Date of First Criticality:** 03 May 1969      **Cumulative Energy Availability Factor:** 70.2%  
**Date of Grid Connection:** 23 Sep 1969      **Cumulative Load Factor:** 66.7%  
**Date of Commercial Operation:** 01 Dec 1969      **Cumulative Unit Capability Factor:** 77.3%  
**Cumulative Energy Unavailability Factor:** 29.8%

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	2013.0	620.0	62.5	72.5	62.5	67.4	37.1	63.1	5474	62.5
1983	225.5	620.0	11.5	68.1	11.5	63.4	4.2	58.9	1007	11.5
1984	305.2	620.0	9.6	64.2	9.6	59.8	5.6	55.3	842	9.6
1985	3746.0	620.0	74.5	64.8	74.5	60.7	69.0	56.2	6518	74.4
1986	1317.7	620.0	26.7	62.6	26.7	58.7	24.3	54.3	2310	26.4
1987	3113.4	620.0	62.0	62.6	62.0	58.9	57.3	54.5	5421	61.9
1988	3547.3	620.0	65.5	62.7	65.5	59.2	65.1	55.0	5749	65.4
1989	2410.1	620.0	53.6	62.3	53.6	59.0	44.4	54.5	4686	53.5
1990	4305.1	620.0	87.7	63.5	87.7	60.3	79.3	55.7	7678	87.6
1991	2954.8	619.0	59.0	63.3	59.0	60.3	54.5	55.6	5167	59.0
1992	4531.8	610.0	84.9	64.2	84.9	61.3	84.6	56.9	7463	85.0
1993	4667.5	610.0	87.4	65.2	87.4	62.4	87.3	58.1	7654	87.4
1994	3633.3	610.0	69.2	65.3	69.2	62.7	68.0	58.5	6096	69.6
1995	5194.1	619.0	97.2	66.5	97.2	64.0	95.8	59.9	8511	97.2
1996	4339.4	619.0	80.9	67.1	80.9	64.6	79.8	60.7	7104	80.9
1997	5073.3	619.0	93.2	68.0	93.2	65.7	93.6	61.9	8164	93.2
1998	4302.2	619.0	81.0	68.5	81.0	66.2	79.3	62.5	7094	81.0
1999	5388.5	619.0	100.0	69.5	100.0	67.3	99.4	63.7	8760	100.0
2000	3908.2	619.0	80.6	69.9	80.6	67.7	71.9	64.0	7073	80.5
2001	5226.4	619.0	97.0	70.7	97.0	68.7	96.4	65.0	8497	97.0
2002	5031.3	619.0	93.8	71.4	93.8	69.4	92.8	65.8	8215	93.8
2003	5256.3	619.0	96.7	72.2	96.7	70.2	96.9	66.7	8468	96.7

# US-219 OYSTER CREEK

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
20 May	171.6	106.2	UF	A14	TECH SPEC REQUIRED SHUTDOWN DUE TO FAILURE OF CABLE DISCONNECTED TO C 4160 VOLT BUS. POWER WAS LOST TO SAFETY RELATED EQUIPMENT. THE VALVE WAS REPLACED WITH A DIFFERENT TYPE.
14 Aug	60.9	37.7	UF4	J42	GENERATOR TRIP/REACTOR SCRAM, CAUSED BY WIDESPREAD GRID DISTURBANCE.
22 Aug	59.0	36.5	UF4	A35	TURBINE TRIP/REACTOR SCRAM - CAUSED BY SPURIOUS MOISTURE SEPARATOR HI-HI LEVEL TRIP CAUSED BY A LEVEL SWITCH FAILURE. THE SWITCH WAS REPLACED.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		230			665	
B. Refuelling without a maintenance					37	
C. Inspection, maintenance or repair combined with refuelling				1531		
D. Inspection, maintenance or repair without refuelling				100		
E. Testing of plant systems or components				4	33	
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling				0		
H. Nuclear regulatory requirements					16	9
J. Grid failure or grid unavailability		60				
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					70	
Subtotal	0	290	0	1635	821	9
Total		290			2465	

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		15
13. Reactor Auxiliary Systems		10
14. Safety Systems	171	183
15. Reactor Cooling Systems		166
31. Turbine and auxiliaries		37
32. Feedwater and Main Steam System		72
33. Circulating Water System		7
35. All other I&C Systems	59	5
41. Main Generator Systems		35
42. Electrical Power Supply Systems		25
XX. Miscellaneous Systems		5
Total	230	560

# US-255 PALISADES

**Operator:** NUCMAN (NUCLEAR MANAGEMENT CO.)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 730.0 MW(e)  
**Design Net Capacity:** 805.0 MW(e)  
**Design Discharge Burnup:** 28000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6158.2 GW(e).h  
**Energy Availability Factor:** 90.0%  
**Load Factor:** 96.3%  
**Operating Factor:** 90.3%  
**Energy Unavailability Factor:** 10.0%  
**Total Off-line Time:** 846 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	591.6	525.6	290.8	156.0	591.7	566.9	560.3	572.7	562.7	588.9	553.5	597.3	6158.2
<b>EAF (%)</b>	100.0	100.0	46.3	33.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.0
<b>UCF (%)</b>	100.0	100.0	46.3	33.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.0
<b>LF (%)</b>	108.9	107.2	53.5	29.7	108.9	107.9	103.2	105.4	107.1	108.3	105.3	110.0	96.3
<b>OF (%)</b>	100.0	100.0	49.2	34.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.3
<b>EUf (%)</b>	0.0	0.0	53.7	66.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0
<b>PUf (%)</b>	0.0	0.0	53.7	66.8	0.0	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1967      **Lifetime Generation:** 118178.2 GW(e).h  
**Date of First Criticality:** 24 May 1971      **Cumulative Energy Availability Factor:** 59.1%  
**Date of Grid Connection:** 31 Dec 1971      **Cumulative Load Factor:** 61.1%  
**Date of Commercial Operation:** 31 Dec 1971      **Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1982	3345.0	635.0	49.3	69.1	49.3	46.6	60.1	48.9	4788	54.7
1983	3770.0	635.0	60.1	68.3	60.1	47.7	67.8	50.5	5282	60.3
1984	811.5	635.0	10.0	63.9	10.0	44.8	14.5	47.7	1334	15.2
1985	5301.8	658.0	82.0	65.2	82.0	47.5	92.0	51.0	7342	83.8
1986	841.2	730.0	14.9	61.4	14.9	45.1	13.2	48.1	1323	15.1
1987	2634.4	730.0	45.2	60.3	45.2	45.1	41.2	47.6	3980	45.4
1988	3435.2	730.0	53.7	59.8	53.7	45.6	53.6	48.0	4853	55.2
1989	3637.8	730.0	67.4	60.3	67.4	47.0	56.9	48.6	6019	68.7
1990	3008.1	730.0	56.1	60.0	56.1	47.5	47.0	48.5	5073	57.9
1991	4873.8	730.0	75.4	60.9	75.4	49.0	76.2	50.0	6693	76.4
1992	4865.1	730.0	70.5	61.4	70.5	50.2	75.9	51.3	6293	71.6
1993	3545.7	730.0	50.4	60.8	50.4	50.2	55.4	51.5	4595	52.5
1994	4513.8	730.0	65.5	61.1	65.5	50.9	70.6	52.4	5860	66.9
1995	4663.5	730.0	73.0	61.6	73.0	51.9	72.9	53.4	6491	74.1
1996	5314.3	730.0	79.7	62.4	79.7	53.1	82.9	54.6	7068	80.5
1997	5803.5	730.0	87.6	63.4	87.6	54.5	90.8	56.1	7714	88.1
1998	5390.6	730.0	81.1	64.1	81.1	55.6	84.3	57.2	7142	81.5
1999	5128.4	730.0	78.4	64.7	78.4	56.4	80.2	58.1	6910	78.9
2000	5748.0	730.0	86.8	65.5	86.8	57.5	89.6	59.3	7672	87.3
2001	2355.6	730.0	35.1	64.4	35.2	56.8	36.8	58.5	3118	35.6
2002	6369.4	730.0	94.2	65.4	93.2	58.0	99.6	59.9	8187	93.5
2003	6158.2	730.0	90.0	66.2	90.0	59.1	96.3	61.1	7914	90.3

# US-255 PALISADES

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
16 Mar	845.2	642.4	PF	C21	REFUELING OUTAGE.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1972 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					1818	
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling	845			1184		
D. Inspection, maintenance or repair without refuelling				175		
E. Testing of plant systems or components				1		
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling					7	
H. Nuclear regulatory requirements					13	110
J. Grid failure or grid unavailability						7
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					29	
Subtotal	845	0	0	1360	1873	117
Total		845			3350	

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

System	2003 Hours Lost	1972 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		146
13. Reactor Auxiliary Systems		160
14. Safety Systems		109
15. Reactor Cooling Systems		144
16. Steam generation systems		494
31. Turbine and auxiliaries		112
32. Feedwater and Main Steam System		104
33. Circulating Water System		40
35. All other I&C Systems		0
41. Main Generator Systems		63
42. Electrical Power Supply Systems		290
Total	0	1662

# US-528 PALO VERDE-1

**Operator:** ANPP (ARIZONA NUCLEAR POWER PROJECT)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1243.0 MW(e)  
**Design Net Capacity:** 1221.0 MW(e)  
**Design Discharge Burnup:** 38000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 10587.1 GW(e).h  
**Energy Availability Factor:** 98.2%  
**Load Factor:** 97.2%  
**Operating Factor:** 98.2%  
**Energy Unavailability Factor:** 1.8%  
**Total Off-line Time:** 156 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	922.3	832.6	768.9	888.7	924.3	891.4	914.0	810.1	889.5	914.0	897.9	933.4	10587.1
<b>EAF (%)</b>	100.0	100.0	85.0	100.0	100.0	100.0	100.0	94.2	100.0	100.0	100.0	100.0	98.2
<b>UCF (%)</b>	100.0	100.0	85.0	100.0	100.0	100.0	100.0	94.2	100.0	100.0	100.0	100.0	98.2
<b>LF (%)</b>	99.7	99.7	83.1	99.3	100.0	99.6	98.8	87.6	99.4	98.8	100.3	100.9	97.2
<b>OF (%)</b>	100.0	100.0	85.1	99.9	100.0	100.0	100.0	94.1	100.0	100.0	100.0	100.0	98.2
<b>EUf (%)</b>	0.0	0.0	15.0	0.0	0.0	0.0	0.0	5.8	0.0	0.0	0.0	0.0	1.8
<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	15.0	0.0	0.0	0.0	0.0	5.8	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	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1976      **Lifetime Generation:** 147588.5 GW(e).h  
**Date of First Criticality:** 25 May 1985      **Cumulative Energy Availability Factor:** 76.9%  
**Date of Grid Connection:** 10 Jun 1985      **Cumulative Load Factor:** 75.6%  
**Date of Commercial Operation:** 28 Jan 1986      **Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1985	1127.7	1270.0	0.0	0.0	66.2	100.0	10.4	0.0	2019	23.7
1986	6264.7	1221.0	66.6	66.6	66.6	66.6	60.6	60.6	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	48.4	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

**US-528 PALO VERDE-1****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
27 Mar	111.3	138.3	UF5	A13	MANUAL RX TRIP DUE TO S/G SODIUM LIMITS CONDENSER TUBE LEAK.
09 Aug	43.2	53.7	UF4	A34	TRIPPED REACTOR FROM 20% POWER AS PART OF PROCEDURAL SHUT DOWN TO TAKE THE UNIT OFF LINE FOR WATER BOX AIR REMOVAL (AR) PIPE REPAIRS.

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

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		154			629	
B. Refuelling without a maintenanc					9	
C. Inspection, maintenance or repai combined with refuelling				1244		
D. Inspection, maintenance or repai without refuelling				71		
E. Testing of plant systems or component				0	14	
J. Grid failure or grid unavailabilit						1
K. Load-following (frequency contro reserve shutdown due to reduced energ demand)					29	14
Subtotal	0	154	0	1315	681	15
Total		154			2011	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		123
13. Reactor Auxiliary System:	111	
14. Safety Systems		19
15. Reactor Cooling System:		83
16. Steam generation system:		63
31. Turbine and auxiliaries:		6
32. Feedwater and Main Steam Syster		127
35. All other I&C Systems:		3
41. Main Generator System:		11
42. Electrical Power Supply System:		77
XX. Miscellaneous Systems	43	
Total	154	512

# US-529 PALO VERDE-2

**Operator:** ANPP (ARIZONA NUCLEAR POWER PROJECT)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1243.0 MW(e)  
**Design Net Capacity:** 1304.0 MW(e)  
**Design Discharge Burnup:** 38000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8444.4 GW(e).h  
**Energy Availability Factor:** 77.7%  
**Load Factor:** 77.6%  
**Operating Factor:** 77.7%  
**Energy Unavailability Factor:** 22.3%  
**Total Off-line Time:** 1951 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	946.5	854.7	945.3	912.4	940.5	908.4	858.1	887.3	779.2	0.0	0.0	412.1	8444.4
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	92.8	100.0	86.7	0.0	0.0	54.8	77.7
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	92.8	100.0	86.7	0.0	0.0	54.8	77.7
<b>LF (%)</b>	102.3	102.3	102.2	102.0	101.7	101.5	92.8	95.9	87.1	0.0	0.0	44.6	77.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	92.7	100.0	86.7	0.0	0.0	54.7	77.7
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	7.2	0.0	13.3	100.0	100.0	45.2	22.3
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.3	100.0	100.0	45.2	21.6
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	7.2	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1976      **Lifetime Generation:** 145388.2 GW(e).h  
**Date of First Criticality:** 18 Apr 1986      **Cumulative Energy Availability Factor:** 78.1%  
**Date of Grid Connection:** 20 May 1986      **Cumulative Load Factor:** 77.8%  
**Date of Commercial Operation:** 19 Sep 1986      **Cumulative Unit Capability Factor:** 78.1%  
**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	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	94.8	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	75.3	89.7	75.3	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



## US-529 PALO VERDE-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
29 Jul	53.4	66.4	UF5	A14	MANUALLY TRIPPED RX DUE TO STUCK OPEN MAIN SPRAY VALVE.
27 Sep	1889.3	2348.4	PF	C21	REFUELING OUTAGE AND SG REPLACEMENT.
14 Dec	6.9	8.6	PF	D31	U2R11 HIGH MAIN TURBINE VIBE ON INITIAL POWER-UP
15 Dec	0.5	0.6	PF	E31	U2R11 MAIN TURBINE OVERSPEED TRIP TEST.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1987 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		53			174	
B. Refuelling without a maintenance					15	
C. Inspection, maintenance or repair combined with refuelling	1889			1074		
D. Inspection, maintenance or repair without refuelling	6			288		
E. Testing of plant systems or components	0			0		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				154	52	
Subtotal	1895	53	0	1516	241	0
Total		1948			1757	

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

System	2003 Hours Lost	1987 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		28
13. Reactor Auxiliary Systems		9
14. Safety Systems	53	
15. Reactor Cooling Systems		13
16. Steam generation systems		6
17. Safety I&C Systems (excluding reactor I&C)		5
31. Turbine and auxiliaries		12
32. Feedwater and Main Steam System		7
35. All other I&C Systems		2
41. Main Generator Systems		7
42. Electrical Power Supply Systems		21
Total	53	110

# US-530 PALO VERDE-3

**Operator:** ANPP (ARIZONA NUCLEAR POWER PROJECT)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1247.0 MW(e)  
**Design Net Capacity:** 1304.0 MW(e)  
**Design Discharge Burnup:** 38000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9554.7 GW(e).h  
**Energy Availability Factor:** 88.0%  
**Load Factor:** 87.5%  
**Operating Factor:** 88.0%  
**Energy Unavailability Factor:** 12.0%  
**Total Off-line Time:** 1048 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	950.7	858.1	846.0	0.0	877.3	699.7	831.4	788.4	905.8	937.9	913.1	946.3	9554.7
<b>EAF (%)</b>	100.0	100.0	90.3	0.0	100.0	88.5	87.1	89.8	100.0	100.0	100.0	100.0	88.0
<b>UCF (%)</b>	100.0	100.0	90.3	0.0	100.0	88.5	87.1	89.8	100.0	100.0	100.0	100.0	88.1
<b>LF (%)</b>	102.5	102.4	91.2	0.0	94.6	77.9	89.6	85.0	100.9	101.1	101.7	102.0	87.5
<b>OF (%)</b>	100.0	100.0	90.3	0.0	100.0	88.5	89.5	87.2	100.0	100.0	100.0	100.0	88.0
<b>EUf (%)</b>	0.0	0.0	9.7	100.0	0.0	11.5	12.9	10.2	0.0	0.0	0.0	0.0	12.0
<b>PUF (%)</b>	0.0	0.0	9.7	100.0	0.0	11.5	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	12.9	10.2	0.0	0.0	0.0	0.0	2.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1976      **Lifetime Generation:** 143063.9 GW(e).h  
**Date of First Criticality:** 25 Oct 1987      **Cumulative Energy Availability Factor:** 83.1%  
**Date of Grid Connection:** 28 Nov 1987      **Cumulative Load Factor:** 82.8%  
**Date of Commercial Operation:** 08 Jan 1988      **Cumulative Unit Capability Factor:** 78.2%  
**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 (%)
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	66.3	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	87.5	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	78.2	89.1	77.6	86.6	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

## US-530 PALO VERDE-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
29 Mar	789.4	984.4	PF	C21	REFUELING OUTAGE.
18 Jun	83.0	103.5	PF	D12	MANUAL RX TRIP FOR REPAIRS TO AR PIPING.
28 Jul	172.1	214.6	UF4	A42	RX TRIPPED DUE TO A FAULT IN THE HASSAYAMPA SWITCHYARD.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		172			119	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	789			1090		
D. Inspection, maintenance or repair without refuelling	83			96	12	
E. Testing of plant systems or components				0		
H. Nuclear regulatory requirements					4	
J. Grid failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					29	25
Subtotal	872	172	0	1186	167	26
Total		1044			1379	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		7
14. Safety Systems		13
16. Steam generation systems		2
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		9
32. Feedwater and Main Steam System		6
42. Electrical Power Supply Systems	172	31
Total	172	72

# US-277 PEACH BOTTOM-2

**Operator:** EXELON (Exelon Nuclear Co.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1116.0 MW(e)  
**Design Net Capacity:** 1065.0 MW(e)  
**Design Discharge Burnup:** 27500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9265.8 GW(e).h  
**Energy Availability Factor:** 96.3%  
**Load Factor:** 94.9%  
**Operating Factor:** 96.2%  
**Energy Unavailability Factor:** 3.7%  
**Total Off-line Time:** 330 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	848.6	714.7	854.2	764.6	726.9	820.2	695.8	842.3	534.4	845.6	824.2	794.3	9265.8
<b>EAF (%)</b>	100.0	100.0	100.0	94.6	100.0	100.0	87.8	100.0	73.3	100.0	100.0	100.0	96.3
<b>UCF (%)</b>	100.0	100.0	100.0	94.6	100.0	100.0	87.8	100.0	73.3	100.0	100.0	100.0	96.3
<b>LF (%)</b>	102.2	95.3	102.9	95.3	87.5	102.1	83.8	101.4	66.5	102.1	102.9	96.0	94.9
<b>OF (%)</b>	100.0	100.0	100.0	94.4	100.0	100.0	87.5	100.0	72.6	100.0	100.0	100.0	96.2
<b>EUF (%)</b>	0.0	0.0	0.0	5.4	0.0	0.0	12.2	0.0	26.7	0.0	0.0	0.0	3.7
<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	5.5	0.0	0.0	12.2	0.0	26.7	0.0	0.0	0.0	3.7
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1968  
**Date of First Criticality:** 16 Sep 1973  
**Date of Grid Connection:** 18 Feb 1974  
**Date of Commercial Operation:** 05 Jul 1974

**Lifetime Generation:** 184958.3 GW(e).h  
**Cumulative Energy Availability Factor:** 69.4%  
**Cumulative Load Factor:** 66.5%  
**Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	4816.8	1051.0	56.5	63.9	56.5	63.9	52.3	62.3	5089	58.1
1983	4481.1	1051.0	49.6	62.3	49.0	62.3	48.7	60.8	4461	50.9
1984	2465.8	1051.0	28.9	59.0	28.9	58.9	26.7	57.4	2544	29.0
1985	2378.2	1051.0	28.7	56.2	28.7	56.2	25.8	54.5	2570	29.3
1986	6896.6	1051.0	79.8	58.2	79.8	58.1	74.9	56.2	7010	80.0
1987	1599.9	1051.0	16.5	55.0	16.5	54.9	17.4	53.2	1724	19.7
1988	0.0	1051.0	0.0	51.0	0.0	51.0	0.0	49.4	0	0.0
1989	3880.9	1051.0	52.3	51.1	52.3	51.1	42.2	48.9	4735	54.1
1990	6699.8	1055.0	78.9	52.9	78.9	52.8	72.5	50.4	6977	79.6
1991	5121.0	1055.0	58.8	53.2	58.8	53.2	55.4	50.7	5277	60.2
1992	5677.9	1055.0	64.9	53.9	64.9	53.8	61.3	51.3	5811	66.2
1993	7704.1	1053.0	85.9	55.6	85.9	55.5	83.5	53.0	7571	86.4
1994	7450.7	1055.0	88.8	57.2	88.8	57.2	80.6	54.4	7783	88.8
1995	9363.4	1093.0	98.2	59.3	98.2	59.2	97.8	56.5	8598	98.2
1996	7660.6	1093.0	93.1	60.8	93.1	60.8	79.8	57.6	8176	93.1
1997	9570.3	1093.0	98.9	62.5	98.9	62.5	100.0	59.5	8663	98.9
1998	7658.8	1093.0	90.5	63.8	90.4	63.7	80.0	60.4	7923	90.4
1999	9462.3	1093.0	98.6	65.2	98.6	65.2	98.8	62.0	8635	98.6
2000	8523.0	1093.0	93.0	66.3	93.0	66.3	88.8	63.0	8169	93.0
2001	9369.2	1093.0	97.8	67.5	97.8	67.5	97.9	64.4	8563	97.8
2002	8838.9	1093.0	93.0	68.4	93.0	68.4	92.3	65.4	8149	93.0
2003	9265.8	1115.0	96.3	69.4	96.3	69.4	94.9	66.5	8430	96.2

## US-277 PEACH BOTTOM-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
12 Apr	40.0	43.7	UF2	A14	REACTOR POWER WAS REDUCED TO 0% DUE TO THE FAILURE OF THE D OUTBOARD MSIV INSTRUMENT AIR LINE.
22 Jul	92.5	101.1	UF4	A42	REACTOR POWER WAS REDUCED TO 0% DUE TO FOREIGN MATERIAL IN ISOPHASE BUS DUCTS THAT CAUSED INTERMITTENT GENERATOR GROUNDS, TRIPPING UNIT. (SYSTEM 50D GENERATOR ISOPHASE BUS COOLING)
15 Sep	196.3	214.6	UF2	J42	REACTOR POWER REDUCED TO 0% DUE TO OFFSITE DISTURBANCES IN THE ELECTRICAL GRID.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		132			468	
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling				1450		
D. Inspection, maintenance or repair without refuelling				262	0	
E. Testing of plant systems or components				6	0	
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling				1		
H. Nuclear regulatory requirements				133	50	15
J. Grid failure or grid unavailability		196				
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				39	8	1
Subtotal	0	328	0	1891	532	16
Total		328			2439	

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

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		26
13. Reactor Auxiliary Systems		19
14. Safety Systems	40	52
15. Reactor Cooling Systems		123
31. Turbine and auxiliaries		54
32. Feedwater and Main Steam System		35
35. All other I&C Systems		2
41. Main Generator Systems		8
42. Electrical Power Supply Systems	92	59
XX. Miscellaneous Systems		7
Total	132	385

# US-278 PEACH BOTTOM-3

**Operator:** EXELON (Exelon Nuclear Co.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1093.0 MW(e)  
**Design Net Capacity:** 1065.0 MW(e)  
**Design Discharge Burnup:** 27500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8937.8 GW(e).h  
**Energy Availability Factor:** 92.4%  
**Load Factor:** 93.0%  
**Operating Factor:** 92.3%  
**Energy Unavailability Factor:** 7.6%  
**Total Off-line Time:** 671 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	829.8	752.4	831.9	804.0	821.3	800.7	814.8	796.8	331.1	474.6	826.0	854.5	8937.8
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	46.9	62.0	100.0	100.0	92.4
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	46.9	62.0	100.0	100.0	92.4
<b>LF (%)</b>	102.0	102.4	102.3	102.3	101.0	101.7	100.2	98.0	42.1	57.3	103.2	103.3	93.0
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	46.8	61.3	100.0	100.0	92.3
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.1	38.0	0.0	0.0	7.6
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.0	0.0	0.0	3.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.1	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 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:** 182316.4 GW(e).h  
**Cumulative Energy Availability Factor:** 69.8%  
**Cumulative Load Factor:** 67.8%  
**Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 30.2%

