JAPAN

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1. ENERGY, ECONOMIC AND ELECTRICITY INFORMATION

1.1. General Overview

Situated in the far east of Asia, Japan is subject to a monsoon climate in the Temperate Zones. Japan has four distinct seasons that affect changes in the demand for energy and electric power. There are two peaks in the annual fluctuation of Japan's electric power demand: one is a summer peak due to the use of air-conditioning (cooling), and the other is a winter peak due to the use of heating.

Table 1 shows Japan's total population, its density and its rate of increase. Table 2 shows the Gross Domestic Product (GDP) in total, the growth rate, and the GDP per sector. Table 3 shows the estimated energy reserves in Japan. Figures 1.1 and 1.2 present the primary energy supply and the final energy consumption. The balance of energy production (supply) and energy consumption (demand) is shown in Table 4.1. Table 4.1 also shows the import/export balance. Table 4.2 shows the end-use of energy consumption by sector.

A key feature of Japan's energy consumption (see Table 4.2) is that the industrial sector accounts for the bulk of the total, with 45.9% (in FY2001), while the residential and commercial sector is 29.3% and the transportation sector is 24.8%.

Japan's total primary energy supply (in FY2001) was 22,784 PJ. Japan still depends heavily on oil, even though its dependency has dramatically decreased from 77.4% in 1973 to 49.4% at present. The decline in oil dependency can be attributed mainly to the energy conservation efforts of Japanese industries and the development of alternative energy resources in Japan. In FY2001, Japan imported 99.8% of the oil consumed in Japan (87.9% of crude oil was imported from Middle Eastern countries).

TABLE 1. POPULATION INFORMATION

	1960	1970	1980	1990	1997	1998	1999	2000	2001	2002	Growth rate (%/yr) 1980 To 2002
Population (millions)	94.1	104.3	116.8	123.5	126.3	126.6	126.6	127.1	127.3	127.1	
Population density (inhabitants/km²)	249.1	276.2	309.2	327.0	334.3	335.1	335.0	336.4	337.0	336.5	
Predicted population growth rate (%) 2001 to 2010			0.7								
Area (1000 km²)			377.8								

Sources: IAEA Energy and Economic Database and Country Information; Data & Statistics, The World Bank

TABLE 2. GROSS DOMESTIC PRODUCT (GDP)

	1998	1999	2000	2001	2002
GDP at market prices (billion US$)	3,941	4,493	4,765	4,141	3,798
GDP growth (annual %)	-1.10	0.67	2.36	-0.58	-0.70
GDP by Sector (% of GDP):					
Agriculture, value added	1.60	1.48	1.36	N/A	N/A
Industry, value added	32.62	32.13	31.82	N/A	N/A
Services, etc., value added	65.78	66.39	66.82	N/A	N/A

Source: Data and Statistics, the World Bank

TABLE 3. ENERGY RESERVES

Unit: Exajoule

	Estimated energy reserves					
	Solid	Liquid	Gas	Uranium [1]	Hydro [2]	Total
Total amount in place	19.23	0.29	1.31	3.60	69.22	93.65

[1] *This total represents essentially recoverable reserves.*

[2] *For comparison purposes a rough attempt is made to convert hydro capacity to energy by multiplying the gross theoretical annual capability (World Energy Council - 1998) by a factor of 10.*

Sources: IAEA Energy and Economic Data Base; Country Information

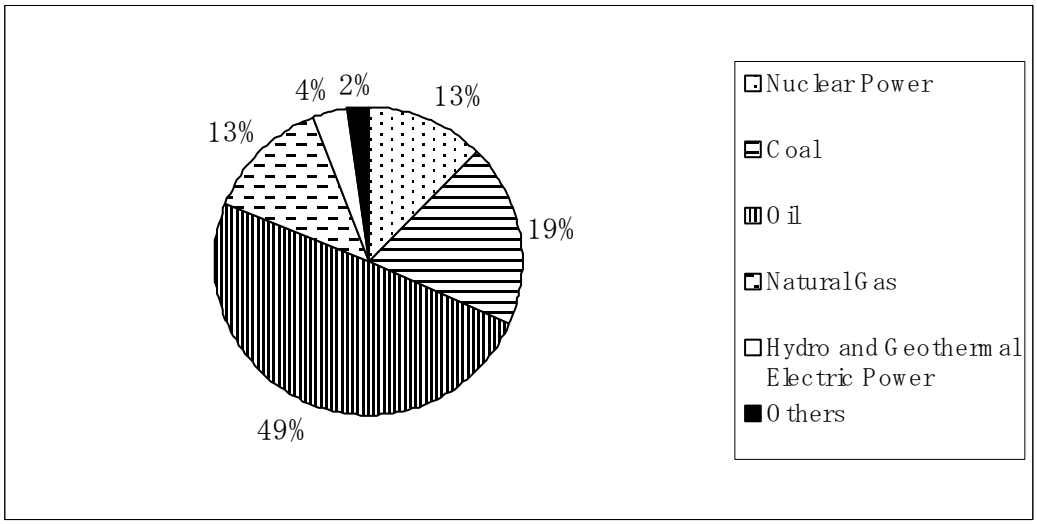


FIG. 1.1. Proportions of Primary Energy Supplies (FY2001)

