

The Global Nuclear Power Picture

1. Worldwide there were 439 nuclear power plants (NPPs) operating as of 31 December 2003. Nuclear power supplied 16% of global electricity generation in 2002, down slightly from 16.2% in 2001.¹ Table 1 summarizes world nuclear experience as of 31 December 2003.

2. The global energy availability factor for NPPs rose to approximately 84% in 2003, continuing its steady climb from 74.2% in 1991. Two new NPPs were connected to the grid in 2003. This follows six new connections in 2002 and three in 2001, specifically

2003: Qinshan 3-2 in China

Ulchin-5 in the Republic of Korea

2002: Ling Ao-1, Ling Ao-2, Qinshan 2-1, Qinshan 3-1 in China

Temelin-2 in the Czech Republic

Yonggwang-6 in the Republic of Korea

2001: Onagawa-3 in Japan

Yonggwang-5 in the Republic of Korea

Rostov-1 in the Russian Federation

3. There were six retirements in 2003, the four 50 MW(e) units at Calder Hall in the UK, the 640 MW(e) unit at Stade in Germany and the Fugen ATR 148 MW(e) unit in Japan. There had been four retirements in 2002 (Kozloduy-1 and -2 in Bulgaria and Bradwell units A and B in the UK) and no retirements in 2001.

4. In 2003, construction started on just one new NPP, a 202 MW(e) PHWR in India.

5. Current expansion, as well as near-term and long-term growth prospects, are centred in Asia. As shown in Table 1, of 31 reactors under construction² worldwide at the end of 2003, 18 are located either in China, the Republic of Korea, the Democratic People's Republic of Korea, Japan or India. Twenty-one of the last 30 reactors to have been connected to the grid are in the Far East and South Asia.

6. Within Asia,³ capacity and production are greatest in Japan (53 NPPs in operation and three under construction) and the Republic of Korea (19 NPPs in operation and one under construction). Both countries lack indigenous energy resources, and consequent concerns about supply diversity and security make new NPPs more economically competitive. In Japan, seven of the 17 reactors shut down in 2002 following revelations by the Tokyo Electric Power Company of past falsifications in self-imposed reactor inspection reports had been returned to service by the end of 2003. In China eight NPPs are in operation, and three more are under construction. India has 14 NPPs in operation, and eight under construction.

¹ International Atomic Energy Agency, Power Reactor Information System (PRIS) Database, (<http://www.iaea.org/programmes/a2/>); and International Atomic Energy Agency, *Reference Data Series No. 1*, Vienna, July 2003.

² The totals include also Taiwan, China.

³ Taiwan, China has six NPPs, with two more under construction.

TABLE 1. NUCLEAR POWER REACTORS IN OPERATION AND UNDER CONSTRUCTION IN THE WORLD (AS OF 31 DECEMBER 2003)

COUNTRY	Reactors in Operation		Reactors under Construction		Nuclear Electricity Supplied in 2003		Total Operating Experience to Dec. 2003	
	No of Units	Total MW(e)	No of Units	Total MW(e)	TW·h	% of Total	Years	Months
ARGENTINA	2	935	1	692	7.03	8.59	50	7
ARMENIA	1	376			1.82	35.48	36	3
BELGIUM	7	5 760			44.61	55.46	191	7
BRAZIL	2	1 901			13.34	3.65	25	3
BULGARIA	4	2 722			16.04	37.71	129	2
CANADA	16	11 323			70.29	12.53	486	11
CHINA	8	5 977	3	2 610	41.59	2.18	39	1
CZECH REPUBLIC	6	3 548			25.87	31.09	74	10
FINLAND	4	2 656			21.82	27.32	99	4
FRANCE	59	63 363			420.70	77.68	1 346	2
GERMANY	18	20 643			157.44	28.10	648	0
HUNGARY	4	1 755			11.01	32.69	74	2
INDIA	14	2 550	8	3 622	16.37	3.30	223	5
IRAN, ISLAMIC REPUBLIC OF			2	2 111			0	0
JAPAN	53	44 139	3	3 696	230.80	25.01	1 123	7
KOREA, DEM. PEOPLE'S REP. OF			1	1 040			0	0
KOREA, REPUBLIC OF	19	15 850	1	960	123.28	40.01	220	8
LITHUANIA	2	2 370			14.30	79.89	36	6
MEXICO	2	1 310			10.51	5.23	23	11
NETHERLANDS	1	449			3.80	4.48	59	0
PAKISTAN	2	425			1.81	2.37	35	10
ROMANIA	1	655	1	655	4.54	9.33	7	6
RUSSIAN FEDERATION	30	20 793	3	2 825	138.39	16.54	761	4
SLOVAKIA	6	2 442	2	776	17.86	57.35	100	6
SLOVENIA	1	676			4.96	40.45	22	3
SOUTH AFRICA	2	1 800			12.66	6.05	38	3
SPAIN	9	7 584			59.36	23.64	219	2
SWEDEN	11	9 451			65.50	49.62	311	1
SWITZERLAND	5	3 220			25.93	39.73	143	10
UKRAINE	13	11 207	4	3 800	76.70	45.93	279	10
UNITED KINGDOM	27	12 052			85.31	23.70	1 329	8
UNITED STATES OF AMERICA	104	98 298			763.74	19.86	2 871	8
Total	439	361 094	31	25 387	2524.03		11 143	5