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	8532.3	1035.0	95.3	66.3	95.3	66.2	94.1	66.3	8372	95.6
1983	2465.7	1035.0	27.5	62.0	27.1	61.9	27.2	62.0	2714	31.0
1984	7445.5	1035.0	86.2	64.4	85.2	64.2	81.9	64.0	7545	85.9
1985	3320.8	1035.0	45.1	62.7	45.1	62.5	36.6	61.5	3988	45.5
1986	4858.8	1035.0	60.9	62.5	60.9	62.4	53.6	60.8	5542	63.3
1987	1507.7	1035.0	14.4	58.8	14.4	58.7	16.6	57.4	1658	18.9
1988	0.0	1035.0	0.0	54.6	0.0	54.5	0.0	53.3	0	0.0
1989	247.3	1035.0	0.1	51.0	0.1	50.9	2.7	50.0	472	5.4
1990	7534.1	1035.0	87.1	53.2	87.1	53.1	83.1	52.0	7684	87.7
1991	5118.9	1035.0	59.1	53.6	57.3	53.4	56.5	52.3	5212	59.5
1992	7180.9	1035.0	83.7	55.3	83.6	55.0	79.0	53.8	7391	84.1
1993	6314.0	1035.0	73.9	56.2	73.9	56.0	69.6	54.6	6594	75.3
1994	8867.4	1035.0	97.9	58.3	97.9	58.1	97.8	56.8	8588	98.0
1995	7172.5	1049.0	90.1	59.9	90.1	59.7	78.1	57.8	7929	90.5
1996	9424.7	1093.0	98.2	61.7	98.2	61.5	98.2	59.7	8627	98.2
1997	7566.6	1093.0	90.3	63.0	90.3	62.8	79.0	60.6	7909	90.3
1998	8823.6	1093.0	93.3	64.3	93.3	64.2	92.2	62.0	8172	93.3
1999	8558.6	1093.0	92.5	65.5	92.5	65.3	89.4	63.1	8100	92.5
2000	9556.8	1093.0	99.3	66.8	99.3	66.7	99.5	64.6	8722	99.3
2001	8524.4	1093.0	93.1	67.9	93.1	67.7	89.0	65.5	8153	93.1
2002	9647.4	1093.0	99.8	69.0	99.8	68.9	100.8	66.8	8740	99.8
2003	8937.8	1097.0	92.4	69.9	92.4	69.8	93.0	67.8	8089	92.3

## US-278 PEACH BOTTOM-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
15 Sep	382.5	418.1	UF2	J42	REACTOR POWER WAS REDUCED TO 0% DUE TO OFFSITE DISTURBANCES IN THE ELECTRICAL GRID. 3R14 REFUELING OUTAGE COMMENCED EARLIER THAN EXPECTED. REACTOR POWER WAS REDUCED TO 0% DUE TO LOSS OF OFFSITE POWER ON 09/15/03, AND 3R14 BEGAN EARLY AND RETURNED TO FULL POWER ON 10/17/03.
01 Oct	287.7	314.5	PF	A42	

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure	287				407	5
B. Refuelling without a maintenance					20	
C. Inspection, maintenance or repair combined with refuelling				1520		
D. Inspection, maintenance or repair without refuelling				107		
E. Testing of plant systems or components				19	1	
H. Nuclear regulatory requirements					220	7
J. Grid failure or grid unavailability		382				2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				27	0	4
Subtotal	287	382	0	1673	648	18
Total		669			2339	

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

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		30
13. Reactor Auxiliary Systems		13
14. Safety Systems		50
15. Reactor Cooling Systems		126
31. Turbine and auxiliaries		55
32. Feedwater and Main Steam System		52
33. Circulating Water System		2
41. Main Generator Systems		22
42. Electrical Power Supply Systems	287	50
Total	287	400

# US-440 PERRY-1

**Operator:** FENOC (FIRST ENERGY NUCLEAR OPERATING CO.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1235.0 MW(e)  
**Design Net Capacity:** 1205.0 MW(e)  
**Design Discharge Burnup:** 25000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8553.2 GW(e).h  
**Energy Availability Factor:** 82.4%  
**Load Factor:** 79.1%  
**Operating Factor:** 82.4%  
**Energy Unavailability Factor:** 17.6%  
**Total Off-line Time:** 1543 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	930.3	764.8	788.5	82.0	0.0	867.5	919.3	678.1	809.6	920.9	856.9	935.1	8553.2
<b>EAF (%)</b>	100.0	100.0	100.0	13.0	0.0	100.0	100.0	76.4	100.0	100.0	100.0	100.0	82.4
<b>UCF (%)</b>	100.0	100.0	100.0	13.0	0.0	100.0	100.0	76.4	100.0	100.0	100.0	100.0	82.4
<b>LF (%)</b>	101.2	92.2	85.8	9.2	0.0	97.6	100.0	73.8	91.1	100.1	96.4	101.8	79.1
<b>OF (%)</b>	100.0	100.0	100.0	13.4	0.0	100.0	100.0	76.3	100.0	100.0	100.0	100.0	82.4
<b>EUf (%)</b>	0.0	0.0	0.0	87.0	100.0	0.0	0.0	23.6	0.0	0.0	0.0	0.0	17.6
<b>PUf (%)</b>	0.0	0.0	0.0	87.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.6
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.6	0.0	0.0	0.0	0.0	2.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1974      **Lifetime Generation:** 124394.8 GW(e).h  
**Date of First Criticality:** 06 Jun 1986      **Cumulative Energy Availability Factor:** 77.7%  
**Date of Grid Connection:** 19 Dec 1986      **Cumulative Load Factor:** 75.3%  
**Date of Commercial Operation:** 18 Nov 1987      **Cumulative Unit Capability Factor:** 78.2%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1988	7233.8	1203.0	76.3	76.3	76.3	76.3	68.5	68.5	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	68.0	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	1236.0	77.9	76.1	77.9	76.1	71.9	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



# US-440 PERRY-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
05 Apr	1343.9	1663.7	PF	C21	REFUELING OUTAGE.
14 Aug	175.1	216.8	UF2	Z42	THE PLANT ENTERED A FORCED SHUTDOWN ON 08/14/03 AT 1610 DUE TO GRID INSTABILITY. THE UNIT WAS SYNCHRONIZED TO THE GRID ON 08/21/03 AT 2315

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					481	
B. Refuelling without a maintenance					23	
C. Inspection, maintenance or repair combined with refuelling	1343			1111		
D. Inspection, maintenance or repair without refuelling				247		
E. Testing of plant systems or components				0		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					10	
Z. Others		175				
Subtotal	1343	175	0	1358	514	0
Total		1518			1872	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		11
14. Safety Systems		0
15. Reactor Cooling Systems		54
31. Turbine and auxiliaries		81
32. Feedwater and Main Steam System		0
33. Circulating Water System		14
35. All other I&C Systems		10
41. Main Generator Systems		43
42. Electrical Power Supply Systems		77
XX. Miscellaneous Systems		153
Total	0	443

# US-293 PILGRIM-1

**Operator:** ENTERGY (ENTERGY NUCLEAR)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 653.0 MW(e)  
**Design Net Capacity:** 655.0 MW(e)  
**Design Discharge Burnup:** 19000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4977.2 GW(e).h  
**Energy Availability Factor:** 85.8%  
**Load Factor:** 84.7%  
**Operating Factor:** 86.2%  
**Energy Unavailability Factor:** 14.2%  
**Total Off-line Time:** 1212 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	496.1	316.5	464.7	283.4	181.5	435.1	508.5	498.3	456.3	337.4	491.0	508.5	4977.2
<b>EAF (%)</b>	100.0	69.8	98.0	57.7	42.3	93.7	100.0	100.0	93.3	70.6	100.0	100.0	85.8
<b>UCF (%)</b>	100.0	69.8	98.0	57.7	42.3	93.7	100.0	100.0	93.3	70.6	100.0	100.0	85.8
<b>LF (%)</b>	102.1	72.1	95.6	60.4	37.4	88.3	99.9	97.9	92.7	66.2	99.7	99.9	84.7
<b>OF (%)</b>	100.0	72.0	97.6	60.4	44.9	93.8	100.0	100.0	96.5	67.7	100.0	100.0	86.2
<b>EUf (%)</b>	0.0	30.2	2.0	42.3	57.7	6.3	0.0	0.0	6.7	29.4	0.0	0.0	14.2
<b>PUf (%)</b>	0.0	0.0	0.0	42.3	42.6	0.0	0.0	0.0	6.7	29.4	0.0	0.0	10.0
<b>UCLF (%)</b>	0.0	30.2	2.0	0.0	15.1	6.3	0.0	0.0	0.0	0.0	0.0	0.0	4.2
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1968  
**Date of First Criticality:** 16 Jun 1972  
**Date of Grid Connection:** 19 Jul 1972  
**Date of Commercial Operation:** 01 Dec 1972

**Lifetime Generation:** 112259.3 GW(e).h  
**Cumulative Energy Availability Factor:** 65.6%  
**Cumulative Load Factor:** 61.3%  
**Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	3287.1	670.0	64.1	60.1	64.1	59.9	56.0	55.9	5597	63.9
1983	4711.9	670.0	87.3	62.6	87.3	62.4	80.3	58.1	7640	87.2
1984	3.5	669.0	1.4	57.5	1.3	57.3	0.1	53.2	34	0.4
1985	4951.0	667.0	93.3	60.2	91.5	59.9	84.7	55.7	8013	91.5
1986	1027.5	670.0	18.9	57.3	18.9	56.9	17.5	52.9	1646	18.8
1987	0.0	670.0	0.0	53.4	0.0	53.1	0.0	49.4	0	0.0
1988	0.0	670.0	0.0	50.1	0.0	49.8	0.0	46.3	0	0.0
1989	1707.8	670.0	56.3	50.4	56.3	50.2	29.1	45.3	4919	56.2
1990	4243.2	670.0	77.5	51.9	77.5	51.7	72.3	46.8	6784	77.4
1991	3424.5	670.0	69.9	52.9	63.7	52.3	58.3	47.4	5572	63.6
1992	4742.0	670.0	84.3	54.5	84.3	53.9	80.6	49.1	7400	84.2
1993	4340.8	670.0	79.1	55.6	78.6	55.1	74.0	50.2	6880	78.5
1994	3824.1	670.0	69.4	56.3	69.4	55.8	65.2	50.9	6069	69.3
1995	4485.8	670.0	79.5	57.3	79.5	56.8	76.4	52.0	6962	79.5
1996	5324.3	670.0	95.0	58.9	95.0	58.4	90.5	53.6	8345	95.0
1997	4310.4	670.0	78.1	59.6	78.1	59.2	73.4	54.4	6840	78.1
1998	5698.4	670.0	100.0	61.2	100.0	60.8	97.1	56.1	8760	100.0
1999	4473.3	670.0	81.6	61.9	81.6	61.5	76.2	56.8	7141	81.5
2000	5512.3	670.0	96.3	63.2	96.3	62.8	93.7	58.1	8454	96.2
2001	5144.0	660.0	90.0	64.1	89.9	63.7	89.0	59.2	7884	90.0
2002	5769.1	653.0	100.0	65.3	100.0	64.9	100.9	60.5	8760	100.0
2003	4977.2	671.0	85.8	65.9	85.8	65.6	84.7	61.3	7548	86.2

# US-293 PILGRIM-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
21 Feb	206.0	142.1	UF	A41	RECIRC MOTOR MG SET EQUIPMENT FAILURE.
19 Apr	588.5	406.1	PF	C21	REFUELING OUTAGE.
16 May	72.2	49.8	UF2	A11	SHUTDOWN TO IDENTIFY AND REPAIR SOURCES OF DRYWELL LEAKAGE.
19 May	34.3	23.7	UF5	B31	UNIT SCRAMMED DUE TO INADVERTENT OPERATION OF THE TURBINE BYPASS VALVES.
01 Jun	45.0	31.1	UF4	A41	AUTO SCRAM DUE TO GENERATOR TRIP.
29 Sep	265.2	183.0	PF	D42	PLANNED SHUTDOWN TO PLACE UNIT AUX TRANSFORMER IN SERVICE AND TO PERFORM PLANNED MAINTENANCE.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1972 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		323			653	
B. Refuelling without a maintenance		34			13	
C. Inspection, maintenance or repair combined with refuelling	588			1521	2	
D. Inspection, maintenance or repair without refuelling	265			159	0	
E. Testing of plant systems or components				61	1	
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling					0	
H. Nuclear regulatory requirements				46	6	167
J. Grid failure or grid unavailability						23
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					60	6
Subtotal	853	357	0	1787	735	196
Total		1210			2718	

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

System	2003 Hours Lost	1972 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	72	4
12. Reactor I&C Systems		37
13. Reactor Auxiliary Systems		120
14. Safety Systems		14
15. Reactor Cooling Systems		167
31. Turbine and auxiliaries		69
32. Feedwater and Main Steam System		61
35. All other I&C Systems		2
41. Main Generator Systems	251	42
42. Electrical Power Supply Systems		68
XX. Miscellaneous Systems		11
Total	323	595

# US-266 POINT BEACH-1

**Operator:** NUCMAN (NUCLEAR MANAGEMENT CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 510.0 MW(e)  
**Design Net Capacity:** 497.0 MW(e)  
**Design Discharge Burnup:** 27000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4343.0 GW(e).h  
**Energy Availability Factor:** 97.5%  
**Load Factor:** 96.3%  
**Operating Factor:** 97.5%  
**Energy Unavailability Factor:** 2.5%  
**Total Off-line Time:** 222 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	375.2	343.2	380.4	368.4	382.1	366.6	260.5	376.5	366.3	378.8	363.7	381.4	4343.0
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	70.8	100.0	100.0	100.0	100.0	100.0	97.5
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	70.8	100.0	100.0	100.0	100.0	100.0	97.5
<b>LF (%)</b>	98.9	99.0	99.1	99.3	99.5	98.7	67.9	98.1	98.6	98.5	97.9	99.3	96.3
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	70.2	100.0	100.0	100.0	100.0	100.0	97.5
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	29.2	0.0	0.0	0.0	0.0	0.0	2.5
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	29.2	0.0	0.0	0.0	0.0	0.0	2.5
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jul 1967      **Lifetime Generation:** 110249.7 GW(e).h  
**Date of First Criticality:** 02 Nov 1970      **Cumulative Energy Availability Factor:** 80.7%  
**Date of Grid Connection:** 06 Nov 1970      **Cumulative Load Factor:** 77.1%  
**Date of Commercial Operation:** 21 Dec 1970      **Cumulative Unit Capability Factor:** 77.3%  
**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 (%)
1982	2701.7	495.0	81.5	82.8	81.5	77.9	62.3	70.7	7134	81.4
1983	2384.9	495.0	74.3	82.1	74.3	77.7	55.0	69.5	6498	74.2
1984	3109.2	485.0	72.6	81.5	72.6	77.3	73.0	69.7	6379	72.6
1985	3354.2	485.0	78.7	81.3	78.6	77.4	78.9	70.3	6917	79.0
1986	3770.1	485.0	88.7	81.7	88.7	78.1	88.7	71.4	7786	88.9
1987	3567.1	485.0	83.6	81.8	83.6	78.4	84.0	72.2	7348	83.9
1988	3831.0	485.0	88.5	82.2	88.5	79.0	89.9	73.1	7787	88.6
1989	3606.2	485.0	87.8	82.5	87.8	79.4	84.9	73.7	7706	88.0
1990	3531.7	485.0	83.8	82.6	83.8	79.6	83.1	74.2	7362	84.0
1991	3628.7	485.0	85.7	82.7	85.7	79.9	85.4	74.7	7524	85.9
1992	3605.6	485.0	84.1	82.8	84.1	80.1	84.6	75.2	7409	84.3
1993	3804.8	485.0	88.8	83.0	88.8	80.5	89.6	75.8	7799	89.0
1994	3905.1	485.0	92.0	83.4	92.0	80.9	91.9	76.4	8071	92.1
1995	3792.4	485.0	88.5	83.6	88.5	81.2	89.3	77.0	7768	88.7
1996	4003.3	485.0	93.0	84.0	93.0	81.7	94.0	77.6	8173	93.0
1997	853.5	485.0	21.3	81.7	21.3	79.5	20.1	75.5	1872	21.4
1998	2584.2	485.0	62.7	81.0	62.7	78.9	60.8	75.0	5489	62.7
1999	3489.3	489.0	80.0	81.0	80.0	78.9	81.5	75.2	7070	80.7
2000	4134.6	510.0	96.1	81.5	95.6	79.5	92.3	75.8	8391	95.5
2001	3702.1	510.0	87.0	81.7	87.0	79.8	82.9	76.0	7611	86.9
2002	3975.8	510.0	91.0	82.0	91.0	80.1	89.0	76.5	7964	90.9
2003	4343.0	515.0	97.5	82.5	97.5	80.7	96.3	77.1	8538	97.5

# US-266 POINT BEACH-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
15 Jul	221.8	112.0	UF4	A41	REACTOR TRIP DUE TO FAILURE OF 1G06 ROD DRIVE MG VOLTAGE REGULATOR.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		221			143	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling				1131		
D. Inspection, maintenance or repair without refuelling				65		
E. Testing of plant systems or components				2		
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling				1		
H. Nuclear regulatory requirements						37
J. Grid failure or grid unavailability						2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				0	212	1
Subtotal	0	221	0	1199	356	40
Total		221			1595	

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		0
15. Reactor Cooling Systems		10
16. Steam generation systems		71
31. Turbine and auxiliaries		19
32. Feedwater and Main Steam System		18
41. Main Generator Systems	221	3
42. Electrical Power Supply Systems		3
Total	221	125

# US-301 POINT BEACH-2

**Operator:** NUCMAN (NUCLEAR MANAGEMENT CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 512.0 MW(e)  
**Design Net Capacity:** 497.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3713.3 GW(e).h  
**Energy Availability Factor:** 85.6%  
**Load Factor:** 82.0%  
**Operating Factor:** 85.3%  
**Energy Unavailability Factor:** 14.4%  
**Total Off-line Time:** 1291 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	378.4	346.6	385.0	314.3	360.9	368.4	327.0	379.4	324.4	26.3	116.3	386.3	3713.3
<b>EAF (%)</b>	100.0	100.0	100.0	88.1	100.0	100.0	91.0	100.0	100.0	11.7	37.5	100.0	85.6
<b>UCF (%)</b>	100.0	100.0	100.0	88.1	100.0	100.0	91.0	100.0	100.0	11.7	37.5	100.0	85.6
<b>LF (%)</b>	99.3	99.6	99.9	84.4	93.6	98.8	84.8	98.4	87.0	6.8	31.2	100.2	82.0
<b>OF (%)</b>	100.0	100.0	100.0	87.8	100.0	100.0	90.7	100.0	100.0	9.7	36.0	100.0	85.3
<b>EUf (%)</b>	0.0	0.0	0.0	11.9	0.0	0.0	9.0	0.0	0.0	88.3	62.5	0.0	14.4
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	88.3	62.5	0.0	12.7
<b>UCLF (%)</b>	0.0	0.0	0.0	11.9	0.0	0.0	9.0	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	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jul 1968      **Lifetime Generation:** 108547.8 GW(e).h  
**Date of First Criticality:** 30 May 1972      **Cumulative Energy Availability Factor:** 83.3%  
**Date of Grid Connection:** 02 Aug 1972      **Cumulative Load Factor:** 80.9%  
**Date of Commercial Operation:** 01 Oct 1972      **Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 16.7%

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 (%)
1982	3605.4	495.0	88.2	86.0	88.2	85.4	83.1	82.6	7595	86.7
1983	3016.3	495.0	74.5	85.0	74.5	84.4	69.6	81.4	6245	71.3
1984	3512.4	495.0	86.0	85.0	86.0	84.5	80.8	81.4	7405	84.3
1985	3603.1	485.0	86.8	85.2	86.8	84.7	84.8	81.6	7491	85.5
1986	3417.6	485.0	82.1	85.0	82.1	84.5	80.4	81.5	7186	82.0
1987	3606.1	485.0	85.9	85.0	85.5	84.6	84.9	81.8	7478	85.4
1988	3718.7	485.0	88.0	85.2	88.0	84.8	87.3	82.1	7626	86.8
1989	3485.1	485.0	82.9	85.1	82.9	84.7	82.0	82.1	7107	81.1
1990	3793.5	485.0	89.1	85.3	89.1	84.9	89.3	82.5	7713	88.0
1991	3689.2	485.0	87.6	85.4	87.6	85.1	86.8	82.7	7569	86.4
1992	3668.2	485.0	86.6	85.5	86.6	85.1	86.1	82.9	7492	85.3
1993	3844.5	485.0	90.9	85.7	90.9	85.4	90.5	83.2	7883	90.0
1994	3752.3	485.0	90.3	85.9	90.3	85.6	88.3	83.5	7827	89.3
1995	3386.0	485.0	83.4	85.8	83.4	85.5	79.7	83.3	7158	81.7
1996	2950.3	485.0	78.0	85.5	78.0	85.2	69.3	82.7	6653	75.7
1997	825.5	485.0	21.4	83.0	21.4	82.7	19.4	80.2	1788	20.4
1998	3123.8	485.0	75.5	82.7	75.5	82.4	73.5	80.0	6609	75.4
1999	3578.5	498.0	82.6	82.7	82.5	82.4	82.0	80.0	7195	82.1
2000	3527.4	512.0	80.9	82.6	80.9	82.4	78.4	80.0	7094	80.8
2001	4343.0	512.0	98.5	83.2	98.6	82.9	96.8	80.6	8631	98.5
2002	4004.3	512.0	90.7	83.4	90.7	83.2	89.3	80.9	7934	90.6
2003	3713.3	517.0	85.6	83.5	85.6	83.3	82.0	80.9	7469	85.3

## US-301 POINT BEACH-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
05 Apr	87.6	44.4	UF2	H11	AT 1717, AT 52% POWER, MANUALLY TRIPPED THE TURBINE DUE TO U2 LOW CONDENSER VACUUM. REACTOR REMAINED CRITICAL. AT 2250, REACTOR TAKEN SUBCRITICAL DUE TO CONTROL ROD BANK OVERLAP LIMITS. REACTOR TRIP DUE TO FAILURE OF B MAIN FEEDWATER PUMP. REFUELING OUTAGE.
10 Jul	68.7	34.8	UF4	A32	
04 Oct	1132.6	574.2	PF	C21	

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1972 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		68			124	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1132			1130		
D. Inspection, maintenance or repair without refuelling				46	0	
E. Testing of plant systems or components				6		
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling				3		
H. Nuclear regulatory requirements		87			2	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				0	46	1
<b>Subtotal</b>	<b>1132</b>	<b>155</b>	<b>0</b>	<b>1185</b>	<b>173</b>	<b>1</b>
<b>Total</b>		<b>1287</b>			<b>1359</b>	

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

System	2003 Hours Lost	1972 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		35
14. Safety Systems		0
15. Reactor Cooling Systems		40
16. Steam generation systems		18
31. Turbine and auxiliaries		8
32. Feedwater and Main Steam System	68	6
42. Electrical Power Supply Systems		10
<b>Total</b>	<b>68</b>	<b>120</b>

# US-282 PRAIRIE ISLAND-1

**Operator:** NUCMAN (NUCLEAR MANAGEMENT CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 522.0 MW(e)  
**Design Net Capacity:** 530.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4596.3 GW(e).h  
**Energy Availability Factor:** 98.4%  
**Load Factor:** 101.1%  
**Operating Factor:** 98.4%  
**Energy Unavailability Factor:** 1.6%  
**Total Off-line Time:** 141 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	406.8	366.9	395.2	305.1	391.8	374.3	386.9	386.3	383.9	403.5	390.3	405.3	4596.3
<b>EAF (%)</b>	100.0	100.0	100.0	80.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.4
<b>UCF (%)</b>	100.0	100.0	100.0	80.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.4
<b>LF (%)</b>	104.7	104.6	103.6	82.7	102.7	99.6	99.6	99.5	102.1	103.8	103.8	104.4	101.1
<b>OF (%)</b>	100.0	100.0	100.0	80.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.4
<b>EUf (%)</b>	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	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	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1968  
**Date of First Criticality:** 01 Dec 1973  
**Date of Grid Connection:** 04 Dec 1973  
**Date of Commercial Operation:** 16 Dec 1973

**Lifetime Generation:** 113693.0 GW(e).h  
**Cumulative Energy Availability Factor:** 85.4%  
**Cumulative Load Factor:** 84.8%  
**Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	3918.0	503.0	90.9	76.4	90.9	76.4	88.9	73.9	7960	90.9
1983	3888.9	503.0	87.2	77.5	87.2	77.5	88.3	75.3	7621	87.0
1984	4159.4	503.0	94.3	79.0	94.3	79.0	94.1	77.0	8285	94.3
1985	3678.5	503.0	83.4	79.4	83.4	79.4	83.5	77.5	7333	83.7
1986	3819.6	503.0	89.6	80.2	89.6	80.2	86.7	78.2	7870	89.8
1987	3590.3	503.0	82.2	80.3	82.2	80.3	81.5	78.4	7232	82.6
1988	3823.4	503.0	89.3	80.9	89.3	80.9	86.5	79.0	7800	88.8
1989	4392.3	503.0	99.8	82.1	99.7	82.1	99.7	80.3	8737	99.7
1990	3829.7	503.0	81.7	82.0	81.7	82.0	86.9	80.6	7764	88.6
1991	3987.1	505.0	90.5	82.5	90.5	82.5	90.1	81.2	7943	90.7
1992	3497.8	503.0	77.4	82.3	77.4	82.2	79.2	81.1	6844	77.9
1993	4378.0	505.0	96.8	83.0	96.8	83.0	99.0	82.0	8480	96.8
1994	3718.2	513.0	82.8	83.0	82.8	83.0	82.7	82.0	7258	82.9
1995	4519.0	513.0	99.9	83.8	99.9	83.7	100.6	82.9	8752	99.9
1996	3741.6	513.0	92.9	84.2	92.2	84.1	83.0	82.9	7327	83.4
1997	3522.8	513.0	79.5	84.0	79.5	83.9	78.4	82.7	6965	79.5
1998	4209.2	514.0	90.8	84.2	90.8	84.2	93.5	83.1	7948	90.7
1999	4068.8	522.0	87.2	84.3	87.2	84.3	89.0	83.3	7643	87.2
2000	4536.5	522.0	96.7	84.8	96.7	84.8	98.9	83.9	8499	96.8
2001	3641.7	522.0	78.8	84.6	78.8	84.6	79.6	83.8	6890	78.7
2002	4373.2	522.0	94.4	84.9	94.4	84.9	95.6	84.2	8268	94.4
2003	4596.3	519.0	98.4	85.4	98.4	85.4	101.1	84.8	8619	98.4



# US-282 PRAIRIE ISLAND-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
15 Apr	140.4	73.7	UF2	A42	GENERATOR TAKEN OFF-LINE TO REPAIR OIL LEAK ON MAIN TRANSFORMER.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1973 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		140			335	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling				682		
D. Inspection, maintenance or repair without refuelling				87		
E. Testing of plant systems or components				8	1	
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling				0		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					29	1
Subtotal	0	140	0	777	367	1
Total		140			1145	