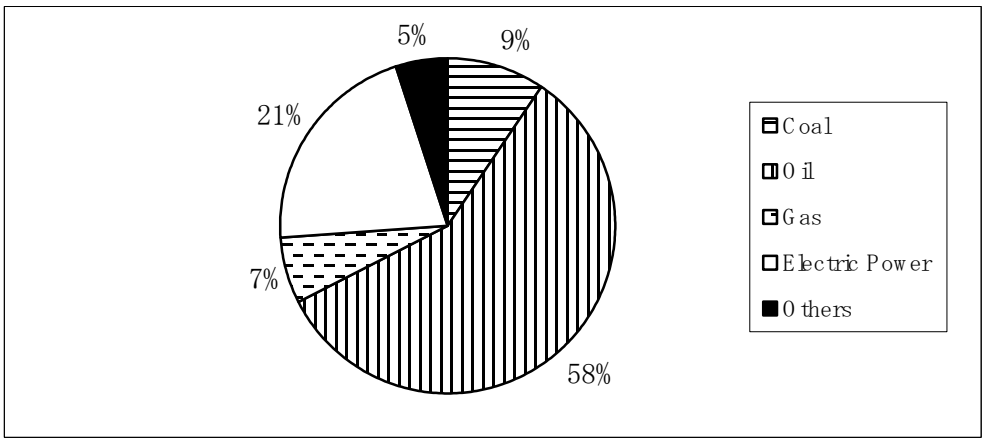


FIG. 1.2. Proportions of Total Final Energy Consumption (FY2001)

TABLE 4.1. ENERGY STATISTICS

Unit:Exajoule

	1960	1970	1980	1990	2000	2001	Average annual growth rate (%) 1960 to 1980	Average annual growth rate (%) 1980 To 2001
Energy production								
- Total	2.13	2.14	2.27	3.06	4.13	4.30	0.33	3.08
- Solids	1.51	1.17	0.47	0.22	0.09	0.09	-5.65	-7.82
- Liquids	0.02	0.03	0.02	0.02	0.03	0.03	0.10	0.76
- Gases	0.03	0.11	0.09	0.08	0.10	0.11	4.93	1.32
- Primary electricity [3]	0.56	0.82	1.69	2.74	3.91	4.08	5.66	4.27
Energy consumption								
- Total [1]	2.00	2.05	14.63	18.12	22.38	25.38	10.46	2.66
- Solids [2]	1.40	1.15	2.52	3.37	3.83	3.65	2.97	1.78
- Liquids			9.45	10.00	10.68	10.94	47.86	0.70
- Gases	0.03	0.16	0.97	2.01	3.96	6.71	18.53	9.62
- Primary electricity [3]	0.56	0.82	1.69	2.74	3.91	4.08	5.66	4.27
Net import (Import - Export)								
- Total	-0.01	0.44	13.06	15.36	19.21	24.35	-44.59	3.01
- Solids	0.00	0.00	1.98	3.13	4.00	4.16	-47.79	3.59
- Liquids	-0.01	0.39	10.19	10.28	11.09	11.38	-43.55	0.53
- Gases		0.04	0.89	1.94	4.12	8.80		11.54

[1] Energy consumption = Primary energy consumption + Net import (Import - Export) of secondary energy.
[2] Solid fuels include coal, lignite and commercial wood.
[3] Primary electricity = Hydro + Geothermal + Nuclear + Wind.
Source: IAEA Energy and Economic Database.

TABLE 4.2. TREND OF END-USE ENERGY CONSUMPTION

(Unit: Exajoule (Gross Calorific Value)

(Fiscal Year)	1973	1979	1986	1992	1995	1996	1997	1998	1999	2000	2001	2002
End-UseEnergy Consumption	11.10	11.70	11.37	13.87	14.98	15.39	15.40	15.24	15.68	15.99	15.80	N/A
-Industry	7.27	6.92	6.03	6.71	7.14	7.41	7.33	6.99	7.25	7.54	7.25	N/A
-Commerce and Residence	2.01	2.45	2.78	3.67	4.07	4.11	4.14	4.33	4.46	4.53	4.63	N/A
-Transportation	1.82	2.33	2.55	3.49	3.77	3.87	3.92	3.92	3.97	3.91	3.92	N/A

Source: Agency of Natural Resources and Energy (METI)