Note: The total includes the following data in Taiwan, China:

— 6 units, 4884 MW(e) in operation; 2 units, 2600 MW(e) under construction;

— 37.37 TW·h of nuclear electricity generation, representing 21.5% of the total electricity generated in 2003;

— 134 years 1 month of total operating experience.

7. In Western Europe, with the retirement of four units in the UK and one in Germany, there are now 141 operating reactors. The last new connection to the grid was France's Civaux-2 in 1999. With upratings and licence extensions, overall capacity is likely to remain near existing levels, despite decisions to phase out nuclear power in Belgium (which passed its phase-out law in January 2003), Germany and Sweden. In contrast, voters in Switzerland rejected two referenda in 2003 proposing, in one case, an extended moratorium on new NPPs and, in the other, a nuclear phase-out. The UK Government decided it would not yet support the replacement of retiring nuclear plants with new nuclear capacity, preferring to promote renewables and turn to nuclear only if these prove insufficient. The most advanced planning for new nuclear capacity is in Finland where, in 2002, a "decision in principle" to build a fifth NPP was made by the Government and Parliament. In 2003 the utility Teollisuuden Voima Oy selected Olkiluoto as the site and signed a contract with a Framatome ANP – Siemens consortium for a 1600 MW(e) European pressurized water reactor. The construction licence application for the reactor was submitted to the Finnish Government in January 2003.

8. Eastern Europe and the newly independent countries of the former Soviet Union have 68 operating NPPs and ten more under construction. In the Russian Federation, which has 30 NPPs in operation and three under construction, ROSENERGOATOM continued its programme to extend licences at eleven NPPs. In 2003 the Russian nuclear regulatory body, Gosatomnadzor, issued a five-year extension for Kola-1.

9. In Bulgaria a review by the World Association of Nuclear Operators concluded that Kozloduy-3 and -4 meet all necessary international standards to continue operating safely. Bulgaria has asked the EU to reconsider an earlier agreement under which Bulgaria would close Kozloduy-3 and -4 before the end of 2006 as a condition for joining the EU. In the meantime, Bulgarian regulators issued a new ten-year licence for Kozloduy 4 (through March 2013), the first long-term licence issued by Bulgaria, and later issued a similar eight-year extension for Kozloduy-3. In Romania, where licence extensions are required every two years, an extension was approved for Cernavoda to 2005.

10. No new NPP has been ordered in the United States of America since 1978, although seven units that were out of service for extended periods have been restarted since 1998. The focus in 2003 continued to be on licence renewal and upratings. In 2003, the US Nuclear Regulatory Commission (NRC) approved nine licence extensions of 20 years each (for a total licensed life of 60 years for each NPP), bringing the total number of approved licence extensions to nineteen by the end of the year. The NRC had 17 applications currently under review and expected at least eleven more in 2004, and eleven in 2005 and 2006. Also in 2003, the NRC approved eight upratings totaling 401 MW(th). As one step in implementing the "Nuclear Power 2010" programme it announced in 2002, the US Government streamlined the regulatory process by introducing early site permits that can be reserved for future use. In the course of 2003 three companies, Exelon, Dominion Energy and Entergy Nuclear filed applications for such permits.

11. In Canada, near-term expansion of nuclear generation is taking the form of restarting some or all of the eight nuclear units (out of a Canadian total of 22) that have been shut in recent years. The first two such restarts, Pickering A-4 and Bruce A-4, took place in 2003. Meanwhile, licences for the four Pickering A units (three of which are still shut down) were extended to 2005, for the four Pickering B units (all operating) until 2008, and for the four Darlington units (all operating) until 2008.

12. In Africa, there are two operating NPPs, both in South Africa. In Latin America, there are six – two each in Argentina, Brazil and Mexico. In South Africa a further step forward was taken on the Pebble Bed Modular Reactor (PBMR) in 2003, with the issuance of a positive "Record of Decision" on the environmental impact assessment study for the PBMR demonstration unit.