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

System	2003 Hours Lost	1973 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		18
12. Reactor I&C Systems		33
14. Safety Systems		11
15. Reactor Cooling Systems		9
16. Steam generation systems		44
31. Turbine and auxiliaries		144
32. Feedwater and Main Steam System		41
35. All other I&C Systems		9
41. Main Generator Systems		1
42. Electrical Power Supply Systems	140	5
XX. Miscellaneous Systems		0
Total	140	315

# US-306 PRAIRIE ISLAND-2

**Operator:** NUCMAN (NUCLEAR MANAGEMENT CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 522.0 MW(e)  
**Design Net Capacity:** 530.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4241.0 GW(e).h  
**Energy Availability Factor:** 92.0%  
**Load Factor:** 92.7%  
**Operating Factor:** 92.0%  
**Energy Unavailability Factor:** 8.0%  
**Total Off-line Time:** 702 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	399.8	366.0	405.4	379.3	392.1	375.7	388.3	380.8	125.4	230.7	391.7	405.8	4241.0
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	36.4	67.0	100.0	100.0	92.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	36.4	67.0	100.0	100.0	92.0
<b>LF (%)</b>	102.9	104.4	104.4	101.1	101.0	100.0	100.0	98.1	33.4	59.3	104.2	104.5	92.7
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	39.4	64.3	100.0	100.0	92.0
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	63.6	33.0	0.0	0.0	8.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	63.6	26.9	0.0	0.0	7.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1969  
**Date of First Criticality:** 17 Dec 1974  
**Date of Grid Connection:** 21 Dec 1974  
**Date of Commercial Operation:** 21 Dec 1974

**Lifetime Generation:** 112411.8 GW(e).h  
**Cumulative Energy Availability Factor:** 87.3%  
**Cumulative Load Factor:** 87.0%  
**Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	3857.7	500.0	90.0	79.9	89.8	79.9	88.1	79.5	7844	89.5
1983	3716.3	500.0	86.5	80.7	86.5	80.6	84.8	80.1	7574	86.5
1984	3906.0	500.0	89.2	81.5	89.2	81.5	88.9	80.9	7830	89.1
1985	3612.5	500.0	93.0	82.5	92.9	82.5	82.5	81.1	7378	84.2
1986	3854.0	500.0	90.5	83.2	90.6	83.2	88.0	81.6	7930	90.5
1987	4462.2	500.0	100.0	84.5	100.0	84.5	101.9	83.2	8760	100.0
1988	3886.2	500.0	88.2	84.7	88.2	84.7	88.5	83.6	7773	88.5
1989	3887.2	500.0	96.9	85.5	96.9	85.5	88.7	83.9	7798	89.0
1990	3803.7	500.0	83.3	85.4	83.3	85.4	86.8	84.1	7602	86.8
1991	4480.4	502.0	100.0	86.3	100.0	86.2	101.9	85.1	8760	100.0
1992	3223.5	500.0	73.5	85.5	73.5	85.5	73.4	84.5	6516	74.2
1993	3746.2	503.0	83.5	85.5	83.5	85.4	85.0	84.5	7338	83.8
1994	4553.0	512.0	99.7	86.2	99.7	86.2	101.5	85.4	8734	99.7
1995	3968.2	512.0	87.5	86.2	87.5	86.2	88.5	85.5	7666	87.5
1996	4485.1	512.0	99.2	86.8	98.6	86.8	99.7	86.2	8653	98.5
1997	3642.9	512.0	82.0	86.6	82.0	86.6	81.2	86.0	7180	82.0
1998	3333.7	512.0	74.8	86.1	74.8	86.1	74.3	85.5	6555	74.8
1999	4597.4	522.0	99.2	86.7	99.2	86.6	100.5	86.1	8690	99.2
2000	4182.3	522.0	89.0	86.8	89.0	86.7	91.2	86.3	7820	89.0
2001	4271.0	522.0	91.7	87.0	91.7	86.9	93.4	86.6	8031	91.7
2002	4296.0	522.0	92.4	87.2	92.4	87.1	93.9	86.8	8082	92.3
2003	4241.0	522.0	92.0	87.3	92.0	87.3	92.7	87.0	8058	92.0

## US-306 PRAIRIE ISLAND-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
12 Sep	656.2	343.8	PF	C21	2R22 REFUELING OUTAGE
12 Oct	44.7	23.4	UF2	A16	FLASH TANK BELLOWS STEAM LEAK.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		44			220	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	656			604		
D. Inspection, maintenance or repair without refuelling				103		
E. Testing of plant systems or components				5		
J. Grid failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					19	1
Subtotal	656	44	0	712	240	1
Total		700			953	

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

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		50
13. Reactor Auxiliary Systems		0
14. Safety Systems		2
15. Reactor Cooling Systems		43
16. Steam generation systems	44	5
31. Turbine and auxiliaries		84
32. Feedwater and Main Steam System		4
33. Circulating Water System		3
35. All other I&C Systems		0
41. Main Generator Systems		8
42. Electrical Power Supply Systems		5
Total	44	204

# US-254 QUAD CITIES-1

**Operator:** EXELON (Exelon Nuclear Co.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 855.0 MW(e)  
**Design Net Capacity:** 789.0 MW(e)  
**Design Discharge Burnup:** 20900 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6810.2 GW(e).h  
**Energy Availability Factor:** 92.4%  
**Load Factor:** 90.9%  
**Operating Factor:** 91.5%  
**Energy Unavailability Factor:** 7.6%  
**Total Off-line Time:** 747 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	651.7	556.8	618.1	634.9	403.0	624.9	655.5	648.8	628.9	649.7	211.2	526.8	6810.2
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	67.4	100.0	100.0	100.0	100.0	100.0	46.1	95.4	92.4
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	67.4	100.0	100.0	100.0	100.0	100.0	46.1	95.4	92.4
<b>LF (%)</b>	102.4	96.9	97.2	103.3	63.4	101.5	103.0	102.0	102.2	102.0	34.3	82.8	90.9
<b>OF (%)</b>	100.0	100.0	100.0	100.0	63.4	100.0	100.0	100.0	100.0	100.0	39.4	94.8	91.5
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	32.6	0.0	0.0	0.0	0.0	0.0	53.9	4.6	7.6
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	32.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.9	4.6	4.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1967      **Lifetime Generation:** 147079.6 GW(e).h  
**Date of First Criticality:** 18 Oct 1971      **Cumulative Energy Availability Factor:** 73.3%  
**Date of Grid Connection:** 12 Apr 1972      **Cumulative Load Factor:** 68.6%  
**Date of Commercial Operation:** 18 Feb 1973      **Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	3258.0	769.0	68.5	66.3	68.5	66.1	48.4	60.2	5951	67.9
1983	5776.4	769.0	94.7	69.2	94.7	69.0	85.7	62.7	8258	94.3
1984	3358.5	769.0	53.4	67.7	53.4	67.5	49.7	61.5	4687	53.4
1985	6072.3	769.0	94.1	69.9	94.1	69.7	90.1	63.9	8242	94.1
1986	4426.2	769.0	68.9	69.8	68.9	69.7	65.7	64.0	6035	68.9
1987	4456.1	769.0	70.1	69.9	70.1	69.7	66.1	64.2	6141	70.1
1988	5662.0	769.0	93.4	71.4	93.4	71.3	83.8	65.5	8199	93.3
1989	4280.4	769.0	73.4	71.5	73.4	71.4	63.5	65.4	6428	73.4
1990	5345.6	769.0	83.1	72.2	83.1	72.1	79.4	66.2	7276	83.1
1991	3549.5	769.0	56.6	71.3	55.8	71.2	52.7	65.4	4882	55.7
1992	4166.1	769.0	70.1	71.3	70.1	71.1	61.7	65.2	6158	70.1
1993	5042.5	769.0	78.8	71.7	78.8	71.5	74.9	65.7	6902	78.8
1994	1670.2	769.0	28.9	69.6	28.9	69.5	24.8	63.8	2526	28.8
1995	5886.2	769.0	90.6	70.6	90.6	70.5	87.4	64.8	7934	90.6
1996	2680.6	769.0	42.9	69.4	42.9	69.3	39.7	63.8	3769	42.9
1997	5565.5	769.0	88.7	70.2	88.7	70.1	82.6	64.5	7764	88.6
1998	3142.9	769.0	49.1	69.3	49.1	69.2	46.7	63.8	4299	49.1
1999	6337.6	769.0	93.7	70.3	93.7	70.2	94.1	65.0	8210	93.7
2000	6168.1	769.0	93.8	71.2	93.8	71.0	91.3	66.0	8242	93.8
2001	6710.9	769.0	99.2	72.2	99.2	72.0	99.6	67.2	8691	99.2
2002	5709.5	776.0	86.6	72.7	86.6	72.6	84.0	67.7	7564	86.3
2003	6810.2	855.0	92.4	73.4	92.4	73.3	90.9	68.6	8013	91.5

# US-254 QUAD CITIES-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
20 May	272.0	207.3	PF	D11	REPLACE LEAKING FUEL (Q1M16).
12 Nov	435.5	331.8	UF2	A34	UNIT SHUTDOWN DUE TO INCREASED MOISTURE CARRY-OVER. (CRS 184152 AND 188129).
20 Dec	38.1	29.1	UF2	A12	UNIT SHUTDOWN TO REPAIR VIBRATION MONITORING EQUIPMENT IN THE DRYWELL.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1972 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		473			427	
B. Refuelling without a maintenance					80	
C. Inspection, maintenance or repair combined with refuelling				1222		
D. Inspection, maintenance or repair without refuelling	272			159	4	
E. Testing of plant systems or components				8	9	
H. Nuclear regulatory requirements					6	2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				1	52	2
Subtotal	272	473	0	1390	578	4
Total		745			1972	

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

System	2003 Hours Lost	1972 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems	38	23
13. Reactor Auxiliary Systems		3
14. Safety Systems		9
15. Reactor Cooling Systems		118
31. Turbine and auxiliaries		81
32. Feedwater and Main Steam System		23
41. Main Generator Systems		19
42. Electrical Power Supply Systems		40
XX. Miscellaneous Systems	435	
Total	473	316

# US-265 QUAD CITIES-2

**Operator:** EXELON (Exelon Nuclear Co.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 855.0 MW(e)  
**Design Net Capacity:** 789.0 MW(e)  
**Design Discharge Burnup:** 20900 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6975.1 GW(e).h  
**Energy Availability Factor:** 94.0%  
**Load Factor:** 93.1%  
**Operating Factor:** 93.4%  
**Energy Unavailability Factor:** 6.0%  
**Total Off-line Time:** 579 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	654.6	596.2	660.6	536.6	551.7	190.9	565.3	632.8	636.2	654.5	636.1	659.6	6975.1
<b>EAF (%)</b>	100.0	100.0	100.0	87.9	94.0	45.4	100.0	100.0	100.0	100.0	100.0	100.0	94.0
<b>UCF (%)</b>	100.0	100.0	100.0	87.9	94.0	45.4	100.0	100.0	100.0	100.0	100.0	100.0	94.0
<b>LF (%)</b>	102.9	103.8	103.8	87.3	86.7	31.0	88.9	99.5	103.3	102.8	103.3	103.7	93.1
<b>OF (%)</b>	100.0	100.0	100.0	86.6	93.4	39.7	100.0	100.0	100.0	100.0	100.0	100.0	93.4
<b>EUf (%)</b>	0.0	0.0	0.0	12.1	6.0	54.6	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	12.1	6.0	54.6	0.0	0.0	0.0	0.0	0.0	0.0	6.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1967      **Lifetime Generation:** 142335.1 GW(e).h  
**Date of First Criticality:** 26 Apr 1972      **Cumulative Energy Availability Factor:** 71.5%  
**Date of Grid Connection:** 23 May 1972      **Cumulative Load Factor:** 66.4%  
**Date of Commercial Operation:** 10 Mar 1973      **Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	5062.3	769.0	84.0	65.2	84.0	65.0	75.1	60.0	7343	83.8
1983	3158.5	769.0	64.2	65.1	64.2	65.0	46.9	58.7	5620	64.2
1984	4984.4	769.0	77.9	66.2	77.9	66.1	73.8	60.1	6837	77.8
1985	4560.7	769.0	71.3	66.7	71.3	66.6	67.7	60.7	6247	71.3
1986	4728.0	769.0	74.2	67.2	74.2	67.1	70.2	61.4	6399	73.0
1987	4953.0	769.0	78.1	68.0	78.1	67.9	73.5	62.3	6832	78.0
1988	4178.9	769.0	70.5	68.2	70.5	68.1	61.9	62.3	6193	70.5
1989	5743.1	769.0	95.5	69.9	95.5	69.8	85.3	63.7	8363	95.5
1990	4373.6	769.0	70.4	69.9	70.4	69.8	64.9	63.8	6186	70.6
1991	5285.2	769.0	88.3	70.9	88.3	70.9	78.5	64.6	7731	88.3
1992	3464.2	769.0	64.0	70.6	64.0	70.5	51.3	63.9	5621	64.0
1993	3111.8	769.0	51.8	69.6	51.8	69.6	46.2	63.0	4538	51.8
1994	4013.3	769.0	65.7	69.4	65.7	69.4	59.6	62.8	5745	65.6
1995	2497.0	769.0	45.3	68.3	45.3	68.3	37.1	61.7	3966	45.3
1996	4666.8	769.0	98.8	69.7	72.3	68.5	69.1	62.0	6348	72.3
1997	2627.7	769.0	42.3	68.5	42.3	67.4	39.0	61.0	3718	42.4
1998	3819.6	769.0	59.0	68.2	58.2	67.0	56.7	60.9	5095	58.2
1999	6596.7	769.0	97.5	69.3	97.5	68.2	97.9	62.3	8537	97.5
2000	6220.6	769.0	92.9	70.2	92.9	69.1	92.1	63.4	8156	92.9
2001	6273.8	769.0	91.9	70.9	91.9	69.9	93.1	64.5	8058	92.0
2002	6556.8	833.0	90.4	71.7	90.4	70.7	89.9	65.4	7852	89.6
2003	6975.1	855.0	94.0	72.5	94.0	71.5	93.1	66.4	8181	93.4

## US-265 QUAD CITIES-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
16 Apr	96.0	74.4	UF	A32	3B PORV STUCK OPEN.(Q2F57).
08 May	49.0	38.0	UF	A32	REPLACE 3B AND 3E PORVS DUE TO HIGH TAILPIPE TEMPERATURES (Q2F58).
11 Jun	433.8	336.2	UF2	A16	STEAM DRYER REPAIRS.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1972 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		578			551	
B. Refuelling without a maintenance					16	
C. Inspection, maintenance or repair combined with refuelling				1079	70	
D. Inspection, maintenance or repair without refuelling				155		
E. Testing of plant systems or components				3	0	
H. Nuclear regulatory requirements					12	0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				110	76	74
Subtotal	0	578	0	1347	725	74
Total		578			2146	

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

System	2003 Hours Lost	1972 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		10
12. Reactor I&C Systems		14
13. Reactor Auxiliary Systems		5
14. Safety Systems		20
15. Reactor Cooling Systems		80
16. Steam generation systems	433	
17. Safety I&C Systems (excluding reactor I&C)		8
21. Fuel Handling and Storage Facilities		22
31. Turbine and auxiliaries		98
32. Feedwater and Main Steam System	145	44
33. Circulating Water System		9
35. All other I&C Systems		1
41. Main Generator Systems		41
42. Electrical Power Supply Systems		81
XX. Miscellaneous Systems		52
Total	578	485

# US-244 R.E. GINNA

**Operator:** RGE (ROCHESTER GAS & ELECTRIC CORP.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 480.0 MW(e)  
**Design Net Capacity:** 470.0 MW(e)  
**Design Discharge Burnup:** 27000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 3868.6 GW(e).h  
**Energy Availability Factor:** 90.1%  
**Load Factor:** 92.0%  
**Operating Factor:** 90.5%  
**Energy Unavailability Factor:** 9.9%  
**Total Off-line Time:** 835 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	369.2	333.0	358.5	357.1	370.0	355.7	361.5	317.4	151.1	168.6	357.4	369.1	3868.6
<b>EAF (%)</b>	100.0	100.0	98.5	100.0	100.0	100.0	100.0	89.3	44.7	49.6	100.0	100.0	90.1
<b>UCF (%)</b>	100.0	100.0	98.5	100.0	100.0	100.0	100.0	89.4	44.7	49.6	100.0	100.0	90.1
<b>LF (%)</b>	103.4	103.2	100.4	103.5	103.6	102.9	101.2	88.9	43.7	47.1	103.4	103.3	92.0
<b>OF (%)</b>	100.0	100.0	98.5	100.0	100.0	100.0	100.0	89.7	47.2	50.7	100.0	100.0	90.5
<b>EU (%)</b>	0.0	0.0	1.5	0.0	0.0	0.0	0.0	10.7	55.3	50.4	0.0	0.0	9.9
<b>PU (%)</b>	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	55.3	48.6	0.0	0.0	8.8
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.7	0.0	1.8	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1966      **Lifetime Generation:** 111633.9 GW(e).h  
**Date of First Criticality:** 08 Nov 1969      **Cumulative Energy Availability Factor:** 79.8%  
**Date of Grid Connection:** 02 Dec 1969      **Cumulative Load Factor:** 79.5%  
**Date of Commercial Operation:** 01 Jul 1970      **Cumulative Unit Capability Factor:** 77.3%  
**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 (%)
1982	2408.0	470.0	58.9	75.8	58.9	68.4	58.5	67.8	5150	58.8
1983	3040.1	470.0	74.9	75.7	74.9	68.9	73.8	68.2	6529	74.5
1984	3156.8	470.0	77.2	75.8	77.2	69.5	76.5	68.8	6779	77.2
1985	3620.3	470.0	87.9	76.6	87.9	70.7	87.9	70.1	7700	87.9
1986	3610.3	470.0	87.5	77.3	87.4	71.7	87.7	71.1	7659	87.4
1987	3797.7	470.0	91.3	78.1	91.3	72.9	92.2	72.4	7994	91.3
1988	3533.2	470.0	86.5	78.5	86.5	73.6	85.6	73.1	7592	86.4
1989	3073.5	470.0	75.0	78.3	75.0	73.7	74.6	73.2	6569	75.0
1990	3451.4	470.0	83.6	78.6	83.6	74.2	83.8	73.7	7325	83.6
1991	3483.3	470.0	86.0	79.0	86.0	74.7	84.6	74.2	7536	86.0
1992	3483.4	470.0	85.8	79.3	85.8	75.2	84.4	74.7	7536	85.8
1993	3499.4	470.0	85.7	79.5	85.7	75.7	85.0	75.1	7509	85.7
1994	3373.7	470.0	82.4	79.7	82.4	76.0	81.9	75.4	7219	82.4
1995	3638.6	470.0	88.8	80.0	88.8	76.5	88.4	75.9	7776	88.8
1996	2898.1	470.0	70.4	79.7	70.4	76.2	70.2	75.7	6175	70.3
1997	3894.7	480.0	91.7	80.1	91.7	76.8	92.6	76.3	8011	91.4
1998	4308.6	480.0	100.0	80.8	100.0	77.7	102.5	77.3	8760	100.0
1999	3534.1	480.0	85.3	81.0	85.3	77.9	84.0	77.5	7444	85.0
2000	3814.1	480.0	91.0	81.3	91.0	78.4	90.5	77.9	8001	91.1
2001	4286.3	480.0	100.0	81.9	100.0	79.1	101.9	78.7	8760	100.0
2002	3843.3	480.0	90.4	82.2	90.4	79.4	91.4	79.1	7951	90.8
2003	3868.6	480.0	90.1	82.4	90.1	79.8	92.0	79.5	7925	90.5



# US-244 R.E. GINNA

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Mar	10.9	5.4	PF	D32	FEEDWATER REGULATOR VALVE ACTUATOR REPAIR AOV-4269.
14 Aug	71.3	35.5	UF4	K42	AUTOMATIC SCRAM OCCURRED FROM GRID INSTABILITY.
17 Aug	5.1	2.5	UF4	B32	TURBINE TRIPPED DUE TO HIGH CONDENSER BACKPRESSURE. THE REACTOR REMAINED CRITICAL.
15 Sep	726.1	361.6	PF	C21	REFUELING AND MAINTENANCE OUTAGE.
15 Oct	13.0	6.5	UF4	K42	LOSS OF OFFSITE CIRCUIT REACTOR TRIP.
15 Oct	7.1	3.5	PF	C21	CONT'D REFUELING.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1971 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					229	
B. Refuelling without a maintenance		5			2	
C. Inspection, maintenance or repair combined with refuelling	733			1201		
D. Inspection, maintenance or repair without refuelling	10			85	2	
E. Testing of plant systems or components				1	0	
H. Nuclear regulatory requirements					0	20
J. Grid failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)		84			10	
Subtotal	743	89	0	1287	243	20
Total		832			1550	

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

System	2003 Hours Lost	1971 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		17
13. Reactor Auxiliary Systems		2
14. Safety Systems		18
15. Reactor Cooling Systems		11
16. Steam generation systems		46
31. Turbine and auxiliaries		43
32. Feedwater and Main Steam System		37
33. Circulating Water System		6
35. All other I&C Systems		1
42. Electrical Power Supply Systems		20
Total	0	202

# US-458 RIVER BEND-1

**Operator:** ENTERGY (ENTERGY NUCLEAR)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 966.0 MW(e)  
**Design Net Capacity:** 934.0 MW(e)  
**Design Discharge Burnup:** 27500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7653.2 GW(e).h  
**Energy Availability Factor:** 91.8%  
**Load Factor:** 90.4%  
**Operating Factor:** 91.9%  
**Energy Unavailability Factor:** 8.2%  
**Total Off-line Time:** 710 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	739.5	543.9	310.8	360.8	729.6	695.5	727.4	726.7	640.7	728.6	711.9	737.9	7653.2
<b>EAF (%)</b>	100.0	93.2	47.6	65.8	100.0	100.0	100.0	100.0	95.0	100.0	100.0	100.0	91.8
<b>UCF (%)</b>	100.0	93.2	47.6	65.8	100.0	100.0	100.0	100.0	95.0	100.0	100.0	100.0	91.8
<b>LF (%)</b>	102.9	83.8	43.2	52.0	101.5	100.0	101.2	101.1	92.1	101.2	102.4	102.7	90.4
<b>OF (%)</b>	100.0	93.2	51.1	63.3	100.0	100.0	100.0	100.0	95.0	100.0	100.0	100.0	91.9
<b>EUF (%)</b>	0.0	6.8	52.4	34.2	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	8.2
<b>PUF (%)</b>	0.0	0.0	52.4	31.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0
<b>UCLF (%)</b>	0.0	6.8	0.0	2.7	0.0	0.0	0.0	0.0	5.0	0.0	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Mar 1977  
**Date of First Criticality:** 31 Oct 1985  
**Date of Grid Connection:** 03 Dec 1985  
**Date of Commercial Operation:** 16 Jun 1986

**Lifetime Generation:** 111645.3 GW(e).h  
**Cumulative Energy Availability Factor:** 80.4%  
**Cumulative Load Factor:** 77.6%  
**Cumulative Unit Capability Factor:** 78.1%  
**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	22.6	936.0	0.0	0.0	0.3	100.0	0.3	0.0	180	2.1
1986	2995.4	936.0	0.0	0.0	56.7	100.0	36.5	0.0	4221	48.2
1987	4964.4	936.0	66.7	66.7	66.7	66.7	60.5	60.5	5836	66.6
1988	7249.0	936.0	92.8	79.8	92.8	79.7	88.2	74.4	8149	92.8
1989	4785.0	936.0	66.9	75.5	66.9	75.5	58.4	69.0	5853	66.8
1990	5592.6	936.0	75.8	75.5	75.8	75.6	68.2	68.8	6642	75.8
1991	6687.2	936.0	85.7	77.6	85.7	77.6	81.6	71.4	7507	85.7
1992	2762.7	936.0	36.5	70.7	36.5	70.7	33.6	65.1	3210	36.5
1993	5257.9	936.0	69.4	70.5	69.4	70.5	64.1	64.9	6076	69.4
1994	4886.2	936.0	62.3	69.5	62.3	69.5	59.6	64.3	5455	62.3
1995	7930.8	936.0	99.4	72.8	99.4	72.8	96.7	67.9	8704	99.4
1996	6860.3	936.0	84.2	74.0	84.2	74.0	83.4	69.4	7391	84.1
1997	6822.7	936.0	84.8	75.0	84.8	75.0	83.2	70.7	7427	84.8
1998	7833.5	936.0	95.9	76.7	95.9	76.7	95.5	72.8	8404	95.9
1999	5704.8	936.0	74.0	76.5	74.0	76.5	69.6	72.5	6476	73.9
2000	7352.7	936.0	88.8	77.4	88.8	77.4	89.4	73.7	7795	88.7
2001	7811.8	936.0	92.4	78.4	92.4	78.4	95.3	75.2	8120	92.7
2002	8472.4	966.0	97.9	79.6	97.9	79.6	100.1	76.8	8579	97.9
2003	7653.2	966.0	91.8	80.4	91.8	80.4	90.4	77.6	8050	91.9

# US-458 RIVER BEND-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
22 Feb	45.2	44.3	UF5	A31	A MANUAL REACTOR SCRAM WAS INITIATED DUE TO A FLUID LEAK IN THE MAIN TURBINE ELECTRO-HYDRAULIC CONTROL SYSTEM.
16 Mar	605.9	593.8	PF	C21	REFUELLING OUTAGE.
11 Apr	19.3	18.9	UF2	A31	THE TURBINE GENERATOR WAS TAKEN OFF LINE TO REPAIR A FLUID LEAK IN THE MAIN TURBINE ELECTROHYDRAULIC CONTROL SYSTEM. THE REACTOR REMAINED CRITICAL.
11 Apr	2.2	2.2	PF	E31	THE TURBINE GENERATOR WAS TAKEN OFF LINE FOR SCHEDULED TESTING. THE REACTOR REMAINED CRITICAL.
22 Sep	35.3	34.6	UF4	A31	DURING SCHEDULED TURBINE TESTING, A MALFUNCTION IN THE EHC SYSTEM CAUSED REACTOR PRESSURE TO INCREASE TO THE AUTO SCRAM SETPOINT.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1986 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		99		7	402	
B. Refuelling without a maintenance					32	
C. Inspection, maintenance or repair combined with refuelling	605			909		
D. Inspection, maintenance or repair without refuelling				210	10	
E. Testing of plant systems or components	2			15	6	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				15	189	
Subtotal	607	99	0	1156	639	0
Total		706			1795	