1.2. Energy Policy

'The Long-term Energy Supply and Demand Outlook' states that energy consumption in 2010 FY will remain almost unchanged compared with that of 1999 as a result of the following measures: (1) following up on Keidanren's voluntary action plan, (2) improving the efficiency of energy-consuming equipment by introducing "the top-runner method" (the Revised Law Concerning the Rational Use of Energy), and (3) changing people's lifestyles to place a greater emphasis on energy conservation. Meanwhile, on the supply side, Japan will make maximum efforts to introduce non-fossil fuel energy sources, and will tenaciously promote the development of nuclear power as a leading part of non-fossil fuels while thoroughly ensuring its safety. Because of economic restrictions, new energy sources cannot immediately replace existing forms of energy supply. However, Japan must endeavour to expand the introduction of new energy sources as much as possible through the improvement of their performance and cost reduction.

The two oil shocks in 1973 and 1979 had a direct impact on Japan's vulnerable energy structure and inflicted considerable damage on Japan's economy. Because of the first oil crisis, the Japanese government introduced the following emergency measures: Approval of Oil Emergency Measures (1973), Enactment of Two Emergency Laws (1973), Participation in IEA (1974), and Enactment of

the Petroleum Stockpiling Law (1975). The first oil crisis prompted the Japanese government not only to formulate various emergency measures as stated above, but also to change the basic philosophy of its energy policy. In 1975, the Advisory Committee for Energy, an advisory council for the Minister of International Trade and Industry, submitted a report suggesting that developing a stable supply of energy should be regarded as the top priority. On the basis of this report, the following five policy pillars were set up: reducing oil dependency, diversification of non-oil energy supplies, securing a stable supply of oil through petroleum reserves, exploration and development of oil by Japanese companies, promotion of energy conservation, and promotion of new energy R&D. In order to strengthen energy conservation, "The Law Concerning the Rational Use of Energy" was enacted in 1979. In 1974, the Sunshine Project was implemented to promote the development of new energy technologies such as solar energy, geothermal energy, coal liquefaction, coal gasification and hydrogen energy. Various alternative energy policy measures were introduced after the second oil crisis. In 1980, “The Law Concerning the Promotion of Development and Introduction of Alternative Energy” was enacted.

1.3. The Electricity System

The Electricity Industry Committee, comprised of non-governmental professionals and experts including some from electric power companies, provides advice and recommendations to The Ministry of Economy, Trade and Industry (METI) on a regular basis, regarding the basic national policies on regional network operations for the stable supply of power, promotion of demand-oriented energy-saving measures, promotion of load levelling, further development of electric power, etc. Based on this advice, METI and related Ministries and Agencies confer regularly with individual power companies to review the up-to-date demand and supply performances and to evaluate the power supply program for the future.

Japan is divided into nine geographical zones with an electric power company in each zone. These are private enterprises that specialize only in electric utility operations and are the main power suppliers in each zone. Apart from these, there is also the Okinawa Electric Power Company, a smaller electric utility company operating in Okinawa Prefecture, which comprises many small islands. These power companies run their own facilities from power generation to transmission and distribution as an integrated business operation.

The Electric Power Development Company, which has its own thermal and hydro electric power stations, and the Japan Atomic Power Company, which has its own nuclear power stations, are other private enterprises that produce electric power and act as wholesalers to the nine electric power companies. However, in relation to Japan's total installed capacity, their installed capacity is relatively small.

Table 5 shows the electricity production and the installed capacity.

With the amendment of the Electricity Utility Industry Law in 2000, a number of system reforms were implemented, such as partial liberalization of the retail supply to extra high-voltage customers. To improve competitiveness, the government established fair and equal rules allowing suppliers other than electric utilities (new entrants) to use power transmission lines owned by power utilities (“wheeling rules”). Also, electric utilities are obliged to notify METI of the wheeling service rates.

TABLE 5. ELECTRICITY PRODUCTION AND INSTALLED CAPACITY

	1960	1970	1980	1990	2000	2001	Average annual growth rate (%) 1960 to 1980	Average annual growth rate (%) 1980 To 2001
Electricity production (TW.h)								
- Total [1]	67.36	132.00	577.52	857.27	901.56	934.9	11.34	2.34
- Thermal	8.88	47.08	401.75	573.27	495.92	548.1	21.00	1.21
- Hydro	58.48	80.09	92.09	95.84	97.14	86.0	2.30	0.25
- Nuclear		4.58	82.59	186.42	304.87	294.0		6.69
- Geothermal		0.24	1.09	1.74	3.58	3.4		5.93
Capacity of electrical plants (GWe)								
- Total	14.89	30.01	143.70	194.73	250.92	233.47	12.00	2.82
- Thermal	2.21	8.65	98.07	125.74	160.88	142.31	20.87	2.55
- Hydro	12.68	19.99	29.78	37.83	45.83	44.90	4.36	2.14
- Nuclear		1.34	15.69	30.89	43.49	45.74		5.07
- Geothermal		0.03	0.16	0.27	0.72	0.52		7.98
- Wind					0.01			

[1] *Electricity losses are not deducted.*

Source: IAEA Energy and Economic Database.