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

System	2003 Hours Lost	1986 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		61
13. Reactor Auxiliary Systems		4
15. Reactor Cooling Systems		115
17. Safety I&C Systems (excluding reactor I&C)		11
31. Turbine and auxiliaries	99	46
32. Feedwater and Main Steam System		40
33. Circulating Water System		4
35. All other I&C Systems		14
41. Main Generator Systems		31
42. Electrical Power Supply Systems		37
XX. Miscellaneous Systems		7
Total	99	370

# US-272 SALEM-1

**Operator:** PSEG (PUBLIC SERVICE ELECTRIC & GAS CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1096.0 MW(e)  
**Design Net Capacity:** 1090.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9096.7 GW(e).h  
**Energy Availability Factor:** 95.8%  
**Load Factor:** 94.7%  
**Operating Factor:** 95.9%  
**Energy Unavailability Factor:** 4.2%  
**Total Off-line Time:** 359 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	838.7	736.5	738.7	762.6	826.9	800.2	760.5	747.5	587.0	725.5	770.9	801.8	9096.7
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	90.2	93.9	76.8	89.5	100.0	100.0	95.8
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	90.2	93.9	76.8	89.5	100.0	100.0	95.9
<b>LF (%)</b>	102.9	100.0	90.6	96.8	101.4	101.4	93.3	91.7	74.4	88.9	97.7	98.3	94.7
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	92.1	92.2	77.1	89.7	100.0	100.0	95.9
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	9.8	6.1	23.2	10.5	0.0	0.0	4.2
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	9.8	6.1	23.2	10.5	0.0	0.0	4.2
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1968  
**Date of First Criticality:** 11 Dec 1976  
**Date of Grid Connection:** 25 Dec 1976  
**Date of Commercial Operation:** 30 Jun 1977

**Lifetime Generation:** 150705.9 GW(e).h  
**Cumulative Energy Availability Factor:** 62.5%  
**Cumulative Load Factor:** 59.0%  
**Cumulative Unit Capability Factor:** 77.2%  
**Cumulative Energy Unavailability Factor:** 37.5%

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 (%)
1982	4107.4	1079.0	47.0	54.0	47.0	53.0	43.5	47.8	4192	47.9
1983	5408.8	1079.0	57.6	54.6	57.6	53.8	57.2	49.4	5127	58.5
1984	2160.1	1079.0	27.1	50.6	27.1	49.9	22.8	45.6	2378	27.1
1985	9007.5	1079.0	95.2	56.2	95.2	55.6	95.3	51.8	8345	95.3
1986	7084.0	1083.0	78.6	58.7	78.6	58.2	74.7	54.3	6921	79.0
1987	6216.6	1106.0	73.1	60.2	72.6	59.6	64.2	55.3	6362	72.6
1988	7418.6	1106.0	77.9	61.8	77.9	61.3	76.4	57.3	6841	77.9
1989	6213.3	1106.0	69.2	62.4	69.2	62.0	64.1	57.9	6059	69.2
1990	5999.2	1106.0	67.0	62.8	67.0	62.4	61.9	58.2	5868	67.0
1991	6810.3	1106.0	74.0	63.6	74.0	63.2	70.3	59.1	6479	74.0
1992	5307.8	1106.0	58.0	63.2	58.0	62.9	54.6	58.8	5090	57.9
1993	5870.6	1106.0	65.6	63.4	65.6	63.0	60.6	58.9	5746	65.6
1994	5779.3	1106.0	67.0	63.6	67.0	63.3	59.7	58.9	5865	67.0
1995	2554.4	1106.0	30.1	61.7	30.1	61.4	26.4	57.1	2632	30.0
1996	0.0	1106.0	0.0	58.4	0.0	58.1	0.0	54.1	0	0.0
1997	0.0	1106.0	0.0	55.5	0.0	55.2	0.0	51.3	0	0.0
1998	6475.6	1106.0	70.8	56.2	70.8	56.0	66.8	52.1	6199	70.8
1999	8009.2	1106.0	87.5	57.6	87.5	57.4	82.7	53.5	7663	87.5
2000	8952.6	1106.0	94.8	59.3	94.8	59.0	92.2	55.2	8328	94.8
2001	7709.4	1088.0	80.9	60.2	80.9	60.0	80.9	56.2	7116	81.2
2002	8620.6	1096.0	89.5	61.3	89.5	61.1	89.8	57.6	7855	89.7
2003	9096.7	1096.0	95.8	62.7	95.8	62.5	94.7	59.0	8401	95.9

# US-272 SALEM-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
29 Jul	117.0	130.0	UF	A42	500KV 1-5 BREAKER FAILURE
20 Sep	165.0	183.3	UF2	N	MANUAL REACTOR SHUTDOWN DUE TO SWITCHYARD ARCING FROM SALT BUILDUP ON INSULATORS FOLLOWING HURRICANE.
15 Oct	77.0	85.5	UF2	A17	MANUAL REACTOR SHUTDOWN DUE TO STEAM GENERATOR LEVEL CONTROL VALVE FAILURE (14BF19).

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1977 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		194			1572	
B. Refuelling without a maintenance					11	
C. Inspection, maintenance or repair combined with refuelling				1107		
D. Inspection, maintenance or repair without refuelling				118	44	
E. Testing of plant systems or components				1	1	
H. Nuclear regulatory requirement					141	40
J. Grid failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				16	119	0
N. Environmental conditions (flood, storm lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)		165				
Subtotal	0	359	0	1242	1888	41
Total		359			3171	

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

System	2003 Hours Lost	1977 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		98
13. Reactor Auxiliary Systems		7
14. Safety Systems		20
15. Reactor Cooling Systems		106
16. Steam generation systems		566
17. Safety I&C Systems (excluding reactor I&C)	77	2
31. Turbine and auxiliaries		294
32. Feedwater and Main Steam System		133
33. Circulating Water System		66
35. All other I&C Systems		7
41. Main Generator Systems		128
42. Electrical Power Supply System	117	31
XX. Miscellaneous Systems		4
Total	194	1463

# US-311 SALEM-2

**Operator:** PSEG (PUBLIC SERVICE ELECTRIC & GAS CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1092.0 MW(e)  
**Design Net Capacity:** 1115.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8095.6 GW(e).h  
**Energy Availability Factor:** 83.7%  
**Load Factor:** 84.5%  
**Operating Factor:** 84.0%  
**Energy Unavailability Factor:** 16.3%  
**Total Off-line Time:** 1405 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	840.0	755.2	760.7	781.9	818.9	802.4	818.4	814.5	580.1	233.1	39.2	851.2	8095.6
<b>EAF (%)</b>	100.0	100.0	90.2	98.7	100.0	100.0	100.0	100.0	77.3	24.7	13.7	100.0	83.7
<b>UCF (%)</b>	100.0	100.0	90.2	98.7	100.0	100.0	100.0	100.0	77.3	24.7	13.7	100.0	83.7
<b>LF (%)</b>	103.4	102.9	93.6	99.6	100.8	102.1	100.7	100.2	73.8	28.7	5.0	102.5	84.5
<b>OF (%)</b>	100.0	100.0	91.0	98.1	100.0	100.0	100.0	100.0	77.6	28.5	12.5	100.0	84.0
<b>EUf (%)</b>	0.0	0.0	9.8	1.3	0.0	0.0	0.0	0.0	22.7	75.3	86.3	0.0	16.3
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	75.3	86.3	0.0	13.5
<b>UCLF (%)</b>	0.0	0.0	9.8	1.3	0.0	0.0	0.0	0.0	22.7	0.0	0.0	0.0	2.8
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1968  
**Date of First Criticality:** 08 Aug 1980  
**Date of Grid Connection:** 03 Jun 1981  
**Date of Commercial Operation:** 13 Oct 1981

**Lifetime Generation:** 129067.5 GW(e).h  
**Cumulative Energy Availability Factor:** 64.1%  
**Cumulative Load Factor:** 59.2%  
**Cumulative Unit Capability Factor:** 77.4%  
**Cumulative Energy Unavailability Factor:** 35.9%

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	7941.7	1106.0	97.5	97.5	97.5	97.5	82.0	82.0	8517	97.2
1983	775.2	1106.0	12.7	55.1	12.6	55.1	8.0	45.0	1078	12.3
1984	3225.7	1106.0	36.4	48.9	36.4	48.9	33.2	41.1	3192	36.3
1985	5033.8	1106.0	56.2	50.7	56.2	50.7	52.0	43.8	4923	56.2
1986	5317.7	1106.0	61.6	52.9	61.6	52.9	54.9	46.0	5388	61.5
1987	6176.6	1106.0	72.4	56.1	72.4	56.1	63.8	49.0	6338	72.4
1988	5982.2	1106.0	66.5	57.6	66.5	57.6	61.6	50.8	5838	66.5
1989	7824.6	1106.0	84.7	61.0	84.7	61.0	80.8	54.5	7419	84.7
1990	5446.1	1106.0	72.2	62.2	72.2	62.2	56.2	54.7	5163	58.9
1991	7662.3	1106.0	82.0	64.2	82.1	64.2	79.1	57.1	7188	82.1
1992	4744.6	1106.0	53.0	63.2	53.1	63.2	48.8	56.4	4657	53.0
1993	5575.5	1106.0	60.9	63.0	60.9	63.0	57.5	56.5	5328	60.8
1994	5606.8	1106.0	69.4	63.5	69.4	63.5	57.9	56.6	6076	69.4
1995	2071.7	1106.0	25.8	60.8	25.8	60.8	21.4	54.1	2261	25.8
1996	0.0	1106.0	0.0	56.8	0.0	56.8	0.0	50.5	0	0.0
1997	2564.3	1106.0	32.4	55.2	32.4	55.2	26.5	49.0	2834	32.4
1998	7797.2	1106.0	83.2	56.9	83.2	56.9	80.5	50.8	7287	83.2
1999	7949.4	1106.0	84.8	58.4	84.8	58.4	82.0	52.5	7431	84.8
2000	8381.7	1106.0	89.0	60.0	89.0	60.0	86.3	54.3	7819	89.0
2001	9517.6	1086.0	99.7	62.0	99.7	62.0	100.0	56.6	8736	99.7
2002	8367.4	1092.0	86.8	63.1	86.8	63.2	87.5	58.0	7620	87.0
2003	8095.6	1094.0	83.7	64.1	83.7	64.1	84.5	59.2	7355	84.0

## US-311 SALEM-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
29 Mar	81.0	89.9	UF	Z	MULTIPLE CIRCULATORS O/S DUE TO HIGH GRASS LEVELS.
20 Sep	161.0	178.7	UF2	N42	MANUAL SHUTDOWN DUE TO SWITCHYARD ARCING FROM SALT BUILD UP ON INSULATORS FOLLOWING HURRICANE.
09 Oct	1163.0	1290.9	PF	C21	REFUELING OUTAGE.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					1349	
B. Refuelling without a maintenance					10	
C. Inspection, maintenance or repair combined with refuelling	1163			1025		
D. Inspection, maintenance or repair without refuelling				136	31	
E. Testing of plant systems or components				0	0	
H. Nuclear regulatory requirements					20	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				5	367	
N. Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)		161				
Z. Others		81				
Subtotal	1163	242	0	1166	1777	0
Total		1405			2943	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		54
13. Reactor Auxiliary Systems		7
14. Safety Systems		65
15. Reactor Cooling Systems		95
16. Steam generation systems		252
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		131
32. Feedwater and Main Steam System		134
33. Circulating Water System		8
35. All other I&C Systems		4
41. Main Generator Systems		341
42. Electrical Power Supply Systems		235
XX. Miscellaneous Systems		10
Total	0	1338

# US-361 SAN ONOFRE-2

**Operator:** SCE (SOUTHERN CALIFORNIA EDISON)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1070.0 MW(e)  
**Design Net Capacity:** 1070.0 MW(e)  
**Design Discharge Burnup:** 34800 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9712.5 GW(e).h  
**Energy Availability Factor:** 99.0%  
**Load Factor:** 103.6%  
**Operating Factor:** 99.0%  
**Energy Unavailability Factor:** 1.0%  
**Total Off-line Time:** 89 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	838.9	701.4	835.0	810.3	836.1	739.0	828.8	833.9	806.7	833.8	809.5	839.0	9712.5
<b>EAF (%)</b>	100.0	94.5	100.0	100.0	100.0	92.8	100.0	100.0	100.0	100.0	100.0	100.0	99.0
<b>UCF (%)</b>	100.0	94.5	100.0	100.0	100.0	92.8	100.0	100.0	100.0	100.0	100.0	100.0	99.0
<b>LF (%)</b>	105.4	97.5	104.9	105.3	105.0	95.9	104.1	104.8	104.7	104.6	105.1	105.4	103.6
<b>OF (%)</b>	100.0	94.5	100.0	100.0	100.0	92.8	100.0	100.0	100.0	100.0	100.0	100.0	99.0
<b>EUf (%)</b>	0.0	5.5	0.0	0.0	0.0	7.2	0.0	0.0	0.0	0.0	0.0	0.0	1.0
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	7.2	0.0	0.0	0.0	0.0	0.0	0.0	0.6
<b>UCLF (%)</b>	0.0	5.5	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Mar 1974      **Lifetime Generation:** 155546.0 GW(e).h  
**Date of First Criticality:** 26 Jul 1982      **Cumulative Energy Availability Factor:** 80.8%  
**Date of Grid Connection:** 20 Sep 1982      **Cumulative Load Factor:** 80.9%  
**Date of Commercial Operation:** 08 Aug 1983      **Cumulative Unit Capability Factor:** 77.7%  
**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 (%)
1982	126.0	1075.0	0.0	0.0	1.4	100.0	1.4	0.0	824	9.9
1983	3660.4	1083.0	0.0	0.0	51.0	100.0	39.3	0.0	4236	49.3
1984	5272.6	1070.0	58.9	58.9	58.9	58.9	56.1	56.1	5167	58.8
1985	5174.0	1070.0	58.4	58.6	58.4	58.6	55.2	55.6	5114	58.4
1986	6371.3	1070.0	71.5	63.0	71.6	62.9	68.0	59.8	6266	71.5
1987	6247.3	1070.0	69.3	64.5	69.3	64.5	66.7	61.5	6067	69.3
1988	9002.7	1070.0	93.8	70.4	93.8	70.4	95.8	68.3	8237	93.8
1989	5237.7	1070.0	56.6	68.1	56.6	68.1	55.9	66.3	4956	56.6
1990	8309.7	1070.0	87.4	70.9	87.4	70.9	88.7	69.5	7657	87.4
1991	5769.4	1070.0	64.4	70.0	64.4	70.0	61.6	68.5	5637	64.3
1992	8795.2	1070.0	93.5	72.7	93.5	72.7	93.6	71.3	8214	93.5
1993	7655.0	1070.0	82.3	73.6	82.4	73.6	81.7	72.3	7213	82.3
1994	9309.2	1070.0	100.0	76.0	99.3	76.0	99.3	74.8	8760	100.0
1995	6496.0	1070.0	70.8	75.6	70.8	75.6	69.3	74.3	6197	70.7
1996	8550.2	1070.0	91.3	76.8	91.3	76.8	91.0	75.6	8016	91.3
1997	6656.3	1070.0	70.8	76.4	70.8	76.4	71.0	75.3	6197	70.7
1998	8430.2	1070.0	89.0	77.2	88.9	77.2	89.9	76.2	7792	88.9
1999	8243.5	1070.0	85.0	77.7	85.0	77.7	87.9	77.0	7447	85.0
2000	8524.2	1070.0	89.0	78.4	89.0	78.4	90.7	77.8	7818	89.0
2001	9492.0	1070.0	97.5	79.4	97.5	79.4	101.3	79.1	8538	97.5
2002	8510.5	1070.0	87.0	79.8	87.0	79.8	90.8	79.7	7618	87.0
2003	9712.5	1070.0	99.0	80.8	99.0	80.8	103.6	80.9	8671	99.0



## US-361 SAN ONOFRE-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Feb	37.0	39.6	UF4	L31	AN ERROR DURING UNIT 3 MAIN TRANSFORMER TESTING RESULTED IN A UNIT 2 MAIN GENERATOR/TURBINE TRIP AND AUTOMATIC REACTOR TRIP.
21 Jun	52.0	55.6	PF	A11	PLANNED OUTAGE TO REPLACE THE POSITION INDICATOR AND CABLE FOR PART-LENGTH CONTROL ELEMENT ASSEMBLY (PLCEA) #33.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure	52				366	
B. Refuelling without a maintenance					45	
C. Inspection, maintenance or repair combined with refuelling				1135		
D. Inspection, maintenance or repair without refuelling				147		
E. Testing of plant systems or components				6		
H. Nuclear regulatory requirements					37	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				33	29	
L. Human factor related		37				
Subtotal	52	37	0	1321	477	0
Total		89			1798	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	52	
12. Reactor I&C Systems		22
13. Reactor Auxiliary Systems		3
14. Safety Systems		2
15. Reactor Cooling Systems		95
16. Steam generation systems		86
31. Turbine and auxiliaries		18
32. Feedwater and Main Steam System		75
41. Main Generator Systems		44
42. Electrical Power Supply Systems		11
XX. Miscellaneous Systems		1
Total	52	357

# US-362 SAN ONOFRE-3

**Operator:** SCE (SOUTHERN CALIFORNIA EDISON)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1080.0 MW(e)  
**Design Net Capacity:** 1070.0 MW(e)  
**Design Discharge Burnup:** 34800 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8596.3 GW(e).h  
**Energy Availability Factor:** 88.4%  
**Load Factor:** 90.9%  
**Operating Factor:** 88.4%  
**Energy Unavailability Factor:** 11.6%  
**Total Off-line Time:** 1019 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	140.4	259.6	831.9	807.8	829.4	802.0	830.4	833.8	805.5	831.2	792.4	831.8	8596.3
<b>EAF (%)</b>	16.1	41.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.4
<b>UCF (%)</b>	16.1	41.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.4
<b>LF (%)</b>	17.5	35.8	103.5	104.0	103.2	103.1	103.3	103.8	103.6	103.3	101.9	103.5	90.9
<b>OF (%)</b>	17.6	39.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.4
<b>EUf (%)</b>	83.9	58.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.6
<b>PUf (%)</b>	83.9	58.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Mar 1974      **Lifetime Generation:** 151188.3 GW(e).h  
**Date of First Criticality:** 29 Aug 1983      **Cumulative Energy Availability Factor:** 82.3%  
**Date of Grid Connection:** 25 Sep 1983      **Cumulative Load Factor:** 80.9%  
**Date of Commercial Operation:** 01 Apr 1984      **Cumulative Unit Capability Factor:** 77.8%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1983	997.2	1082.0	0.0	0.0	91.7	100.0	11.3	0.0	1642	20.1
1984	4666.7	1080.0	0.0	0.0	72.1	100.0	49.2	0.0	4708	53.6
1985	3735.9	1080.0	53.8	53.8	53.8	53.8	39.5	39.5	4708	53.7
1986	6760.6	1080.0	80.7	67.2	80.7	67.2	71.5	55.5	7067	80.7
1987	7523.6	1080.0	79.8	71.4	79.8	71.4	79.5	63.5	6987	79.8
1988	6146.0	1080.0	65.1	69.8	65.1	69.8	64.8	63.8	5714	65.1
1989	8840.6	1080.0	93.9	74.6	93.9	74.6	93.4	69.7	8224	93.9
1990	6602.0	1080.0	70.3	73.9	70.3	73.9	69.8	69.7	6159	70.3
1991	8693.2	1080.0	92.4	76.6	92.4	76.6	91.9	72.9	8094	92.4
1992	6830.8	1080.0	74.4	76.3	74.4	76.3	72.0	72.8	6533	74.4
1993	7128.2	1080.0	76.4	76.3	76.4	76.3	75.3	73.1	6689	76.4
1994	9147.7	1080.0	99.8	78.7	99.8	78.6	96.7	75.4	8742	99.8
1995	7501.6	1080.0	81.9	78.9	81.9	78.9	79.3	75.8	7175	81.9
1996	8838.6	1080.0	94.6	80.3	94.6	80.3	93.2	77.2	8313	94.6
1997	6842.9	1080.0	72.6	79.7	72.6	79.7	72.3	76.9	6357	72.6
1998	9058.6	1080.0	94.8	80.7	94.8	80.7	95.7	78.2	8304	94.8
1999	8416.5	1080.0	87.4	81.2	87.4	81.2	89.0	78.9	7658	87.4
2000	9633.8	1080.0	100.0	82.4	100.0	82.4	101.5	80.3	8784	100.0
2001	5679.3	1080.0	58.9	81.0	58.9	81.0	60.0	79.1	5170	59.0
2002	9548.2	1080.0	98.8	82.0	98.8	82.0	100.9	80.4	8658	98.8
2003	8596.3	1080.0	88.4	82.3	88.4	82.3	90.9	80.9	7741	88.4

## US-362 SAN ONOFRE-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
06 Jan	1019.0	1100.5	PF	C21	REFUELING OUTAGE.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					497	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	1019			900		
D. Inspection, maintenance or repair without refuelling				88		
E. Testing of plant systems or components				6		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					7	
Subtotal	1019	0	0	994	506	0
Total		1019			1500	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		43
14. Safety Systems		60
15. Reactor Cooling Systems		76
16. Steam generation systems		67
31. Turbine and auxiliaries		12
32. Feedwater and Main Steam System		13
41. Main Generator Systems		44
42. Electrical Power Supply Systems		42
Total	0	357

# US-443 SEABROOK-1

**Operator:** FPL (FLORIDA POWER & LIGHT CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1155.0 MW(e)  
**Design Net Capacity:** 1149.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9275.4 GW(e).h  
**Energy Availability Factor:** 92.7%  
**Load Factor:** 91.7%  
**Operating Factor:** 92.7%  
**Energy Unavailability Factor:** 7.3%  
**Total Off-line Time:** 639 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	861.0	777.4	861.1	832.6	862.3	834.6	862.1	861.6	820.1	124.5	715.8	862.3	9275.4
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	16.0	97.9	100.0	92.7
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	16.0	97.9	100.0	92.7
<b>LF (%)</b>	100.2	100.2	100.2	100.3	100.3	100.4	100.3	100.3	98.6	14.5	86.1	100.3	91.7
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	18.9	95.1	100.0	92.7
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	84.0	2.1	0.0	7.3
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.9	0.0	0.0	6.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	2.1	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jul 1976  
**Date of First Criticality:** 13 Jun 1989  
**Date of Grid Connection:** 29 May 1990  
**Date of Commercial Operation:** 19 Aug 1990

**Lifetime Generation:** 112454.3 GW(e).h  
**Cumulative Energy Availability Factor:** 84.0%  
**Cumulative Load Factor:** 82.4%  
**Cumulative Unit Capability Factor:** 79.4%  
**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 (%)
1990	4094.0	1151.0	0.0	0.0	87.9	100.0	40.6	0.0	4125	47.1
1991	6814.4	1150.0	73.0	73.0	73.0	73.0	67.6	67.6	6394	73.0
1992	7868.4	1150.0	80.3	76.6	80.3	76.6	77.9	72.8	7056	80.3
1993	9046.8	1150.0	92.4	81.9	92.4	81.9	89.8	78.4	8094	92.4
1994	6203.5	1150.0	62.3	77.0	62.3	77.0	61.6	74.2	5466	62.4
1995	8380.6	1150.0	85.2	78.6	85.2	78.6	83.2	76.0	7465	85.2
1996	9844.2	1158.0	99.0	82.0	99.0	82.0	96.8	79.5	8690	98.9
1997	7945.7	1158.0	79.2	81.6	79.2	81.6	78.3	79.3	6929	79.1
1998	8388.4	1158.0	83.3	81.8	83.3	81.8	82.7	79.8	7294	83.3
1999	8685.7	1156.0	86.3	82.3	86.3	82.3	85.8	80.4	7564	86.3
2000	7921.5	1155.0	78.7	82.0	78.7	82.0	78.1	80.2	6910	78.7
2001	8692.2	1155.0	90.6	82.8	87.9	82.5	85.9	80.7	7703	87.9
2002	9293.4	1155.0	92.2	83.5	92.2	83.3	91.9	81.6	8083	92.3
2003	9275.4	1155.0	92.7	84.3	92.7	84.0	91.7	82.4	8121	92.7

**US-443 SEABROOK-1****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
04 Oct	571.5	663.5	PF	C21	REFUELING OUTAGE.
27 Oct	14.1	16.4	PF	D31	PERFORMED TURBINE ROTOR BALANCING. LOAD REDUCED FROM 200MWE, GENERATOR BREAKER OPENED. REACTOR POWER HELD AT 1.5% RTP.
28 Oct	13.7	15.9	PF	D31	PERFORMED TURBINE ROTOR BALANCING. LOAD REDUCED FROM 100 MWE, GENERATOR BREAKER OPENED. REACTOR POWER HELD AT 1.5% RTP.
31 Oct	23.5	27.3	UF4	D32	AUTOMATIC REACTOR TRIP ON SG LOW LEVEL FOLLOWING THE LOSS OF ONE OF THE TWO MAIN FEED PUMPS DURING TROUBLESHOOTING.
11 Nov	15.3	17.8	UF	A17	AN RCS LEAK WAS IDENTIFIED AT A LOOP 3 FLOW TRANSMITTER. REACTOR REMAINED CRITICAL DURING REPAIR.

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

Outage Cause	2003 Hours Lost			1990 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		15			379	
C. Inspection, maintenance or repair combined with refuelling	571			901		
D. Inspection, maintenance or repair without refuelling	27	23		16		
E. Testing of plant systems or component				0	7	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	4	16
Subtotal	598	38	0	917	390	16
Total		636			1323	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1990 to 2003 Average Hours Lost Per Year
13. Reactor Auxiliary System:		124
15. Reactor Cooling System:		61
17. Safety I&C Systems (excluding reactor I&C)	15	4
31. Turbine and auxiliaries:		46
32. Feedwater and Main Steam System		25
35. All other I&C Systems:		28
41. Main Generator System:		57
42. Electrical Power Supply System:		28
Total	15	373

# US-327 SEQUOYAH-1

**Operator:** TVA (TENNESSEE VALLEY AUTHORITY)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1125.0 MW(e)  
**Design Net Capacity:** 1148.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7351.1 GW(e).h  
**Energy Availability Factor:** 73.6%  
**Load Factor:** 74.6%  
**Operating Factor:** 73.6%  
**Energy Unavailability Factor:** 26.4%  
**Total Off-line Time:** 2317 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	857.5	775.2	440.3	0.0	0.0	299.6	836.8	759.3	799.2	870.2	840.9	872.2	7351.1
<b>EAF (%)</b>	100.0	100.0	51.7	0.0	0.0	45.3	100.0	87.1	100.0	100.0	100.0	100.0	73.6
<b>UCF (%)</b>	100.0	100.0	51.7	0.0	0.0	45.3	100.0	87.1	100.0	100.0	100.0	100.0	73.6
<b>LF (%)</b>	102.4	102.5	52.6	0.0	0.0	37.0	100.0	90.7	98.7	103.8	103.8	104.2	74.6
<b>OF (%)</b>	100.0	100.0	52.0	0.0	0.0	44.4	100.0	89.2	97.6	100.0	100.0	100.0	73.6
<b>EU (%)</b>	0.0	0.0	48.3	100.0	100.0	54.7	0.0	12.9	0.0	0.0	0.0	0.0	26.4
<b>PU (%)</b>	0.0	0.0	48.3	100.0	100.0	54.7	0.0	0.0	0.0	0.0	0.0	0.0	25.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.9	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1970      **Lifetime Generation:** 144734.2 GW(e).h  
**Date of First Criticality:** 05 Jul 1980      **Cumulative Energy Availability Factor:** 66.3%  
**Date of Grid Connection:** 22 Jul 1980      **Cumulative Load Factor:** 64.0%  
**Date of Commercial Operation:** 01 Jul 1981      **Cumulative Unit Capability Factor:** 77.4%  
**Cumulative Energy Unavailability Factor:** 33.7%

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 (%)
1982	4909.7	1128.0	53.4	53.4	53.4	53.4	49.7	49.7	4626	52.8
1983	7340.9	1139.0	78.3	65.9	78.2	65.9	73.6	61.7	6791	77.5
1984	6104.7	1148.0	69.1	66.9	69.1	66.9	60.5	61.3	5992	68.2
1985	4076.1	1148.0	44.7	61.4	44.7	61.3	40.5	56.1	3760	42.9
1986	0.0	1148.0	0.0	49.0	0.0	49.0	0.0	44.8	0	0.0
1987	0.0	1148.0	0.0	40.8	0.0	40.8	0.0	37.3	0	0.0
1988	127.7	1148.0	6.3	35.9	6.3	35.9	1.3	32.1	282	3.2
1989	9550.6	1148.0	98.5	43.7	98.5	43.7	95.0	40.0	8624	98.4
1990	6840.7	1148.0	74.0	47.1	74.0	47.1	68.0	43.1	6406	73.1
1991	7270.1	1122.0	77.6	50.1	77.6	50.1	74.0	46.2	6774	77.3
1992	8402.5	1122.0	88.2	53.5	88.2	53.5	85.3	49.7	7734	88.0
1993	1290.5	1122.0	14.8	50.3	14.8	50.3	13.1	46.7	1219	13.9
1994	6111.6	1111.0	66.0	51.5	66.0	51.5	62.8	47.9	5774	65.9
1995	6829.5	1111.0	75.6	53.2	75.6	53.2	70.2	49.4	6620	75.6
1996	9293.5	1112.0	95.1	55.9	95.1	55.9	95.1	52.4	8344	95.0
1997	8324.3	1117.0	85.5	57.8	85.5	57.8	85.1	54.4	7486	85.5
1998	8905.7	1118.0	91.0	59.7	91.0	59.7	90.9	56.6	7966	90.9
1999	9987.0	1122.0	100.0	61.9	100.0	61.9	101.6	59.0	8760	100.0
2000	7720.5	1122.0	79.5	62.8	79.5	62.8	78.3	60.1	6988	79.6
2001	9019.0	1122.0	91.2	64.2	91.2	64.2	91.8	61.6	7988	91.2
2002	9953.5	1124.0	100.0	65.9	100.0	65.9	101.1	63.5	8760	100.0
2003	7351.1	1125.0	73.6	66.3	73.6	66.3	74.6	64.0	6443	73.6

# US-327 SEQUOYAH-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
17 Mar	2209.3	2478.8	PF	C21	REFUELING OUTAGE.
17 Jun	9.9	11.1	PF	D31	UNIT 1 GENERATOR WAS FROM FROM GRID FOR TURBINE BALANCE SHOT TEST ON JUNE 17 AT 11411 EDT. REACTOR REMAINED AT POWER. THE GENERATOR WAS TIED ONLINE ON JUNE 18 AT 0004 EDT.
28 Aug	96.7	108.5	UF5	L41	REACTOR WAS MANUALLY TRIPPED FOLLOWING A GENERATOR TRIP DURING QUARTERLY TURBINE OIL TRIP TEST. THE CAUSE WAS A CLOSED INSTRUMENT ISOLATION VALVE TO ONE OF THE TURBINE AUTO-STOP OIL PRESSURE SWITCHES.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1981 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure						723
B. Refuelling without a maintenance						21
C. Inspection, maintenance or repair combined with refuelling	2209			804		
D. Inspection, maintenance or repair without refuelling	9			15	31	
E. Testing of plant systems or components				1		
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling						4
H. Nuclear regulatory requirements				48	396	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				60	708	
L. Human factor related		96				
Subtotal	2218	96	0	928	1883	0
Total		2314			2811	

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

System	2003 Hours Lost	1981 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		25
13. Reactor Auxiliary Systems		19
14. Safety Systems		17
15. Reactor Cooling Systems		71
16. Steam generation systems		4
31. Turbine and auxiliaries		37
32. Feedwater and Main Steam System		376
35. All other I&C Systems		7
41. Main Generator Systems		113
42. Electrical Power Supply Systems		35
Total	0	704

# US-328 SEQUOYAH-2

**Operator:** TVA (TENNESSEE VALLEY AUTHORITY)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1126.0 MW(e)  
**Design Net Capacity:** 1148.0 MW(e)  
**Design Discharge Burnup:** 36000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8258.3 GW(e).h  
**Energy Availability Factor:** 84.6%  
**Load Factor:** 83.7%  
**Operating Factor:** 84.5%  
**Energy Unavailability Factor:** 15.4%  
**Total Off-line Time:** 1359 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	680.7	774.5	448.8	774.2	847.5	810.2	831.7	826.6	803.8	845.2	238.5	376.7	8258.3
<b>EAF (%)</b>	81.6	100.0	58.6	95.8	100.0	100.0	100.0	100.0	100.0	100.0	27.3	53.4	84.6
<b>UCF (%)</b>	81.6	100.0	58.6	95.8	100.0	100.0	100.0	100.0	100.0	100.0	27.3	53.4	84.6
<b>LF (%)</b>	81.3	102.4	53.6	95.6	101.2	99.9	99.3	98.7	99.1	100.8	29.4	45.0	83.7
<b>OF (%)</b>	81.5	100.0	58.2	95.7	100.0	100.0	100.0	100.0	100.0	100.0	29.7	49.9	84.5
<b>EUf (%)</b>	18.4	0.0	41.4	4.2	0.0	0.0	0.0	0.0	0.0	0.0	72.7	46.6	15.4
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	72.7	31.2	8.6
<b>UCLF (%)</b>	18.4	0.0	41.4	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.4	6.7
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1970      **Lifetime Generation:** 145528.6 GW(e).h  
**Date of First Criticality:** 05 Nov 1981      **Cumulative Energy Availability Factor:** 71.1%  
**Date of Grid Connection:** 23 Dec 1981      **Cumulative Load Factor:** 67.6%  
**Date of Commercial Operation:** 01 Jun 1982      **Cumulative Unit Capability Factor:** 77.6%  
**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 (%)
1982	5207.6	1145.0	0.0	0.0	85.2	100.0	51.9	0.0	5881	67.1
1983	6691.4	1133.0	72.8	72.8	72.8	72.8	67.4	67.4	6346	72.4
1984	6403.3	1148.0	69.8	71.3	69.8	71.3	63.5	65.4	6112	69.6
1985	5625.0	1148.0	59.8	67.4	59.8	67.4	55.9	62.3	5223	59.6
1986	0.0	1148.0	0.0	50.5	0.0	50.5	0.0	46.7	0	0.0
1987	0.0	1148.0	0.0	40.4	0.0	40.4	0.0	37.3	0	0.0
1988	3934.7	1148.0	59.4	43.6	59.4	43.6	39.0	37.6	5097	58.0
1989	6067.7	1148.0	70.7	47.5	70.7	47.5	60.3	40.8	6103	69.7
1990	7185.5	1148.0	79.1	51.4	79.1	51.4	71.5	44.7	6864	78.4
1991	9318.9	1122.0	96.9	56.4	96.9	56.4	94.8	50.1	8482	96.8
1992	7276.1	1122.0	80.3	58.8	80.3	58.7	73.8	52.5	7031	80.0
1993	2094.4	1122.0	26.3	55.9	26.3	55.8	21.3	49.7	2213	25.3
1994	5849.4	1106.0	61.9	56.3	61.8	56.3	60.4	50.5	5415	61.8
1995	8887.7	1106.0	92.2	59.0	92.1	59.0	91.7	53.6	8064	92.1
1996	7682.5	1108.0	78.6	60.4	78.6	60.4	78.9	55.4	6894	78.5
1997	8725.6	1117.0	91.5	62.4	91.5	62.4	89.2	57.6	8001	91.3
1998	9799.6	1117.0	98.8	64.7	98.8	64.7	100.1	60.3	8656	98.8
1999	8979.0	1117.0	93.7	66.4	93.7	66.4	91.8	62.1	8203	93.6
2000	9058.3	1117.0	92.9	67.8	92.9	67.8	92.3	63.7	8158	92.9
2001	9939.9	1117.0	100.0	69.5	100.0	69.5	101.6	65.7	8760	100.0
2002	8542.0	1119.0	87.3	70.4	87.3	70.4	87.1	66.8	7640	87.2
2003	8258.3	1126.0	84.6	71.1	84.6	71.1	83.7	67.6	7401	84.5



## US-328 SEQUOYAH-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	138.0	154.1	UF3	A15	UNIT 2 REMAINED IN MODE 5 AT THE BEGINNING OF JANUARY FOLLOWING DECEMBER 26 UNPLANNED AUTOMATIC SCRAM.
10 Mar	158.9	177.5	UF5	A32	MANUAL REACTOR SCRAM FOLLOWING LOSS OF THE 2B HOTWELL PUMP AND BOTH NO.7 HEATER DRAIN TANK PUMPS. THE CAUSE WAS THE OFF-NORMAL CONDITION OF THE NO. 7 HDT OUTLET VALVE BEING DOGGED OPEN COINCIDENT WITH ELECTRICAL FAILURE OF THE 2B HOTWELL PUMP MOTOR.
24 Mar	151.8	169.6	UF5	A41	INITIATED MANUAL SHUTDOWN FOLLOWING INDICATIONS OF GENERATOR GAS LEAKAGE INTO THE STATOR COOLER WATER SYSTEM. A HYDROGEN GAS PIPE HAD DEVELOPED A LEAK BECAUSE OF A MANUFACTURE DEFECT AND SYSTEM VIBRATION.
12 Apr	30.8	34.4	UF4	A31	SPURIOUS TURBINE/RX TRIP DUE TO SUSPECTED SHORT IN VIBRATION POWER DRAWER.
09 Nov	762.8	852.0	PF	C21	REFUELING OUTAGE.
27 Dec	115.3	128.8	UF2	A41	UNIT 2 SHUTDOWN WAS INITIATED WHEN THE MAIN GENERATOR HYDROGEN LEAKAGE SHOWED SIGNIFICANT INCREASE. REPAIRS TO THE MAIN GENERATOR WERE BEING PERFORMED.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1982 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		594			544	
B. Refuelling without a maintenance					26	
C. Inspection, maintenance or repair combined with refuelling	762			762		
D. Inspection, maintenance or repair without refuelling				34		
E. Testing of plant systems or components				1		
H. Nuclear regulatory requirements					542	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					509	
Subtotal	762	594	0	797	1621	0
Total		1356			2418	

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

System	2003 Hours Lost	1982 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		5
13. Reactor Auxiliary Systems		10
14. Safety Systems		2
15. Reactor Cooling Systems	138	54
16. Steam generation systems		32
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries	30	32
32. Feedwater and Main Steam System	158	54
35. All other I&C Systems		2
41. Main Generator Systems	267	312
42. Electrical Power Supply Systems		22
Total	593	527

# US-400 SHEARON HARRIS-1

**Operator:** PROGRESS (Progress Energy Corporation)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 900.0 MW(e)  
**Design Net Capacity:** 900.0 MW(e)  
**Design Discharge Burnup:** 31500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7236.9 GW(e).h  
**Energy Availability Factor:** 92.3%  
**Load Factor:** 91.8%  
**Operating Factor:** 92.3%  
**Energy Unavailability Factor:** 7.7%  
**Total Off-line Time:** 678 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	697.8	628.4	692.0	550.0	200.2	585.7	675.5	566.3	587.0	690.2	668.4	695.4	7236.9
<b>EAF (%)</b>	100.0	100.0	100.0	83.3	36.3	93.6	100.0	94.9	100.0	100.0	100.0	100.0	92.3
<b>UCF (%)</b>	100.0	100.0	100.0	83.3	36.3	93.6	100.0	94.9	100.0	100.0	100.0	100.0	92.3
<b>LF (%)</b>	104.2	103.9	103.4	85.0	29.9	90.4	100.9	84.6	90.6	102.9	103.2	103.9	91.8
<b>OF (%)</b>	100.0	100.0	100.0	83.3	36.3	93.6	100.0	94.9	100.0	100.0	100.0	100.0	92.3
<b>EUf (%)</b>	0.0	0.0	0.0	16.7	63.7	6.4	0.0	5.1	0.0	0.0	0.0	0.0	7.7
<b>PUf (%)</b>	0.0	0.0	0.0	16.7	56.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	6.8	6.4	0.0	5.1	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1974      **Lifetime Generation:** 102521.7 GW(e).h  
**Date of First Criticality:** 03 Jan 1987      **Cumulative Energy Availability Factor:** 86.1%  
**Date of Grid Connection:** 19 Jan 1987      **Cumulative Load Factor:** 84.5%  
**Date of Commercial Operation:** 02 May 1987      **Cumulative Unit Capability Factor:** 78.2%  
**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 (%)
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	99.5	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

# US-400 SHEARON HARRIS-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
26 Apr	543.0	488.7	PF	C21	REFUELING OUTAGE.
18 May	34.3	30.9	UF4	A31	AUTOMATIC TURBINE/REACTOR TRIP DURING STARTUP. THE TURBINE TRIP WAS CAUSED BY A FAILED TURBINE SPEED SENSOR.
20 May	16.4	14.8	UF5	A32	MANUAL REACTOR TRIP DURING STARTUP DUE TO A LOSS OF FEEDWATER SUPPLY. THE EVENT WAS INITIATED BY A FAILED INTERNAL OIL PUMP IN THE FLUID SPEED COUPLING OF A-CONDENSATE BOOSTER PUMP, WHICH TRIPPED THE A-MAIN FEED PUMP.
14 Jun	45.8	41.2	UF5	A17	A PRINTED CIRCUIT BOARD (PCB) FAILURE IN THE CONTROL LOGIC FOR THE B-MAIN FEED PUMP RESULTED IN A LOSS OF MAIN FEED TRAIN EVENT, LEADING TO A MANUAL REACTOR TRIP. THE PCB WAS REPLACED AND THE UNIT WAS RETURNED TO SERVICE.
17 Aug	37.9	34.1	UF5	A32	A MOTOR FAULT TRIPPED THE A-CONDENSATE PUMP MOTOR, RESULTING IN A LOSS OF THE A-TRAIN PUMPS IN THE FEEDWATER AND CONDENSATE SYSTEM. OPERATING PROCEDURES REQUIRE A PLANT SHUTDOWN (MANUAL TRIP ACTUATION) ON A LOSS OF ONE FEED TRAIN.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		134			175	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	543			892		
D. Inspection, maintenance or repair without refuelling				89	8	
E. Testing of plant systems or components				1		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					3	5
Subtotal	543	134	0	982	188	5
Total		677			1175	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		17
15. Reactor Cooling Systems		1
17. Safety I&C Systems (excluding reactor I&C)	45	
31. Turbine and auxiliaries	34	76
32. Feedwater and Main Steam System	54	54
41. Main Generator Systems		14
42. Electrical Power Supply Systems		2
XX. Miscellaneous Systems		7
Total	133	171

# US-498 SOUTH TEXAS-1

**Operator:** STP (STP Nuclear Operating Co.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1250.0 MW(e)  
**Design Net Capacity:** 1250.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6858.8 GW(e).h  
**Energy Availability Factor:** 62.3%  
**Load Factor:** 62.6%  
**Operating Factor:** 62.0%  
**Energy Unavailability Factor:** 37.7%  
**Total Off-line Time:** 3327 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	953.2	863.2	647.3	0.0	0.0	0.0	0.0	629.6	921.6	957.6	926.4	959.8	6858.8
<b>EAF (%)</b>	100.0	100.0	73.3	0.0	0.0	0.0	0.0	75.7	100.0	100.0	100.0	100.0	62.3
<b>UCF (%)</b>	100.0	100.0	73.3	0.0	0.0	0.0	0.0	75.7	100.0	100.0	100.0	100.0	62.3
<b>LF (%)</b>	102.5	102.8	69.6	0.0	0.0	0.0	0.0	67.7	102.4	102.8	102.9	103.2	62.6
<b>OF (%)</b>	100.0	100.0	73.5	0.0	0.0	0.0	0.0	72.7	100.0	100.0	100.0	100.0	62.0
<b>EUf (%)</b>	0.0	0.0	26.7	100.0	100.0	100.0	100.0	24.3	0.0	0.0	0.0	0.0	37.7
<b>PUF (%)</b>	0.0	0.0	19.6	62.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.8
<b>UCLF (%)</b>	0.0	0.0	7.1	37.1	100.0	100.0	100.0	24.3	0.0	0.0	0.0	0.0	30.9
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1975  
**Date of First Criticality:** 08 Mar 1988  
**Date of Grid Connection:** 30 Mar 1988  
**Date of Commercial Operation:** 25 Aug 1988

**Lifetime Generation:** 125158.3 GW(e).h  
**Cumulative Energy Availability Factor:** 76.0%  
**Cumulative Load Factor:** 74.4%  
**Cumulative Unit Capability Factor:** 78.5%  
**Cumulative Energy Unavailability Factor:** 24.0%

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 (%)
1988	2791.5	1250.0	0.0	0.0	91.6	100.0	27.2	0.0	2404	29.3
1989	6307.7	1250.0	63.1	63.1	63.1	63.1	57.6	57.6	5524	63.1
1990	6072.9	1251.0	59.4	61.2	59.4	61.2	55.4	56.5	5198	59.3
1991	7239.8	1251.0	69.3	63.9	69.3	63.9	66.1	59.7	6069	69.3
1992	7265.1	1251.0	68.7	65.1	68.7	65.1	66.1	61.3	6033	68.7
1993	666.0	1251.0	7.7	53.6	7.7	53.6	6.1	50.3	676	7.7
1994	8251.4	1251.0	78.2	57.7	78.2	57.7	75.3	54.4	6842	78.1
1995	9301.8	1251.0	86.5	61.8	86.5	61.8	84.9	58.8	7570	86.4
1996	10226.8	1251.0	93.5	65.8	93.5	65.8	93.1	63.1	8213	93.5
1997	9873.2	1251.0	91.6	68.7	91.6	68.7	90.1	66.1	8019	91.5
1998	10859.9	1250.0	99.8	71.8	99.8	71.8	99.2	69.4	8739	99.8
1999	9645.4	1250.0	89.7	73.4	89.7	73.4	88.1	71.1	7857	89.7
2000	8591.9	1250.0	78.6	73.8	78.6	73.8	78.3	71.7	6905	78.6
2001	10338.2	1250.0	94.1	75.4	94.1	75.4	94.4	73.4	8240	94.1
2002	10867.9	1253.0	97.8	77.0	97.9	77.0	99.0	75.3	8573	97.9
2003	6858.8	1250.0	62.3	76.0	62.3	76.0	62.6	74.4	5433	62.0

## US-498 SOUTH TEXAS-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Mar	52.3	66.1	UF5	A35	MANUAL REACTOR TRIP IN RESPONSE TO A LOSS OF CONDENSATE FLOW CAUSED BY A FAILED POWER SUPPLY. THE POWER SUPPLY WAS REPLACED.
26 Mar	622.0	786.2	PF	C21	REFUELING OUTAGE.
20 Apr	2639.9	3336.8	UF2	A17	INVESTIGATE AND REPAIR BOTTOM MOUNTED INSTRUMENTATION PENETRATION INDICATIONS.
12 Aug	11.5	14.5	UF2	A31	MAIN TURBINE INTERCEPT VALVE OIL LEAK REPAIR

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		2703			821	
B. Refuelling without a maintenance					22	
C. Inspection, maintenance or repair combined with refuelling	622			765		
D. Inspection, maintenance or repair without refuelling				98	64	
E. Testing of plant systems or components				9		
H. Nuclear regulatory requirements					23	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				0		
Subtotal	622	2703	0	872	930	0
Total		3325			1802	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		8
14. Safety Systems		582
15. Reactor Cooling Systems		15
17. Safety I&C Systems (excluding reactor I&C)	2639	36
31. Turbine and auxiliaries	11	25
32. Feedwater and Main Steam System		29
35. All other I&C Systems	52	3
41. Main Generator Systems		103
42. Electrical Power Supply Systems		8
Total	2702	811

# US-499 SOUTH TEXAS-2

**Operator:** STP (STP Nuclear Operating Co.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1250.0 MW(e)  
**Design Net Capacity:** 1250.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8920.2 GW(e).h  
**Energy Availability Factor:** 81.1%  
**Load Factor:** 81.5%  
**Operating Factor:** 81.2%  
**Energy Unavailability Factor:** 18.9%  
**Total Off-line Time:** 1648 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	46.4	0.0	533.0	915.0	941.6	908.3	936.3	930.3	907.5	946.7	911.2	944.0	8920.2
<b>EAF (%)</b>	4.7	0.0	62.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	81.1
<b>UCF (%)</b>	4.7	0.0	62.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	81.1
<b>LF (%)</b>	5.0	0.0	57.3	101.8	101.2	100.9	100.7	100.0	100.8	101.7	101.2	101.5	81.5
<b>OF (%)</b>	8.7	0.0	60.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	81.2
<b>EUf (%)</b>	95.3	100.0	37.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.9
<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>	95.3	100.0	37.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.9
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1975  
**Date of First Criticality:** 12 Mar 1989  
**Date of Grid Connection:** 11 Apr 1989  
**Date of Commercial Operation:** 19 Jun 1989

**Lifetime Generation:** 121141.0 GW(e).h  
**Cumulative Energy Availability Factor:** 78.7%  
**Cumulative Load Factor:** 77.0%  
**Cumulative Unit Capability Factor:** 78.8%  
**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 (%)
1989	3026.7	1250.0	0.0	0.0	77.7	100.0	29.1	0.0	2845	34.2
1990	6452.2	1251.0	62.8	62.8	62.8	62.8	58.9	58.9	5494	62.7
1991	7268.0	1251.0	70.0	66.4	70.0	66.4	66.3	62.6	6134	70.0
1992	10341.0	1251.0	97.3	76.7	97.3	76.7	94.1	73.1	8548	97.3
1993	690.3	1251.0	8.0	59.6	8.0	59.6	6.3	56.4	702	8.0
1994	5991.0	1251.0	58.2	59.3	58.2	59.3	54.7	56.1	5098	58.2
1995	9923.1	1251.0	91.2	64.6	91.2	64.6	90.5	61.8	7985	91.2
1996	10457.9	1251.0	95.3	69.0	95.3	69.0	95.2	66.6	8373	95.3
1997	9972.9	1251.0	92.4	71.9	92.4	71.9	91.0	69.6	8093	92.4
1998	9983.9	1250.0	92.5	74.2	92.5	74.2	91.2	72.0	8096	92.4
1999	9799.3	1250.0	91.7	76.0	91.7	76.0	89.5	73.8	8034	91.7
2000	10557.2	1250.0	96.2	77.8	96.2	77.8	96.1	75.8	8449	96.2
2001	9537.6	1250.0	88.5	78.7	88.5	78.7	87.1	76.8	7751	88.5
2002	8219.8	1250.0	75.9	78.5	75.9	78.5	75.1	76.6	6663	76.1
2003	8920.2	1250.0	81.1	78.7	81.1	78.7	81.5	77.0	7112	81.2

## US-499 SOUTH TEXAS-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Jan	508.4	643.1	UF5	A31	REACTOR MANUALLY TRIPPED DUE TO A SUDDEN HIGH MAIN TURBINE VIBRATION. DAMAGE DISCOVERED IN LOW PRESSURE TURBINE BLADING.
24 Jan	1138.5	1440.2	UF2	A31	MAIN TURBINE/GENERATOR REMOVED FROM SERVICE DUE TO EXCESSIVE VIBRATION.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1989 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		1646			590	
B. Refuelling without a maintenance					12	
C. Inspection, maintenance or repair combined with refuelling				1031		
D. Inspection, maintenance or repair without refuelling				107		
E. Testing of plant systems or components				3		
H. Nuclear regulatory requirements					3	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					9	
Subtotal	0	1646	0	1141	614	0
Total		1646			1755	

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

System	2003 Hours Lost	1989 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		3
13. Reactor Auxiliary Systems		14
14. Safety Systems		269
15. Reactor Cooling Systems		1
16. Steam generation systems		21
17. Safety I&C Systems (excluding reactor I&C)		9
31. Turbine and auxiliaries	1646	30
32. Feedwater and Main Steam System		65
33. Circulating Water System		2
35. All other I&C Systems		12
41. Main Generator Systems		59
42. Electrical Power Supply Systems		60
Total	1646	545

# US-335 ST. LUCIE-1

**Operator:** FPL (FLORIDA POWER & LIGHT CO.)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 839.0 MW(e)  
**Design Net Capacity:** 830.0 MW(e)  
**Design Discharge Burnup:** 30000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7504.8 GW(e).h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 102.1%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 0 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	640.7	578.9	638.8	616.8	638.1	614.7	637.6	638.1	612.0	633.5	615.4	640.0	7504.8
<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>	102.6	102.7	102.3	102.2	102.2	101.8	102.2	102.2	101.3	101.4	101.9	102.5	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	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jul 1970      **Lifetime Generation:** 157425.4 GW(e).h  
**Date of First Criticality:** 22 Apr 1976      **Cumulative Energy Availability Factor:** 80.6%  
**Date of Grid Connection:** 07 May 1976      **Cumulative Load Factor:** 80.6%  
**Date of Commercial Operation:** 21 Dec 1976      **Cumulative Unit Capability Factor:** 77.2%  
**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 (%)
1982	6784.6	803.0	94.2	77.5	94.1	77.5	96.5	78.3	8227	93.9
1983	1099.5	820.0	15.4	68.3	15.4	68.2	15.3	68.9	1350	15.4
1984	4243.3	822.0	60.8	67.3	58.6	67.0	58.8	67.6	5154	58.7
1985	5868.6	825.0	80.4	68.8	80.4	68.5	81.2	69.2	7067	80.7
1986	7052.0	829.0	95.7	71.6	95.7	71.4	97.1	72.1	8351	95.3
1987	5719.2	839.0	77.8	72.2	77.8	72.0	77.8	72.6	6812	77.8
1988	6256.0	839.0	84.4	73.2	84.4	73.0	84.9	73.7	7407	84.3
1989	6947.3	839.0	94.3	74.9	94.3	74.7	94.5	75.3	8257	94.3
1990	4503.5	839.0	64.3	74.1	64.3	74.0	61.3	74.3	5463	62.4
1991	5793.3	839.0	81.0	74.6	80.9	74.4	78.8	74.6	7089	80.9
1992	7142.2	839.0	96.5	76.0	96.5	75.9	96.9	76.1	8479	96.5
1993	5440.5	839.0	76.6	76.0	76.2	75.9	74.0	75.9	6678	76.2
1994	6183.6	839.0	86.8	76.7	86.8	76.5	84.1	76.4	7600	86.8
1995	5519.4	839.0	76.2	76.6	76.2	76.5	75.1	76.3	6662	76.1
1996	5222.0	839.0	73.8	76.5	73.8	76.4	70.9	76.1	6472	73.7
1997	5717.7	839.0	78.1	76.6	78.1	76.4	77.8	76.1	6842	78.1
1998	7035.5	839.0	95.8	77.5	95.8	77.3	95.7	77.0	8393	95.8
1999	6532.7	839.0	89.9	78.0	88.5	77.8	88.9	77.6	7752	88.5
2000	7513.7	839.0	100.0	79.0	100.0	78.8	102.0	78.6	8784	100.0
2001	6709.8	839.0	90.4	79.4	90.4	79.3	91.3	79.1	7915	90.4
2002	6919.4	839.0	93.2	80.0	93.2	79.8	94.1	79.7	8163	93.2
2003	7504.8	839.0	100.0	80.7	100.0	80.6	102.1	80.6	8760	100.0



# US-335 ST. LUCIE-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1976 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure				0	422	
B. Refuelling without a maintenance					26	
C. Inspection, maintenance or repair combined with refuelling				1148		
D. Inspection, maintenance or repair without refuelling				94	7	
E. Testing of plant systems or components				4		
H. Nuclear regulatory requirements				7		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				0	10	15
Subtotal	0	0	0	1253	465	15
Total	0			1733		

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

System	2003 Hours Lost	1976 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		33
12. Reactor I&C Systems		9
13. Reactor Auxiliary Systems		17
14. Safety Systems		6
15. Reactor Cooling Systems		125
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		11
32. Feedwater and Main Steam System		16
33. Circulating Water System		3
41. Main Generator Systems		16
42. Electrical Power Supply Systems		26
XX. Miscellaneous Systems		12
Total	0	276

# US-389 ST. LUCIE-2

**Operator:** FPL (FLORIDA POWER & LIGHT CO.)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 839.0 MW(e)  
**Design Net Capacity:** 830.0 MW(e)  
**Design Discharge Burnup:** 30000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5891.3 GW(e).h  
**Energy Availability Factor:** 81.3%  
**Load Factor:** 80.2%  
**Operating Factor:** 81.3%  
**Energy Unavailability Factor:** 18.7%  
**Total Off-line Time:** 1640 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	635.0	572.7	629.1	280.6	0.0	230.9	631.8	632.2	601.9	627.2	610.8	439.0	5891.3
<b>EAF (%)</b>	100.0	100.0	100.0	52.7	0.0	49.8	100.0	100.0	100.0	100.0	100.0	74.3	81.3
<b>UCF (%)</b>	100.0	100.0	100.0	52.7	0.0	49.8	100.0	100.0	100.0	100.0	100.0	74.3	81.3
<b>LF (%)</b>	101.7	101.6	100.8	46.5	0.0	38.2	101.2	101.3	99.6	100.3	101.1	70.3	80.2
<b>OF (%)</b>	100.0	100.0	100.0	52.6	0.0	49.6	100.0	100.0	100.0	100.0	100.0	74.2	81.3
<b>EUf (%)</b>	0.0	0.0	0.0	47.3	100.0	50.2	0.0	0.0	0.0	0.0	0.0	25.7	18.7
<b>PUf (%)</b>	0.0	0.0	0.0	33.4	100.0	27.2	0.0	0.0	0.0	0.0	0.0	0.0	13.5
<b>UCLF (%)</b>	0.0	0.0	0.0	13.9	0.0	23.0	0.0	0.0	0.0	0.0	0.0	25.7	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1976      **Lifetime Generation:** 127290.1 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:** 85.1%  
**Date of Commercial Operation:** 08 Aug 1983      **Cumulative Unit Capability Factor:** 77.7%  
**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	2575.8	808.0	0.0	0.0	87.9	100.0	38.4	0.0	3598	43.3
1984	5564.8	786.0	82.8	82.8	79.5	79.5	80.6	80.6	7067	80.5
1985	6108.6	824.0	83.9	83.4	83.9	81.7	84.6	82.7	7368	84.1
1986	6151.2	837.0	82.8	83.2	82.8	82.1	83.9	83.1	7253	82.8
1987	5950.2	839.0	82.3	83.0	82.3	82.1	81.0	82.5	7206	82.3
1988	7407.1	839.0	100.0	86.4	100.0	85.8	100.5	86.2	8784	100.0
1989	5443.4	839.0	74.6	84.4	74.6	83.9	74.1	84.2	6531	74.6
1990	5341.5	839.0	74.1	82.9	74.1	82.5	72.7	82.5	6487	74.1
1991	7428.7	839.0	100.0	85.1	100.0	84.7	101.1	84.8	8760	100.0
1992	5431.2	839.0	75.2	84.0	75.1	83.6	73.7	83.6	6598	75.1
1993	4719.9	839.0	76.4	83.2	76.4	82.9	64.2	81.6	6687	76.3
1994	5607.4	839.0	79.6	82.9	79.6	82.6	76.3	81.1	6971	79.6
1995	5295.9	839.0	75.0	82.2	75.0	82.0	72.1	80.4	6570	75.0
1996	6984.8	839.0	96.2	83.3	96.2	83.1	94.8	81.5	8444	96.1
1997	6498.9	839.0	88.5	83.7	88.6	83.5	88.4	82.0	7756	88.5
1998	6739.5	839.0	91.5	84.2	91.4	84.0	91.7	82.6	8009	91.4
1999	7213.0	839.0	98.0	85.1	98.0	84.9	98.1	83.6	8583	98.0
2000	6804.3	839.0	91.6	85.5	91.6	85.3	92.3	84.1	8041	91.5
2001	6707.5	839.0	91.1	85.8	91.1	85.6	91.3	84.5	7979	91.1
2002	7425.0	839.0	99.8	86.5	99.8	86.3	101.0	85.4	8742	99.8
2003	5891.3	839.0	81.3	86.3	81.3	86.1	80.2	85.1	7120	81.3

## US-389 ST. LUCIE-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
01 Apr	100.2	84.0	UF5	A32	UNIT 2 MANUAL REACTOR AND TURBINE TRIP DUE TO HIGH BACKPRESSURE FROM LEAK ON INTERCONDENSER EJECTOR PIPING.
21 Apr	1180.9	990.8	PF	C21	UNIT 2 OFFLINE FOR MAINTENANCE AND REFUELING.
11 Jun	165.5	138.9	UF4	A32	UNIT 2 EXPERIENCED REACTOR AND TURBINE AUTOMATIC TRIP DUE TO HIGH STEAM GENERATOR LEVEL CAUSED BY A FEEDWATER VALVE PROBLEM. (LER 3892003003)
04 Dec	34.7	29.1	UF5	A32	REACTOR AND TURBINE WERE MANUALLY TRIPPED BY OPERATORS FOLLOWING PROBLEMS WITH 2C CONDENSATE PUMP.
20 Dec	105.8	88.7	UF4	A41	AUTOMATIC TRIP FOLLOWING LOSS OF GENERATOR EXCITATION.
26 Dec	50.9	42.7	UF	A41	UNIT 2 REMOVED FROM SERVICE TO CONDUCT ADDITIONAL TROUBLESHOOTING OF THE MAIN GENERATOR EXCITATION SWITCHGEAR.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		456			294	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	1180			723		
D. Inspection, maintenance or repair without refuelling				37	20	
E. Testing of plant systems or components				3	0	
H. Nuclear regulatory requirements				0		1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				0	28	11
Subtotal	1180	456	0	763	346	12
Total		1636			1121	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		36
14. Safety Systems		17
15. Reactor Cooling Systems		140
17. Safety I&C Systems (excluding reactor I&C)		4
31. Turbine and auxiliaries		48
32. Feedwater and Main Steam System	300	31
33. Circulating Water System		0
41. Main Generator Systems	156	12
42. Electrical Power Supply Systems		3
Total	456	291

# US-280 SURRY-1

**Operator:** DOMIN (DOMINION VIRGINIA POWER)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 810.0 MW(e)  
**Design Net Capacity:** 788.0 MW(e)  
**Design Discharge Burnup:** 31500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5419.8 GW(e).h  
**Energy Availability Factor:** 77.0%  
**Load Factor:** 76.4%  
**Operating Factor:** 77.0%  
**Energy Unavailability Factor:** 23.0%  
**Total Off-line Time:** 2019 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	296.0	551.8	611.7	371.6	0.0	247.6	607.5	604.8	498.1	432.5	584.3	613.8	5419.8
<b>EAF (%)</b>	53.8	100.0	100.0	63.3	0.0	46.2	100.0	100.0	90.3	72.1	100.0	100.0	77.0
<b>UCF (%)</b>	53.8	100.0	100.0	63.3	0.0	46.2	100.0	100.0	90.3	72.1	100.0	100.0	77.0
<b>LF (%)</b>	49.1	101.4	101.5	63.8	0.0	42.5	100.8	100.4	85.4	71.7	100.2	101.8	76.4
<b>OF (%)</b>	53.8	100.0	100.0	63.3	0.0	46.0	100.0	100.0	90.3	72.1	100.0	100.0	77.0
<b>EUf (%)</b>	46.2	0.0	0.0	36.7	100.0	53.8	0.0	0.0	9.7	27.9	0.0	0.0	23.0
<b>PUf (%)</b>	0.0	0.0	0.0	36.7	100.0	48.6	0.0	0.0	0.0	27.9	0.0	0.0	17.9
<b>UCLF (%)</b>	46.2	0.0	0.0	0.0	0.0	5.2	0.0	0.0	9.7	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 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:** 149375.2 GW(e).h  
**Cumulative Energy Availability Factor:** 71.6%  
**Cumulative Load Factor:** 69.7%  
**Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	5483.1	775.0	89.2	58.3	89.2	58.0	80.8	54.7	7776	88.8
1983	3517.1	775.0	56.4	58.2	56.3	57.9	51.8	54.4	5010	57.2
1984	3334.1	775.0	58.1	58.2	58.1	57.9	49.0	53.9	5138	58.5
1985	5618.3	779.0	89.3	60.6	89.3	60.3	82.3	56.1	7827	89.3
1986	4488.6	781.0	68.1	61.1	68.1	60.9	65.6	56.8	6013	68.6
1987	4633.4	781.0	70.1	61.7	70.1	61.5	67.7	57.5	6113	69.8
1988	2685.0	781.0	18.7	59.0	18.7	58.8	39.1	56.4	3632	41.3
1989	3170.5	781.0	46.8	58.3	46.8	58.1	46.3	55.8	4217	48.1
1990	4772.2	781.0	74.9	59.2	74.9	59.0	69.8	56.6	6655	76.0
1991	6590.9	781.0	100.0	61.4	96.3	61.2	96.3	58.7	8760	100.0
1992	5223.8	781.0	79.6	62.3	79.6	62.1	76.1	59.5	7033	80.1
1993	6229.2	781.0	95.9	63.9	95.9	63.7	91.1	61.0	8402	95.9
1994	4881.9	781.0	74.3	64.3	74.3	64.2	71.4	61.5	6560	74.9
1995	5747.0	784.0	85.4	65.3	85.4	65.1	83.7	62.5	7505	85.7
1996	7137.8	801.0	100.0	66.8	100.0	66.6	101.4	64.1	8784	100.0
1997	5640.5	801.0	80.7	67.3	80.7	67.2	80.4	64.8	7067	80.7
1998	5752.4	801.0	81.9	67.9	81.9	67.8	82.0	65.5	7170	81.8
1999	7116.2	801.0	100.0	69.1	100.0	69.0	101.4	66.8	8760	100.0
2000	6548.4	801.0	93.2	70.0	93.2	69.9	93.1	67.8	8188	93.2
2001	5941.6	810.0	84.3	70.5	84.3	70.4	83.7	68.4	7380	84.2
2002	7149.5	810.0	100.0	71.5	100.0	71.4	100.8	69.5	8760	100.0
2003	5419.8	810.0	77.0	71.7	77.0	71.6	76.4	69.7	6741	77.0

# US-280 SURRY-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
14 Jan	268.7	217.6	UF5	A15	REACTOR MANUALLY TRIPPED DUE TO C REACTOR COOLANT PUMP MOTOR BEARING FAILURE.
25 Jan	75.0	60.8	UF4	A14	DURING STARTUP REACTOR TRIPPED ON LOW SG LEVEL, CAUSE DUE TO LEVEL CONTROL ASSOCIATED WITH THE FEEDWATER CONTROL VALVES.
20 Apr	1358.4	1100.3	PF	C21	UNIT OFFLINE FOR REFUELING OUTAGE/REACTOR VESSEL HEAD REPLACEMENT.
15 Jun	37.7	30.5	UF5	A13	DURING STARTUP, UNIT WAS MANUALLY TRIPPED FROM CRITICAL DURING PHYSICS TESTING DUE TO MISALIGNED CONTROL ROD.
18 Sep	69.8	56.5	UF2	A42	UNIT 1 FORCED OFFLINE DUE TO LOSS OF POWER TO ALL CW PUMPS DURING HURRICANE ISABEL.
12 Oct	207.9	168.4	PF	D42	UNIT 1 SHUTDOWN FOR A MAIN TRANSFORMER REPAIRS.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1972 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		451			628	
B. Refuelling without a maintenance					22	
C. Inspection, maintenance or repair combined with refuelling	1358			864		
D. Inspection, maintenance or repair without refuelling	207			475	1	
E. Testing of plant systems or components				2	0	
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling				1		
H. Nuclear regulatory requirements					66	169
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				1	142	0
Subtotal	1565	451	0	1343	859	169
Total		2016			2371	

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

System	2003 Hours Lost	1972 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		33
13. Reactor Auxiliary Systems	37	6
14. Safety Systems	75	3
15. Reactor Cooling Systems	268	215
16. Steam generation systems		67
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		24
32. Feedwater and Main Steam System		104
41. Main Generator Systems		9
42. Electrical Power Supply Systems	69	99
XX. Miscellaneous Systems		6
Total	449	568

# US-281 SURRY-2

**Operator:** DOMIN (DOMINION VIRGINIA POWER)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 815.0 MW(e)  
**Design Net Capacity:** 788.0 MW(e)  
**Design Discharge Burnup:** 31500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5612.1 GW(e).h  
**Energy Availability Factor:** 78.3%  
**Load Factor:** 78.6%  
**Operating Factor:** 78.3%  
**Energy Unavailability Factor:** 21.7%  
**Total Off-line Time:** 1899 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	536.1	553.9	613.9	593.2	613.9	591.1	607.2	606.5	347.5	0.0	0.0	548.8	5612.1
<b>EAF (%)</b>	88.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	59.0	0.0	0.0	93.3	78.3
<b>UCF (%)</b>	88.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	59.0	0.0	0.0	93.3	78.3
<b>LF (%)</b>	88.4	101.1	101.2	101.2	101.2	100.7	100.1	100.0	59.2	0.0	0.0	90.5	78.6
<b>OF (%)</b>	88.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	59.0	0.0	0.0	93.1	78.3
<b>EUF (%)</b>	11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.0	100.0	100.0	6.7	21.7
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	100.0	100.0	6.7	20.0
<b>UCLF (%)</b>	11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1968      **Lifetime Generation:** 148433.6 GW(e).h  
**Date of First Criticality:** 07 Mar 1973      **Cumulative Energy Availability Factor:** 72.2%  
**Date of Grid Connection:** 10 Mar 1973      **Cumulative Load Factor:** 70.1%  
**Date of Commercial Operation:** 01 May 1973      **Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	5492.2	775.0	88.7	58.5	88.7	58.1	80.9	55.9	7729	88.2
1983	4086.1	775.0	65.0	59.1	65.0	58.8	60.2	56.3	5729	65.4
1984	5209.4	775.0	83.3	61.3	83.3	61.0	76.5	58.2	7327	83.4
1985	4072.4	775.0	65.8	61.7	65.8	61.4	60.0	58.3	5857	66.9
1986	4498.9	780.0	68.7	62.2	68.7	62.0	65.8	58.9	6072	69.3
1987	4791.0	781.0	73.6	63.0	73.6	62.8	70.0	59.7	6456	73.7
1988	3570.9	781.0	56.5	62.6	56.6	62.4	52.1	59.2	4993	56.8
1989	893.6	781.0	13.3	59.5	13.3	59.3	13.1	56.3	1355	15.5
1990	5837.8	781.0	84.8	61.0	84.8	60.8	85.3	58.0	7919	90.4
1991	3985.2	781.0	66.5	61.3	66.6	61.2	58.3	58.0	5886	67.2
1992	6426.5	781.0	96.3	63.2	96.3	63.0	93.7	59.9	8470	96.4
1993	4541.7	781.0	71.0	63.5	71.0	63.4	66.4	60.2	6283	71.7
1994	6261.0	781.0	94.0	65.0	94.1	64.9	91.5	61.7	8251	94.2
1995	5517.4	787.0	80.7	65.7	80.6	65.6	80.0	62.6	7087	80.9
1996	6081.5	801.0	85.9	66.6	85.9	66.5	86.4	63.6	7539	85.8
1997	6451.3	801.0	91.8	67.7	91.7	67.6	91.9	64.8	8034	91.7
1998	7178.9	801.0	100.0	69.0	100.0	68.9	102.3	66.4	8760	100.0
1999	5874.8	801.0	85.6	69.7	85.6	69.6	83.7	67.1	7493	85.5
2000	6539.4	801.0	91.3	70.5	91.3	70.4	92.9	68.0	8022	91.3
2001	6720.7	815.0	93.7	71.3	93.7	71.3	94.1	69.0	8203	93.6
2002	6523.7	815.0	91.0	72.0	91.0	72.0	91.4	69.8	7966	90.9
2003	5612.1	815.0	78.3	72.3	78.3	72.2	78.6	70.1	6861	78.3

## US-281 SURRY-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
25 Jan	87.7	71.5	UF4	A41	REACTOR TRIPPED DUE TO GENERATOR DIFFERENTIAL LOCKOUT.
18 Sep	55.5	45.2	UF2	A42	UNIT 2 FORCED OFFLINE DUE TO LOSS OF POWER TO ALL CW PUMPS DURING HURRICANE ISABEL.
21 Sep	1754.8	1430.1	PF	C21	REFUELING OUTAGE/REACTOR VESSEL HEAD REPLACEMENT.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1973 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		143			623	
B. Refuelling without a maintenance					22	
C. Inspection, maintenance or repair combined with refuelling	1754			1328	0	
D. Inspection, maintenance or repair without refuelling				274		
E. Testing of plant systems or components				0		
F. TMajor back-fitting, refurbishment or upgrading activities with refuelling				1		
H. Nuclear regulatory requirements					21	7
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				6	0	
Subtotal	1754	143	0	1609	666	7
Total		1897			2282	

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

System	2003 Hours Lost	1973 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		29
13. Reactor Auxiliary Systems		5
14. Safety Systems		80
15. Reactor Cooling Systems		16
16. Steam generation systems		159
31. Turbine and auxiliaries		133
32. Feedwater and Main Steam System		143
35. All other I&C Systems		2
41. Main Generator Systems	87	3
42. Electrical Power Supply Systems	55	22
XX. Miscellaneous Systems		4
Total	142	596

# US-387 SUSQUEHANNA-1

**Operator:** PP&L (PENNSYLVANIA POWER & LIGHT CO.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1105.0 MW(e)  
**Design Net Capacity:** 1065.0 MW(e)  
**Design Discharge Burnup:** 30000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9359.9 GW(e).h  
**Energy Availability Factor:** 98.0%  
**Load Factor:** 96.7%  
**Operating Factor:** 98.0%  
**Energy Unavailability Factor:** 2.0%  
**Total Off-line Time:** 175 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	819.1	738.2	827.9	800.6	792.5	758.8	811.7	804.4	571.9	810.7	796.4	827.7	9359.9
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	98.0	100.0	100.0	100.0	78.2	100.0	100.0	100.0	98.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	98.0	100.0	100.0	100.0	78.2	100.0	100.0	100.0	98.0
<b>LF (%)</b>	99.6	99.4	100.7	100.8	96.4	95.4	98.7	97.8	71.9	98.5	100.1	100.7	96.7
<b>OF (%)</b>	100.0	100.0	100.0	100.0	97.8	100.0	100.0	100.0	77.9	100.0	100.0	100.0	98.0
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	21.8	0.0	0.0	0.0	2.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	2.0	0.0	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	21.8	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	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1973      **Lifetime Generation:** 154067.9 GW(e).h  
**Date of First Criticality:** 10 Sep 1982      **Cumulative Energy Availability Factor:** 82.0%  
**Date of Grid Connection:** 16 Nov 1982      **Cumulative Load Factor:** 80.3%  
**Date of Commercial Operation:** 08 Jun 1983      **Cumulative Unit Capability Factor:** 77.7%  
**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 (%)
1982	321.3	1076.0	0.0	0.0	3.2	100.0	3.6	0.0	852	10.2
1983	4472.8	1034.0	0.0	0.0	55.6	100.0	50.3	0.0	4891	56.9
1984	6088.1	1032.0	74.5	74.5	72.0	72.0	67.2	67.2	6377	72.6
1985	5286.4	1032.0	60.4	67.4	60.4	66.2	58.5	62.8	5469	62.4
1986	5839.2	1032.0	66.8	67.2	66.8	66.4	64.6	63.4	5992	68.4
1987	6132.9	1032.0	70.7	68.1	70.7	67.5	67.8	64.5	6331	72.3
1988	8410.1	1032.0	93.1	73.1	93.1	72.6	92.8	70.2	8206	93.4
1989	6483.9	1032.0	72.2	72.9	72.1	72.5	71.7	70.4	6447	73.6
1990	6446.7	1033.0	73.1	73.0	73.1	72.6	71.2	70.6	6528	74.5
1991	8821.6	1035.0	98.0	76.1	98.0	75.8	97.3	73.9	8596	98.1
1992	6400.3	1040.0	73.6	75.8	73.6	75.6	70.1	73.5	6568	74.8
1993	5232.4	1040.0	57.5	74.0	57.5	73.7	57.4	71.9	5205	59.4
1994	8414.5	1040.0	94.2	75.8	94.2	75.6	92.4	73.7	8249	94.2
1995	7432.3	1073.0	81.1	76.3	81.1	76.1	79.1	74.2	7126	81.3
1996	7752.9	1090.0	84.7	77.0	84.7	76.8	81.0	74.7	7434	84.6
1997	9085.3	1090.0	94.5	78.3	94.5	78.1	95.2	76.3	8274	94.5
1998	7652.8	1090.0	81.5	78.5	81.5	78.3	80.1	76.5	7015	80.1
1999	8814.5	1090.0	94.0	79.5	94.0	79.3	92.3	77.5	8234	94.0
2000	8180.6	1090.0	86.5	79.9	86.5	79.8	85.4	78.0	7598	86.5
2001	9413.0	1090.0	99.5	81.0	99.5	80.9	98.6	79.2	8718	99.5
2002	8026.6	1098.0	85.7	81.3	85.7	81.2	83.4	79.4	7493	85.5
2003	9359.9	1105.0	98.0	82.2	98.0	82.0	96.7	80.3	8585	98.0



# US-387 SUSQUEHANNA-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
03 May	15.3	16.6	PF	D42	TURBINE/GENERATOR TAKEN OFFLINE TO PERFORM PLANNED MAINTENANCE ON THE MAIN TRANSFORMER.
24 Sep	159.0	173.3	UF4	A14	UNPLANNED AUTOMATIC SCRAM DUE TO LOW REACTOR WATER LEVEL FOLLOWING AN INADVERTENT FEEDPUMP TRIP DURING FEEDPUMP TESTING.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		159			295	
B. Refuelling without a maintenance					30	
C. Inspection, maintenance or repair combined with refuelling				945		
D. Inspection, maintenance or repair without refuelling	15			73	21	
E. Testing of plant systems or component				76		
H. Nuclear regulatory requirement						35
J. Grid failure or grid unavailability						9
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				92	48	
Subtotal	15	159	0	1186	394	44
Total		174			1624	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		12
13. Reactor Auxiliary System:		1
14. Safety Systems	159	14
15. Reactor Cooling System:		46
17. Safety I&C Systems (excluding reactor I&C)		11
31. Turbine and auxiliaries:		100
32. Feedwater and Main Steam System		19
33. Circulating Water System		0
35. All other I&C Systems		4
41. Main Generator System:		15
42. Electrical Power Supply System:		25
XX. Miscellaneous Systems		34
Total	159	281

# US-388 SUSQUEHANNA-2

**Operator:** PP&L (PENNSYLVANIA POWER & LIGHT CO.)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 1111.0 MW(e)  
**Design Net Capacity:** 1065.0 MW(e)  
**Design Discharge Burnup:** 30000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8654.7 GW(e).h  
**Energy Availability Factor:** 88.1%  
**Load Factor:** 87.3%  
**Operating Factor:** 87.9%  
**Energy Unavailability Factor:** 11.9%  
**Total Off-line Time:** 1059 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	833.6	688.2	151.2	224.8	861.0	821.3	844.7	843.1	818.7	861.2	833.2	873.5	8654.7
<b>EAF (%)</b>	100.0	100.0	22.6	33.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.1
<b>UCF (%)</b>	100.0	100.0	22.6	33.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.2
<b>LF (%)</b>	100.8	92.2	18.3	28.1	100.4	98.9	99.6	99.4	99.7	101.4	101.5	103.0	87.3
<b>OF (%)</b>	100.0	100.0	22.6	32.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	87.9
<b>EUf (%)</b>	0.0	0.0	77.4	67.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.9
<b>PUF (%)</b>	0.0	0.0	77.4	67.0	0.0	0.0	0.0	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	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1973  
**Date of First Criticality:** 08 May 1984  
**Date of Grid Connection:** 03 Jul 1984  
**Date of Commercial Operation:** 12 Feb 1985

**Lifetime Generation:** 150143.3 GW(e).h  
**Cumulative Energy Availability Factor:** 85.4%  
**Cumulative Load Factor:** 83.9%  
**Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1984	932.0	1079.0	0.0	0.0	71.3	100.0	9.9	0.0	1767	20.3
1985	7323.3	1034.0	0.0	0.0	90.8	100.0	83.4	0.0	7463	87.8
1986	5458.4	1032.0	63.5	63.5	63.5	63.5	60.4	60.4	5730	65.4
1987	8598.4	1032.0	96.0	79.8	96.0	79.8	95.1	77.7	8431	96.2
1988	5915.2	1034.0	66.3	75.3	66.3	75.3	65.1	73.5	5985	68.1
1989	6777.0	1038.0	76.9	75.7	76.9	75.7	74.5	73.8	6745	77.0
1990	8290.7	1038.0	94.4	79.4	94.4	79.4	91.2	77.3	8143	93.0
1991	7041.4	1041.0	78.4	79.3	78.4	79.3	77.2	77.3	6955	79.4
1992	7186.2	1044.0	80.2	79.4	80.2	79.4	78.4	77.4	7119	81.0
1993	8337.9	1044.0	92.3	81.0	92.3	81.0	91.2	79.1	8094	92.4
1994	6909.8	1073.0	74.7	80.3	74.7	80.3	73.5	78.5	6577	75.1
1995	8192.7	1094.0	87.8	81.1	87.8	81.1	85.5	79.2	7691	87.8
1996	9127.2	1094.0	95.0	82.4	95.0	82.4	95.0	80.7	8346	95.0
1997	7732.6	1094.0	82.4	82.4	82.4	82.4	80.7	80.7	7211	82.3
1998	8820.8	1094.0	93.3	83.3	93.3	83.3	92.0	81.6	8172	93.3
1999	7794.7	1094.0	83.0	83.2	83.0	83.2	81.3	81.6	7268	83.0
2000	9347.2	1094.0	97.8	84.2	97.8	84.2	97.3	82.7	8587	97.8
2001	8397.1	1102.0	87.9	84.5	87.9	84.5	87.0	83.0	7693	87.8
2002	9306.2	1111.0	96.3	85.2	96.4	85.2	95.6	83.7	8439	96.3
2003	8654.7	1132.0	88.2	85.4	88.1	85.4	87.3	83.9	7701	87.9

## US-388 SUSQUEHANNA-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
08 Mar	1058.1	1175.5	PF	C21	REFUELING OUTAGE.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1984 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					300	
B. Refuelling without a maintenance					7	
C. Inspection, maintenance or repair combined with refuelling	1058			798		
D. Inspection, maintenance or repair without refuelling				27	1	
E. Testing of plant systems or components				96		
J. Grid failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					13	
Subtotal	1058	0	0	921	321	1
Total		1058			1243	

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

System	2003 Hours Lost	1984 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		24
12. Reactor I&C Systems		10
13. Reactor Auxiliary Systems		8
14. Safety Systems		6
15. Reactor Cooling Systems		22
31. Turbine and auxiliaries		27
32. Feedwater and Main Steam System		35
41. Main Generator Systems		32
42. Electrical Power Supply Systems		60
XX. Miscellaneous Systems		46
Total	0	270

# US-289 THREE MILE ISLAND-1

**Operator:** AMERGEN (AMERGEN ENERGY Co.)  
**Contractor:** B&W (BABCOCK & WILCOX CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 802.0 MW(e)  
**Design Net Capacity:** 819.0 MW(e)  
**Design Discharge Burnup:** 14400 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 6205.1 GW(e).h  
**Energy Availability Factor:** 86.7%  
**Load Factor:** 88.3%  
**Operating Factor:** 86.8%  
**Energy Unavailability Factor:** 13.3%  
**Total Off-line Time:** 1158 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	632.0	572.5	632.0	605.6	624.7	597.9	610.2	609.6	592.3	309.5	0.0	418.8	6205.1
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	54.1	0.0	86.1	86.7
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	54.1	0.0	86.2	86.7
<b>LF (%)</b>	105.9	106.2	105.9	105.0	104.7	103.5	102.3	102.2	102.6	51.8	0.0	70.2	88.3
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	54.8	0.0	86.4	86.8
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.9	100.0	13.9	13.3
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.9	100.0	13.0	13.2
<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	0.9	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 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:** 137071.6 GW(e).h  
**Cumulative Energy Availability Factor:** 67.8%  
**Cumulative Load Factor:** 67.3%  
**Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	0.0	776.0	100.0	77.0	0.0	39.8	0.0	39.9	0	0.0
1983	0.0	776.0	100.0	79.5	0.0	35.4	0.0	35.5	0	0.0
1984	0.0	776.0	100.0	81.5	0.0	31.9	0.0	32.0	0	0.0
1985	811.7	776.0	37.8	77.6	37.8	32.4	11.9	30.2	1853	21.2
1986	4818.3	776.0	70.8	77.0	70.8	35.6	70.9	33.5	6209	70.9
1987	5034.3	776.0	72.5	76.7	72.5	38.4	74.1	36.6	6351	72.5
1988	5465.4	784.0	76.0	76.6	76.0	41.1	79.4	39.7	6679	76.0
1989	7216.8	808.0	99.5	78.2	99.5	45.1	102.0	44.0	8714	99.5
1990	5316.2	808.0	81.8	78.4	81.8	47.5	75.1	46.0	7123	81.3
1991	5671.2	808.0	86.4	78.9	86.4	49.9	80.1	48.1	7536	86.0
1992	6936.5	789.0	99.5	80.1	99.5	52.6	100.1	51.0	8743	99.5
1993	5962.2	786.0	88.0	80.5	88.0	54.5	86.6	52.8	7702	87.9
1994	6590.9	786.0	95.3	81.2	95.3	56.5	95.7	55.0	8349	95.3
1995	6388.0	786.0	90.5	81.7	90.5	58.2	92.8	56.8	7926	90.5
1996	7100.3	786.0	100.0	82.5	100.0	60.1	102.8	58.9	8784	100.0
1997	5918.8	786.0	87.3	82.7	87.3	61.2	86.0	60.1	7633	87.1
1998	7059.2	786.0	100.0	83.4	100.0	62.9	102.5	61.8	8760	100.0
1999	6328.4	786.0	89.4	83.7	89.4	63.9	91.9	63.0	7827	89.3
2000	7144.9	786.0	100.0	84.3	100.0	65.3	103.5	64.6	8784	100.0
2001	5416.7	786.0	80.3	84.2	80.3	65.9	78.7	65.1	7034	80.3
2002	7313.5	798.0	100.0	84.7	100.0	67.1	104.6	66.5	8760	100.0
2003	6205.1	802.0	86.7	84.8	86.7	67.8	88.3	67.3	7602	86.8

# US-289 THREE MILE ISLAND-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
18 Oct	1151.5	939.6	PF	C21	REFUELING OUTAGE. MAIN GENERATOR WAS SYNCHRONIZED TO THE GRID FOLLOWING REFUELING OUTAGE T1R15, ON 12/04/03 AT 22:40. BOTH OUTPUT BREAKERS WERE OPENED AT 22:47 ON 12/04/03, BASED ON MAIN TURBINE BEARING HIGH VIBRATIONS.
04 Dec	6.3	5.1	UF2	A41	

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1974 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		6			140	
B. Refuelling without a maintenance					10	
C. Inspection, maintenance or repair combined with refuelling	1151			609		
D. Inspection, maintenance or repair without refuelling				76	1	
E. Testing of plant systems or components				11	0	
H. Nuclear regulatory requirements					225	1974
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					1	
Subtotal	1151	6	0	696	377	1974
Total		1157			3047	

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

System	2003 Hours Lost	1974 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		28
13. Reactor Auxiliary Systems		11
15. Reactor Cooling Systems		35
16. Steam generation systems		7
31. Turbine and auxiliaries		28
32. Feedwater and Main Steam System		7
35. All other I&C Systems		0
41. Main Generator Systems	6	8
42. Electrical Power Supply Systems		4
XX. Miscellaneous Systems		0
Total	6	128

# US-250 TURKEY POINT-3

**Operator:** FPL (FLORIDA POWER & LIGHT CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 693.0 MW(e)  
**Design Net Capacity:** 693.0 MW(e)  
**Design Discharge Burnup:** 24500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5445.6 GW(e).h  
**Energy Availability Factor:** 90.6%  
**Load Factor:** 89.7%  
**Operating Factor:** 90.5%  
**Energy Unavailability Factor:** 9.4%  
**Total Off-line Time:** 830 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	493.5	393.0	28.1	478.8	480.6	506.5	520.2	508.3	504.9	529.1	518.6	484.0	5445.6
<b>EAF (%)</b>	93.8	100.0	10.4	90.0	96.9	100.0	100.0	100.0	100.0	100.0	100.0	97.4	90.6
<b>UCF (%)</b>	93.8	100.0	10.4	90.0	96.9	100.0	100.0	100.0	100.0	100.0	100.0	97.4	90.6
<b>LF (%)</b>	95.7	84.4	5.5	96.1	93.2	101.5	100.9	98.6	101.2	102.5	103.9	93.9	89.7
<b>OF (%)</b>	93.8	100.0	10.3	92.9	93.8	100.0	100.0	100.0	100.0	100.0	100.0	97.3	90.5
<b>EUf (%)</b>	6.2	0.0	89.6	10.0	3.1	0.0	0.0	0.0	0.0	0.0	0.0	2.6	9.4
<b>PUf (%)</b>	0.0	0.0	89.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6
<b>UCLF (%)</b>	6.2	0.0	0.0	10.0	3.1	0.0	0.0	0.0	0.0	0.0	0.0	2.6	1.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1967      **Lifetime Generation:** 131087.0 GW(e).h  
**Date of First Criticality:** 20 Oct 1972      **Cumulative Energy Availability Factor:** 71.2%  
**Date of Grid Connection:** 02 Nov 1972      **Cumulative Load Factor:** 70.0%  
**Date of Commercial Operation:** 14 Dec 1972      **Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 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 (%)
1982	3771.4	646.0	64.3	70.9	64.2	56.8	66.6	57.2	5612	64.1
1983	4331.0	659.0	73.3	71.2	73.3	58.3	75.0	58.8	6415	73.2
1984	4784.2	666.0	82.6	72.1	82.6	60.3	81.8	60.7	7253	82.6
1985	3421.0	666.0	61.0	71.3	59.7	60.3	58.6	60.6	5224	59.6
1986	4513.1	666.0	77.9	71.7	77.9	61.6	77.4	61.8	6816	77.8
1987	885.3	666.0	17.9	68.1	17.9	58.6	15.2	58.6	1566	17.9
1988	3468.0	666.0	60.6	67.7	60.6	58.8	59.3	58.7	5320	60.6
1989	3605.1	666.0	65.1	67.5	65.1	59.1	61.8	58.9	5696	65.0
1990	3388.4	666.0	59.4	67.0	59.4	59.1	58.1	58.8	5200	59.4
1991	1332.0	666.0	50.0	66.1	50.0	58.7	22.8	56.9	2155	24.6
1992	3428.2	666.0	67.2	66.2	67.2	59.1	58.6	57.0	5896	67.1
1993	5657.3	666.0	96.1	67.6	96.1	60.9	97.0	58.9	8421	96.1
1994	4924.9	666.0	85.8	68.5	85.8	62.0	84.4	60.1	7513	85.8
1995	5219.0	666.0	89.6	69.4	89.6	63.2	89.5	61.4	7846	89.6
1996	5750.8	673.0	96.7	70.5	96.7	64.6	97.3	62.9	8490	96.7
1997	5252.4	693.0	87.0	71.2	87.0	65.5	86.5	63.9	7570	86.4
1998	5408.3	693.0	89.8	72.0	89.0	66.5	89.1	64.9	7757	88.6
1999	6112.3	693.0	99.1	73.0	99.1	67.7	100.7	66.3	8684	99.1
2000	5684.4	693.0	92.5	73.7	92.5	68.7	93.4	67.3	8122	92.5
2001	5526.0	693.0	90.5	74.3	90.5	69.4	91.0	68.1	7923	90.4
2002	6215.4	693.0	100.0	75.2	100.0	70.5	102.4	69.3	8760	100.0
2003	5445.6	693.0	90.6	75.7	90.6	71.2	89.7	70.0	7930	90.5

## US-250 TURKEY POINT-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
27 Jan	45.9	31.8	UF5	A16	MANUAL TRIP DUE TO LOW STEAM GENERATOR LEVEL.
01 Mar	666.5	461.9	PF	C21	REFUELING OUTAGE.
28 Apr	72.8	50.5	UF2	A33	UNIT 3 MANUAL REACTOR SHUTDOWN DUE TO LETDOWN VALVE CV-3-200B OUT OF SERVICE.
20 May	23.3	16.1	UF2	A32	MANUAL REACTOR SHUTDOWN DUE TO SHUTDOWN BANK B NOT ABLE TO MOVE ON DEMAND. SHUTDOWN BANK B WAS REPAIRED AND THE WAS RETURNED TO MODE 1 ON 05/21/03.
06 Dec	19.5	13.5	UF2	A31	TURBINE GOVERNOR FAILURE. THE REACTOR REMAINED CRITICAL WITH THE PLANT OFFLINE.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1972 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		161		0	490	
B. Refuelling without a maintenance					5	
C. Inspection, maintenance or repair combined with refuelling	666			872		
D. Inspection, maintenance or repair without refuelling				365		
E. Testing of plant systems or component				10	2	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				3		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				322	20	7
<b>Subtotal</b>	<b>666</b>	<b>161</b>	<b>0</b>	<b>1572</b>	<b>517</b>	<b>7</b>
<b>Total</b>		<b>827</b>			<b>2096</b>	

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

System	2003 Hours Lost	1972 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		45
13. Reactor Auxiliary System:		64
14. Safety Systems		24
15. Reactor Cooling System:		94
16. Steam generation system:	45	24
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries:	19	42
32. Feedwater and Main Steam System	23	31
33. Circulating Water System	72	
35. All other I&C Systems		2
41. Main Generator System:		80
42. Electrical Power Supply System:		11
XX. Miscellaneous Systems		53
<b>Total</b>	<b>159</b>	<b>471</b>

# US-251 TURKEY POINT-4

**Operator:** FPL (FLORIDA POWER & LIGHT CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 693.0 MW(e)  
**Design Net Capacity:** 693.0 MW(e)  
**Design Discharge Burnup:** 24500 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 5562.5 GW(e).h  
**Energy Availability Factor:** 91.7%  
**Load Factor:** 91.6%  
**Operating Factor:** 91.7%  
**Energy Unavailability Factor:** 8.3%  
**Total Off-line Time:** 727 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	510.9	481.8	527.8	502.7	521.8	502.2	514.4	503.6	492.5	40.0	421.2	543.6	5562.5
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	16.2	85.8	100.0	91.7
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	16.2	85.8	100.0	91.7
<b>LF (%)</b>	99.1	103.5	102.4	100.9	101.2	100.6	99.8	97.7	98.7	7.7	84.4	105.4	91.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	16.1	85.8	100.0	91.7
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	83.8	14.2	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	83.8	14.2	0.0	8.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 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:** 128778.9 GW(e).h  
**Cumulative Energy Availability Factor:** 73.8%  
**Cumulative Load Factor:** 72.2%  
**Cumulative Unit Capability Factor:** 77.1%  
**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 (%)
1982	3847.2	646.0	66.3	71.3	66.3	67.8	68.0	68.0	5806	66.3
1983	2978.9	659.0	52.4	69.5	52.4	66.3	51.6	66.4	4568	52.1
1984	3084.1	666.0	54.4	68.1	54.4	65.2	52.7	65.1	4774	54.3
1985	5177.9	666.0	89.8	69.9	89.7	67.2	88.8	67.1	7852	89.6
1986	1744.0	666.0	31.9	67.0	31.9	64.5	29.9	64.2	2790	31.8
1987	2657.5	666.0	49.3	65.7	49.3	63.4	45.6	62.9	4314	49.2
1988	3267.7	666.0	56.8	65.1	56.8	63.0	55.9	62.4	4986	56.8
1989	2107.6	666.0	42.0	63.7	42.0	61.7	36.1	60.8	3676	42.0
1990	4384.9	666.0	76.4	64.4	76.4	62.5	75.2	61.6	6692	76.4
1991	808.0	666.0	48.2	63.5	48.2	61.8	13.9	59.0	1335	15.2
1992	4642.3	666.0	81.3	64.5	81.3	62.8	79.4	60.1	7139	81.3
1993	4746.3	666.0	83.1	65.4	83.1	63.8	81.4	61.1	7277	83.1
1994	4844.4	666.0	85.0	66.3	85.0	64.8	83.0	62.2	7437	84.9
1995	5780.1	666.0	98.5	67.8	98.5	66.3	99.1	63.8	8629	98.5
1996	5165.4	673.0	88.6	68.7	88.6	67.3	87.4	64.9	7771	88.5
1997	5442.6	693.0	89.6	69.6	89.6	68.3	89.7	65.9	7809	89.1
1998	6181.5	693.0	100.0	70.9	100.0	69.6	101.8	67.4	8760	100.0
1999	5735.3	693.0	93.5	71.8	93.4	70.5	94.5	68.5	8185	93.4
2000	5591.4	693.0	91.4	72.5	91.4	71.3	91.9	69.4	8028	91.4
2001	6105.3	693.0	98.4	73.5	98.4	72.3	100.6	70.6	8623	98.4
2002	5854.1	693.0	95.5	74.3	95.6	73.2	96.4	71.5	8369	95.5
2003	5562.5	693.0	91.7	74.9	91.7	73.8	91.6	72.2	8033	91.7



**US-251 TURKEY POINT-4****6. 2003 Outages**

Date	Hours	GW(e).h	Type	Code	Description
06 Oct	726.8	503.7	PF	C21	REFUELING OUTAGE

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

Outage Cause	2003 Hours Lost			1975 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					418	
B. Refuelling without a maintenanc					14	
C. Inspection, maintenance or repai combined with refuelling	726			1339		
D. Inspection, maintenance or repai without refuelling				143		
E. Testing of plant systems or component				8		
H. Nuclear regulatory requirement				199		
J. Grid failure or grid unavailabilit						0
K. Load-following (frequency contro reserve shutdown due to reduced energ demand)					175	0
Subtotal	726	0	0	1689	607	0
Total		726			2296	

**8. Equipment Related Full Outages, Analysis by System**

System	2003 Hours Lost	1975 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		9
12. Reactor I&C Systems		24
13. Reactor Auxiliary System:		4
14. Safety Systems		5
15. Reactor Cooling System:		120
16. Steam generation system:		123
31. Turbine and auxiliaries:		59
32. Feedwater and Main Steam Syster		20
33. Circulating Water System		4
35. All other I&C Systems:		0
41. Main Generator System:		1
42. Electrical Power Supply System:		42
Total	0	411

# US-271 VERMONT YANKEE

**Operator:** ENTERGY (ENTERGY NUCLEAR)  
**Contractor:** GE (GENERAL ELECTRIC COMPANY (US))

## 1. Station Details

**Type:** BWR  
**Maximum Net Capacity at the beginning of 2003:** 510.0 MW(e)  
**Design Net Capacity:** 514.0 MW(e)  
**Design Discharge Burnup:** 19000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 4444.2 GW(e).h  
**Energy Availability Factor:** 98.3%  
**Load Factor:** 99.5%  
**Operating Factor:** 98.3%  
**Energy Unavailability Factor:** 1.7%  
**Total Off-line Time:** 148 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	394.2	343.5	393.1	380.1	387.3	368.8	370.0	378.0	308.4	353.6	378.1	389.2	4444.2
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.4	91.7	100.0	100.0	98.3
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.4	91.7	100.0	100.0	98.3
<b>LF (%)</b>	103.9	100.2	103.6	103.6	102.1	100.4	97.5	99.6	84.0	93.1	103.0	102.6	99.5
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.1	91.7	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	11.6	8.3	0.0	0.0	1.7
<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	11.6	8.3	0.0	0.0	1.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Dec 1967      **Lifetime Generation:** 110666.9 GW(e).h  
**Date of First Criticality:** 24 Mar 1972      **Cumulative Energy Availability Factor:** 82.4%  
**Date of Grid Connection:** 20 Sep 1972      **Cumulative Load Factor:** 80.3%  
**Date of Commercial Operation:** 30 Nov 1972      **Cumulative Unit Capability Factor:** 77.1%  
**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	4174.3	504.0	96.7	76.5	96.7	76.2	94.5	73.0	8406	96.0
1983	2874.5	504.0	69.8	75.9	69.8	75.6	65.1	72.3	6072	69.3
1984	3335.8	504.0	79.0	76.2	79.0	75.9	75.3	72.5	6933	78.9
1985	2999.4	504.0	71.8	75.8	71.8	75.6	67.9	72.2	6287	71.8
1986	2058.4	504.0	48.9	73.9	48.9	73.6	46.6	70.3	4280	48.9
1987	3536.4	504.0	83.2	74.5	83.2	74.3	80.1	71.0	7288	83.2
1988	4113.8	504.0	94.9	75.8	94.9	75.6	92.9	72.4	8333	94.9
1989	3606.8	504.0	84.4	76.3	84.4	76.1	81.7	72.9	7372	84.2
1990	3616.3	504.0	84.7	76.8	84.7	76.6	81.9	73.4	7392	84.4
1991	4108.3	504.0	95.1	77.7	93.7	77.5	93.1	74.4	8200	93.6
1992	3734.6	504.0	87.6	78.2	87.6	78.0	84.4	74.9	7680	87.4
1993	3372.1	504.0	78.6	78.3	78.6	78.0	76.4	75.0	6860	78.3
1994	4315.6	504.0	98.2	79.2	98.2	78.9	97.7	76.0	8600	98.2
1995	3858.5	507.0	86.6	79.5	86.6	79.3	86.9	76.5	7554	86.2
1996	3798.8	510.0	84.9	79.7	84.9	79.5	84.8	76.9	7422	84.5
1997	4266.9	510.0	95.6	80.4	95.6	80.2	95.5	77.6	8358	95.4
1998	3358.7	510.0	76.6	80.2	76.6	80.0	75.2	77.5	6690	76.4
1999	4059.1	510.0	90.5	80.6	90.5	80.4	90.9	78.0	7936	90.6
2000	4548.1	510.0	99.5	81.3	99.5	81.1	101.5	78.9	8738	99.5
2001	4171.1	510.0	93.1	81.7	93.1	81.5	93.4	79.4	8145	93.0
2002	3962.6	510.0	91.0	82.0	91.0	81.8	88.7	79.7	7966	90.9
2003	4444.2	510.0	98.3	82.5	98.3	82.4	99.5	80.3	8612	98.3

# US-271 VERMONT YANKEE

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
27 Sep	36.4	18.4	UF2	A11	MANUAL SHUTDOWN DUE TO DRYWELL LEAKAGE CAUSED BY THE RV-19 VALVE.
29 Sep	110.7	56.0	UF2	A15	CONTINUATION OF OUTAGE FOR B RECIRCULATION PUMP SEAL REPLACEMENT.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1972 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		147			258	
B. Refuelling without a maintenance					8	
C. Inspection, maintenance or repair combined with refuelling				966		
D. Inspection, maintenance or repair without refuelling				132	0	
E. Testing of plant systems or components				7	13	
H. Nuclear regulatory requirements						6
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)				25		6
Subtotal	0	147	0	1130	279	12
Total		147			1421	

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

System	2003 Hours Lost	1972 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories	36	8
12. Reactor I&C Systems		7
13. Reactor Auxiliary Systems		20
14. Safety Systems		54
15. Reactor Cooling Systems	110	43
31. Turbine and auxiliaries		45
32. Feedwater and Main Steam System		22
42. Electrical Power Supply Systems		53
XX. Miscellaneous Systems		2
Total	146	254

# US-395 VIRGIL C. SUMMER-1

**Operator:** SCEG (SOUTH CAROLINA ELECTRIC & GAS CO.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 966.0 MW(e)  
**Design Net Capacity:** 900.0 MW(e)  
**Design Discharge Burnup:** 36000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 7352.1 GW(e).h  
**Energy Availability Factor:** 86.4%  
**Load Factor:** 86.9%  
**Operating Factor:** 86.3%  
**Energy Unavailability Factor:** 13.6%  
**Total Off-line Time:** 1196 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	730.8	660.0	730.3	705.8	646.4	702.5	724.7	723.0	701.3	223.0	72.6	731.6	7352.1
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	90.0	100.0	100.0	100.0	100.0	32.3	14.5	100.0	86.4
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	90.0	100.0	100.0	100.0	100.0	32.4	14.5	100.0	86.4
<b>LF (%)</b>	101.7	101.7	101.6	101.6	89.9	101.0	100.8	100.6	100.8	31.0	10.4	101.8	86.9
<b>OF (%)</b>	100.0	100.0	100.0	100.0	89.9	100.0	100.0	100.0	100.0	32.2	14.4	100.0	86.3
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	67.7	85.5	0.0	13.6
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	67.7	83.8	0.0	12.6
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Mar 1973      **Lifetime Generation:** 131713.7 GW(e).h  
**Date of First Criticality:** 22 Oct 1982      **Cumulative Energy Availability Factor:** 82.8%  
**Date of Grid Connection:** 16 Nov 1982      **Cumulative Load Factor:** 79.4%  
**Date of Commercial Operation:** 01 Jan 1984      **Cumulative Unit Capability Factor:** 77.7%  
**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 (%)
1982	191.2	887.0	0.0	0.0	2.6	100.0	2.6	0.0	761	9.1
1983	4327.5	900.0	0.0	0.0	74.4	100.0	54.9	0.0	6238	71.2
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	88.3	75.5	7829	89.1
1997	7267.9	948.0	89.9	81.2	89.9	81.1	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

## US-395 VIRGIL C. SUMMER-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
12 May	74.5	72.0	UF2	A41	REPLACED FAULTY CONTACTS IN THE GENERATOR FIELD BREAKER. ALSO MODIFIED CIRCUITRY BY INSTALLING BACKUP CONTACTS.
11 Oct	1107.6	1069.9	PF	C21	COMPLETE REFUELING OUTAGE.
26 Nov	12.9	12.5	UF2	A31	MAIN TURBINE HIGH VIBRATION. REACTOR REMAINED CRITICAL.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1983 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		87		11	152	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling	1107			1066		
D. Inspection, maintenance or repair without refuelling				204		
E. Testing of plant systems or components				3	0	
J. Grid failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					46	1
Subtotal	1107	87	0	1284	212	1
Total		1194			1497	

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

System	2003 Hours Lost	1983 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		18
14. Safety Systems		6
15. Reactor Cooling Systems		46
16. Steam generation systems		16
31. Turbine and auxiliaries	12	11
32. Feedwater and Main Steam System		15
35. All other I&C Systems		1
41. Main Generator Systems	74	18
42. Electrical Power Supply Systems		14
Total	86	145

# US-424 VOGTLE-1

**Operator:** SOUTH (Southern Nuclear Operating Co.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1152.0 MW(e)  
**Design Net Capacity:** 1122.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9411.5 GW(e).h  
**Energy Availability Factor:** 92.5%  
**Load Factor:** 93.3%  
**Operating Factor:** 92.4%  
**Energy Unavailability Factor:** 7.5%  
**Total Off-line Time:** 663 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	870.4	798.6	878.2	849.8	788.4	840.6	865.3	864.7	744.6	201.1	824.1	885.7	9411.5
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	93.2	100.0	100.0	100.0	90.0	27.9	100.0	100.0	92.5
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	93.2	100.0	100.0	100.0	90.0	27.9	100.0	100.0	92.5
<b>LF (%)</b>	101.6	103.2	102.5	102.6	92.0	101.3	101.0	100.9	89.8	23.4	99.4	103.3	93.3
<b>OF (%)</b>	100.0	100.0	100.0	100.0	93.1	100.0	100.0	100.0	90.1	27.4	100.0	100.0	92.4
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	6.8	0.0	0.0	0.0	10.0	72.1	0.0	0.0	7.5
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	6.8	0.0	0.0	0.0	10.0	72.1	0.0	0.0	7.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1976      **Lifetime Generation:** 140603.2 GW(e).h  
**Date of First Criticality:** 09 Mar 1987      **Cumulative Energy Availability Factor:** 88.8%  
**Date of Grid Connection:** 27 Mar 1987      **Cumulative Load Factor:** 88.3%  
**Date of Commercial Operation:** 01 Jun 1987      **Cumulative Unit Capability Factor:** 78.2%  
**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 (%)
1988	6799.7	1079.0	74.3	74.3	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	79.0	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	86.2	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	81.8	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	93.4	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	88.7	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

# US-424 VOGTLE-1

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
09 May	50.7	58.2	PF	Z	PERFORM CHEMISTRY SAMPLING AND MODE CHANGE PREREQUISITES
28 Sep	610.2	700.5	PF	C21	REFUELING OUTAGE
23 Oct	1.0	1.1	PF	E31	TURBINE OVERSPEED TRIP SURVEILLANCE TEST.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1988 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					160	
B. Refuelling without a maintenance					18	
C. Inspection, maintenance or repair combined with refuelling	610			685		
D. Inspection, maintenance or repair without refuelling				35		
E. Testing of plant systems or components	1			4		
H. Nuclear regulatory requirements					12	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					2	4
Z. Others	50					
Subtotal	661	0	0	724	192	4
Total		661			920	

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

System	2003 Hours Lost	1988 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		6
14. Safety Systems		35
15. Reactor Cooling Systems		46
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		12
35. All other I&C Systems		3
41. Main Generator Systems		28
42. Electrical Power Supply Systems		16
Total	0	151

# US-425 VOGTLE-2

**Operator:** SOUTH (Southern Nuclear Operating Co.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1149.0 MW(e)  
**Design Net Capacity:** 1101.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 9736.6 GW(e).h  
**Energy Availability Factor:** 95.9%  
**Load Factor:** 96.7%  
**Operating Factor:** 95.9%  
**Energy Unavailability Factor:** 4.1%  
**Total Off-line Time:** 359 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	886.0	799.2	717.1	849.7	871.0	839.1	862.6	566.4	733.1	877.9	849.6	885.0	9736.6
<b>EAF (%)</b>	100.0	100.0	93.2	100.0	100.0	100.0	100.0	69.2	89.3	100.0	100.0	100.0	95.9
<b>UCF (%)</b>	100.0	100.0	93.2	100.0	100.0	100.0	100.0	69.2	89.3	100.0	100.0	100.0	95.9
<b>LF (%)</b>	103.6	103.5	83.9	102.8	101.9	101.4	100.9	66.3	88.6	102.6	102.7	103.5	96.7
<b>OF (%)</b>	100.0	100.0	93.1	100.0	100.0	100.0	100.0	69.6	88.6	100.0	100.0	100.0	95.9
<b>EUf (%)</b>	0.0	0.0	6.8	0.0	0.0	0.0	0.0	30.8	10.7	0.0	0.0	0.0	4.1
<b>PUf (%)</b>	0.0	0.0	6.8	0.0	0.0	0.0	0.0	30.8	10.7	0.0	0.0	0.0	4.1
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1976  
**Date of First Criticality:** 28 Mar 1989  
**Date of Grid Connection:** 10 Apr 1989  
**Date of Commercial Operation:** 20 May 1989

**Lifetime Generation:** 130980.2 GW(e).h  
**Cumulative Energy Availability Factor:** 90.3%  
**Cumulative Load Factor:** 89.3%  
**Cumulative Unit Capability Factor:** 78.8%  
**Cumulative Energy Unavailability Factor:** 9.7%

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	5547.2	1110.0	0.0	0.0	96.0	100.0	60.2	0.0	5104	61.5
1990	6868.0	1110.0	81.1	81.1	81.1	81.1	70.6	70.6	7125	81.3
1991	8897.4	1097.0	95.4	88.2	95.4	88.2	92.6	81.5	8375	95.6
1992	7779.6	1109.0	80.8	85.7	80.8	85.7	79.9	81.0	7175	81.7
1993	8680.9	1140.0	88.1	86.3	88.1	86.3	86.9	82.5	7737	88.3
1994	9331.6	1168.0	92.1	87.5	92.1	87.5	91.2	84.3	8062	92.0
1995	9165.6	1162.0	90.8	88.1	90.3	88.0	90.0	85.3	7908	90.3
1996	9037.6	1162.0	89.9	88.4	89.9	88.3	88.5	85.8	7899	89.9
1997	10310.8	1162.0	100.0	89.8	100.0	89.8	101.3	87.7	8760	100.0
1998	8388.6	1162.0	83.9	89.2	83.9	89.1	82.4	87.1	7347	83.9
1999	9022.6	1156.0	89.5	89.2	89.5	89.1	89.1	87.3	7833	89.4
2000	10337.8	1149.0	100.0	90.2	100.0	90.1	102.4	88.7	8784	100.0
2001	9456.7	1149.0	92.6	90.4	92.6	90.3	94.0	89.2	8112	92.6
2002	8418.9	1149.0	83.7	89.9	83.7	89.8	83.6	88.7	7328	83.7
2003	9736.6	1149.0	95.9	90.3	95.9	90.3	96.7	89.3	8401	95.9



## US-425 VOGTLE-2

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
21 Mar	50.3	57.8	PF	Z	SHUTDOWN FOR PLANNED HIDEOUT RETURN STUDY.
08 Aug	181.5	208.6	PF	D15	RCS LEAK AT CONOSEAL ON REACTOR HEAD.
30 Aug	125.9	144.6	PF	D15	RCS LEAK AT CANOPY SEAL WELD.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1989 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure					69	
B. Refuelling without a maintenance					37	
C. Inspection, maintenance or repair combined with refuelling				596		
D. Inspection, maintenance or repair without refuelling	307			58		
E. Testing of plant systems or components				1		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					17	2
Z. Others	50					
Subtotal	357	0	0	655	123	2
Total		357			780	

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

System	2003 Hours Lost	1989 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		7
13. Reactor Auxiliary Systems		1
14. Safety Systems		20
15. Reactor Cooling Systems		7
16. Steam generation systems		2
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		8
35. All other I&C Systems		10
41. Main Generator Systems		0
42. Electrical Power Supply Systems		4
Total	0	60

# US-382 WATERFORD-3

**Operator:** ENTERGY (ENTERGY NUCLEAR)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1075.0 MW(e)  
**Design Net Capacity:** 1104.0 MW(e)  
**Design Discharge Burnup:** 34384 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8503.1 GW(e).h  
**Energy Availability Factor:** 89.7%  
**Load Factor:** 90.3%  
**Operating Factor:** 89.8%  
**Energy Unavailability Factor:** 10.3%  
**Total Off-line Time:** 895 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	824.2	626.5	823.4	793.5	815.7	790.0	813.4	809.4	766.2	404.8	211.1	824.9	8503.1
<b>EAF (%)</b>	100.0	85.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	57.5	31.9	100.0	89.7
<b>UCF (%)</b>	100.0	85.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	57.5	31.9	100.0	89.7
<b>LF (%)</b>	103.1	86.7	102.9	102.7	102.0	102.1	101.7	101.2	99.0	50.5	27.3	103.1	90.3
<b>OF (%)</b>	100.0	85.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	61.1	29.6	100.0	89.8
<b>EUf (%)</b>	0.0	14.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.5	68.1	0.0	10.3
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.5	68.1	0.0	9.2
<b>UCLF (%)</b>	0.0	14.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1974      **Lifetime Generation:** 147086.4 GW(e).h  
**Date of First Criticality:** 04 Mar 1985      **Cumulative Energy Availability Factor:** 85.6%  
**Date of Grid Connection:** 18 Mar 1985      **Cumulative Load Factor:** 85.0%  
**Date of Commercial Operation:** 24 Sep 1985      **Cumulative Unit Capability Factor:** 77.8%  
**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	2773.1	1099.0	0.0	0.0	93.1	100.0	30.7	0.0	3372	41.1
1986	7308.4	1096.0	79.5	79.5	79.5	79.5	76.1	76.1	6921	79.0
1987	7434.1	1075.0	80.9	80.2	80.9	80.2	78.9	77.5	7085	80.9
1988	6548.4	1075.0	73.7	78.0	73.7	78.0	69.3	74.8	6468	73.6
1989	7609.4	1075.0	81.5	78.9	81.5	78.9	80.8	76.3	7136	81.5
1990	8604.2	1075.0	92.3	81.6	92.2	81.6	91.4	79.3	8079	92.2
1991	7274.9	1075.0	78.9	81.1	78.5	81.0	77.3	79.0	6869	78.4
1992	7622.2	1075.0	82.1	81.3	82.1	81.2	80.7	79.2	7213	82.1
1993	9138.8	1075.0	99.2	83.5	99.2	83.4	97.0	81.4	8691	99.2
1994	7931.9	1075.0	86.3	83.8	86.3	83.8	84.2	81.7	7555	86.2
1995	7763.4	1075.0	82.7	83.7	82.7	83.7	82.4	81.8	7241	82.7
1996	8926.8	1075.0	93.8	84.6	93.8	84.6	94.5	83.0	8237	93.8
1997	6720.7	1075.0	70.3	83.4	70.4	83.4	71.4	82.0	6161	70.3
1998	8620.8	1075.0	91.0	84.0	91.0	84.0	91.5	82.7	7966	90.9
1999	7441.7	1075.0	78.9	83.6	78.9	83.6	79.0	82.5	6905	78.8
2000	8477.4	1075.0	88.2	83.9	88.2	83.9	89.8	83.0	7743	88.1
2001	9539.1	1075.0	99.5	84.9	99.5	84.9	101.3	84.1	8718	99.5
2002	8847.9	1075.0	92.8	85.4	92.8	85.4	94.0	84.7	8136	92.9
2003	8503.1	1075.0	89.7	85.6	89.7	85.6	90.3	85.0	7865	89.8

## US-382 WATERFORD-3

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
14 Feb	97.7	106.6	UF4	A31	A MAIN TURBINE TRIP OCCURRED ON LOW GENERATOR SEAL OIL DIFFERENTIAL PRESSURE WHEN THE AIR SIDE SEAL OIL PUMP WAS DE-ENERGIZED.
19 Oct	795.3	867.7	PF	C21	REFUELLING OUTAGE.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1985 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		97			250	
B. Refuelling without a maintenance					17	
C. Inspection, maintenance or repair combined with refuelling	795			782		
D. Inspection, maintenance or repair without refuelling				118		
E. Testing of plant systems or component				1		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					9	1
Subtotal	795	97	0	901	276	1
Total		892			1178	

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

System	2003 Hours Lost	1985 to 2003 Average Hours Lost Per Year
12. Reactor I&C Systems		11
13. Reactor Auxiliary System:		5
14. Safety Systems		3
15. Reactor Cooling System:		114
17. Safety I&C Systems (excluding reactor I&C)		41
31. Turbine and auxiliaries	97	4
32. Feedwater and Main Steam System		30
35. All other I&C Systems:		24
41. Main Generator System:		3
42. Electrical Power Supply System:		3
Total	97	238

# US-390 WATTS BAR-1

**Operator:** TVA (TENNESSEE VALLEY AUTHORITY)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1125.0 MW(e)  
**Design Net Capacity:** 1218.0 MW(e)  
**Design Discharge Burnup:** 36000 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8549.6 GW(e).h  
**Energy Availability Factor:** 86.2%  
**Load Factor:** 86.9%  
**Operating Factor:** 86.2%  
**Energy Unavailability Factor:** 13.8%  
**Total Off-line Time:** 1209 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	874.4	788.4	682.4	830.9	850.4	815.1	831.5	771.8	145.5	251.0	839.1	869.0	8549.6
<b>EAF (%)</b>	100.0	100.0	81.0	100.0	100.0	100.0	100.0	95.5	19.5	38.3	100.0	100.0	86.2
<b>UCF (%)</b>	100.0	100.0	81.0	100.0	100.0	100.0	100.0	95.5	19.5	38.3	100.0	100.0	86.2
<b>LF (%)</b>	104.5	104.3	81.5	102.7	101.6	100.6	99.7	92.5	18.0	30.1	104.0	104.2	86.9
<b>OF (%)</b>	100.0	100.0	81.0	100.0	100.0	100.0	100.0	95.4	22.5	36.1	100.0	100.0	86.2
<b>EUF (%)</b>	0.0	0.0	19.0	0.0	0.0	0.0	0.0	4.5	80.5	61.7	0.0	0.0	13.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.7	61.7	0.0	0.0	9.6
<b>UCLF (%)</b>	0.0	0.0	19.0	0.0	0.0	0.0	0.0	4.5	26.8	0.0	0.0	0.0	4.2
<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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Dec 1972  
**Date of First Criticality:** 01 Jan 1996  
**Date of Grid Connection:** 06 Feb 1996  
**Date of Commercial Operation:** 05 May 1996

**Lifetime Generation:** 67424.7 GW(e).h  
**Cumulative Energy Availability Factor:** 90.6%  
**Cumulative Load Factor:** 90.0%  
**Cumulative Unit Capability Factor:** 81.9%  
**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 (%)
1996	5544.2	1109.0	0.0	0.0	65.5	100.0	61.3	0.0	5491	67.3
1997	7600.1	1117.0	82.3	82.3	82.3	82.3	77.7	77.7	7269	83.0
1998	9681.0	1117.0	99.0	90.6	99.0	90.6	98.9	88.3	8672	99.0
1999	8267.4	1118.0	86.8	89.3	86.8	89.4	84.4	87.0	7606	86.8
2000	9076.4	1118.0	92.5	90.1	92.5	90.1	92.4	88.4	8124	92.5
2001	9626.6	1126.0	96.1	91.3	96.1	91.3	97.6	90.2	8419	96.1
2002	9079.4	1125.0	91.3	91.3	91.3	91.3	92.1	90.5	7998	91.3
2003	8549.6	1123.0	86.2	90.6	86.2	90.6	86.9	90.0	7551	86.2

## US-390 WATTS BAR-1

### 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
10 Mar	141.0	159.0	UF4	A42	AUTO SCRAM DUE TO FAULT IN A POTENTIAL DEVICE ON C PHASE OF THE MAIN TRANSFORMER.
25 Aug	33.3	37.6	UF4	K31	REACTOR AUTOMATICALLY TRIPPED FOLLOWING A GENERATOR/TURBINE TRIP. THE CAUSE WAS INADVERTENT ACTUATION OF THE MAIN BANK C PHASE SUDDEN PRESSURE RELAYS WHEN A WORKER BUMPED THE RELAY CABINET IN THE SWITCHYARD.
07 Sep	192.0	216.6	UF2	A14	MANUAL SHUTDOWN DUE TO LEAKAGE ABOVE PLANT CRITERIA FROM RCP SEAL.
15 Sep	841.2	948.9	PF	C21	SHUTDOWN ON 9/7/03 RESULTED IN STARTING REFUELING OUTAGE AHEAD OF SCHEDULE.

### 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1996 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		333			195	
B. Refuelling without a maintenance					12	
C. Inspection, maintenance or repair combined with refuelling	841			433		
E. Testing of plant systems or components				88		
H. Nuclear regulatory requirements				143		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)		33			21	
Subtotal	841	366	0	664	228	0
Total		1207			892	

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

System	2003 Hours Lost	1996 to 2003 Average Hours Lost Per Year
14. Safety Systems	192	
15. Reactor Cooling Systems		27
31. Turbine and auxiliaries		30
32. Feedwater and Main Steam System		90
33. Circulating Water System		33
35. All other I&C Systems		5
42. Electrical Power Supply Systems	141	9
Total	333	194

# US-482 WOLF CREEK

**Operator:** WOLF (WOLF CREEK NUCLEAR OPERATION CORP.)  
**Contractor:** WEST (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Maximum Net Capacity at the beginning of 2003:** 1165.0 MW(e)  
**Design Net Capacity:** 1170.0 MW(e)  
**Design Discharge Burnup:** 32700 MW.d/t

## 2. Production Summary 2003

**Energy Production:** 8902.5 GW(e).h  
**Energy Availability Factor:** 86.7%  
**Load Factor:** 87.2%  
**Operating Factor:** 86.7%  
**Energy Unavailability Factor:** 13.3%  
**Total Off-line Time:** 1166 hours

## 3. 2003 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	831.1	801.2	885.6	854.7	882.3	850.3	872.8	805.4	848.5	462.6	0.0	808.0	8902.5
<b>EAF (%)</b>	96.6	100.0	100.0	100.0	100.0	100.0	100.0	94.2	100.0	54.8	0.0	94.8	86.7
<b>UCF (%)</b>	96.6	100.0	100.0	100.0	100.0	100.0	100.0	94.2	100.0	54.8	0.0	94.8	86.7
<b>LF (%)</b>	95.9	102.3	102.2	102.0	101.8	101.2	100.5	92.8	101.0	53.2	0.0	93.1	87.2
<b>OF (%)</b>	96.5	100.0	100.0	100.0	100.0	100.0	100.0	94.1	100.0	54.8	0.0	94.8	86.7
<b>EUf (%)</b>	3.4	0.0	0.0	0.0	0.0	0.0	0.0	5.8	0.0	45.2	100.0	5.2	13.3
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.2	100.0	5.2	12.5
<b>UCLF (%)</b>	3.4	0.0	0.0	0.0	0.0	0.0	0.0	5.8	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. 2003 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1977  
**Date of First Criticality:** 22 May 1985  
**Date of Grid Connection:** 12 Jun 1985  
**Date of Commercial Operation:** 03 Sep 1985

**Lifetime Generation:** 156058.5 GW(e).h  
**Cumulative Energy Availability Factor:** 84.6%  
**Cumulative Load Factor:** 83.9%  
**Cumulative Unit Capability Factor:** 77.8%  
**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 (%)
1985	3814.0	1144.0	0.0	0.0	39.5	100.0	39.5	0.0	4350	51.5
1986	6966.1	1128.0	73.0	73.0	73.0	73.0	70.5	70.5	6416	73.2
1987	6504.1	1128.0	68.6	70.8	68.6	70.8	65.8	68.2	6009	68.6
1988	6676.4	1128.0	66.8	69.5	66.8	69.5	67.4	67.9	5963	67.9
1989	9709.3	1135.0	98.3	76.7	98.4	76.7	97.7	75.4	8618	98.4
1990	7889.1	1135.0	79.8	77.3	79.8	77.3	79.3	76.2	7036	80.3
1991	5891.4	1135.0	71.0	76.3	71.0	76.3	59.3	73.3	6288	71.8
1992	8490.7	1131.0	85.4	77.6	85.4	77.6	85.5	75.1	7538	85.8
1993	7908.6	1132.0	79.3	77.8	79.3	77.8	79.8	75.7	7000	79.9
1994	8546.0	1149.0	85.4	78.7	85.4	78.6	84.9	76.7	7500	85.6
1995	10062.2	1163.0	98.5	80.7	98.5	80.7	98.8	79.0	8625	98.5
1996	8233.7	1165.0	81.8	80.8	80.6	80.7	80.5	79.1	7078	80.6
1997	8447.5	1163.0	82.8	81.0	82.8	80.8	82.9	79.4	7255	82.8
1998	10400.7	1163.0	100.0	82.4	100.0	82.3	102.1	81.2	8760	100.0
1999	9156.6	1163.0	89.6	83.0	89.6	82.9	89.9	81.8	7847	89.6
2000	9071.4	1169.0	88.8	83.4	88.8	83.3	88.3	82.3	7795	88.7
2001	10346.7	1170.0	99.7	84.4	99.7	84.3	101.0	83.5	8731	99.7
2002	9041.7	1167.0	87.8	84.6	87.8	84.5	88.4	83.8	7695	87.8
2003	8902.5	1166.0	86.7	84.7	86.7	84.6	87.2	83.9	7594	86.7

# US-482 WOLF CREEK

## 6. 2003 Outages

Date	Hours	GW(e).h	Type	Code	Description
03 Jan	25.1	29.4	UF4	B41	AUTOMATIC REACTOR TRIP DUE TO POWER RANGE NEUTRON FLUX HIGH NEGATIVE RATE. THIS WAS CAUSED BY AN OPERATOR ERROR THAT RESULTED IN OPENING BOTH ROD DRIVE MG SET OUTPUT BREAKERS FOLLOWING ROUTINE MAINTENANCE.
18 Aug	43.2	50.5	UF2	A17	REPLACED CIRCUIT CARDS AND SOLENOIDS ON FEEDWATER ISOLATION VALVE (AEFV40)
18 Oct	1093.9	1279.9	PF	C21	REFUELING OUTAGE
02 Dec	1.7	2.0	PF	E31	TURBINE OVERSPEED TEST.

## 7. Full Outages, Analysis by Cause

Outage Cause	2003 Hours Lost			1986 to 2003 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment failure		43			155	
B. Refuelling without a maintenance		25			151	
C. Inspection, maintenance or repair combined with refuelling	1093			912		
D. Inspection, maintenance or repair without refuelling				12	18	
E. Testing of plant systems or components	1			0		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand)					12	6
Subtotal	1094	68	0	924	336	6
Total		1162			1266	

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

System	2003 Hours Lost	1986 to 2003 Average Hours Lost Per Year
11. Reactor and Accessories		34
12. Reactor I&C Systems		16
15. Reactor Cooling Systems		2
16. Steam generation systems		8
17. Safety I&C Systems (excluding reactor I&C)	43	
31. Turbine and auxiliaries		6
32. Feedwater and Main Steam System		24
35. All other I&C Systems		3
42. Electrical Power Supply Systems		5
Total	43	98