2. NUCLEAR POWER SITUATION

2.1. Historical Development and Current Nuclear Power Organizational Structure

2.1.1. Overview

Enactment of the Atomic Energy Law (1955) introduced the promotion of atomic energy development and utilization toward peaceful objectives in compliance with the three basic principles of Democratic Management, Voluntary Action, and Open Information. Inauguration of the Atomic Energy Commission (1956) established an advisory board for the Prime Minister on matters regarding promotion of atomic energy development and utilization.

Long-term program for Research, Development and Utilization of Nuclear Energy (Long-term Program) was formulated in 1956. Today, it is the basic program for the nation on nuclear power development and utilization. The plan is revised and updated every five years.

The Ministry of International Trade and Industry (the former METI) was reorganized in 1966 to accommodate its increasing workload. This change provided additional rules and regulations for the introduction of commercial light water reactors in Japan after 1966.

In 1974, three basic laws for the promotion of electric power development were made into law; namely, the “Law for the Adjustment of Areas Adjacent to Power-Generating Facilities,” the “Electric Power Development Promotion Tax Law,” and the “Special Account Law for Electric Power Promotion.” These laws also advanced the appropriate siting of nuclear power stations.

In 1978, the Nuclear Safety Commission was formed as a separate entity from the Atomic Energy Commission. Safety assurance measures were enhanced in 1980 in order to reflect the lessons learned from the TMI-2 Accident (1979) and, later, the Chernobyl No. 4 Accident in 1986.

The overall appraisal of the Vision of Nuclear Power in 1986 provided long-range prospects of energy availability and electric power requirements through 2030, and a program for enhancement of safety called “Safety 21,” which further reinforced safety assurance measures. In 1990, Japan revised its supply targets to include alternative energy sources to mitigate its growing demand for oil and its part in the greenhouse effect.

In 2001, the Nuclear and Industrial Safety Agency (NISA) was formed as a separate entity from the Agency of Natural Resources and Energy of the Ministry of Economy, Trade and Industry (or METI, which was renamed from the Ministry of International Trade and Industry or MITI), to hold jurisdiction over matters of nuclear and industrial safety.

2.1.2. Current Organizational Chart

Figure 2 shows Japan's organization chart in nuclear power, comprising government regulatory authorities, electric power companies and contracting engineers/suppliers.

The Japanese government carried out administrative reform in January 2001. The Atomic Energy Commission and Nuclear Safety Commission (NSC) of the Cabinet Office gives high-level independent and proper directions to other ministries and agencies.

The Ministry of Education, Culture, Sports, Science and Technology (MEXT) was created through a merger between the former Ministry of Education, Science, Sports and Culture and the Science and Technology Agency (STA). In MEXT, three Bureaus and four Divisions are in charge of nuclear energy. MEXT is responsible for the administration of nuclear energy for science and technology. Its key roles are nuclear research and development (including nuclear fuel cycle, FBR, quantum research, fusion, and accelerators), utilization of radiation and radioisotopes, nuclear liability, safety regulation and disaster prevention for nuclear reactors for testing and research, use of nuclear fuel material, and regulation for ensuring peaceful use and safeguards. It is also responsible for supervision of the National Institute of Radiological Science, the Japan Atomic Energy Research Institute and the Japan Nuclear Cycle Development Institute.

The Ministry of Economy, Trade and Industry (METI) will be in charge not only of those areas that it had been involved in previously - as the Ministry of International Trade and Industry (MITI) – or taken over from STA – related to the nuclear fuel cycle business (refining, enrichment, fabrication, reprocessing and waste disposal), but also regulation of nuclear reactors including Monju and Fugen, that are in the research and development stage for use in generating electricity. Nuclear power-related issues will continue to be the responsibility of the Agency of Natural Resources and Energy. In addition, the Nuclear and Industrial Safety Agency (NISA), with its ten sections related to nuclear energy, was added as a special institution, to play a central role in safety regulations for industrialized nuclear power. NISA is responsible for regulating nuclear safety. The drafting of safety regulations and the licensing of milling and refining, nuclear fuel fabrication, spent nuclear fuel reprocessing and storage, disposal of radioactive waste and decommissioning of nuclear power plants, are now carried out by NISA. A double check system of safety review of nuclear facilities by NSC and NISA or MEXT is continuously adopted.

The Ministry of Foreign Affairs (MoFA) is responsible for the international aspect of nuclear energy utilization, including the implementation of the related international treaties and conventions.

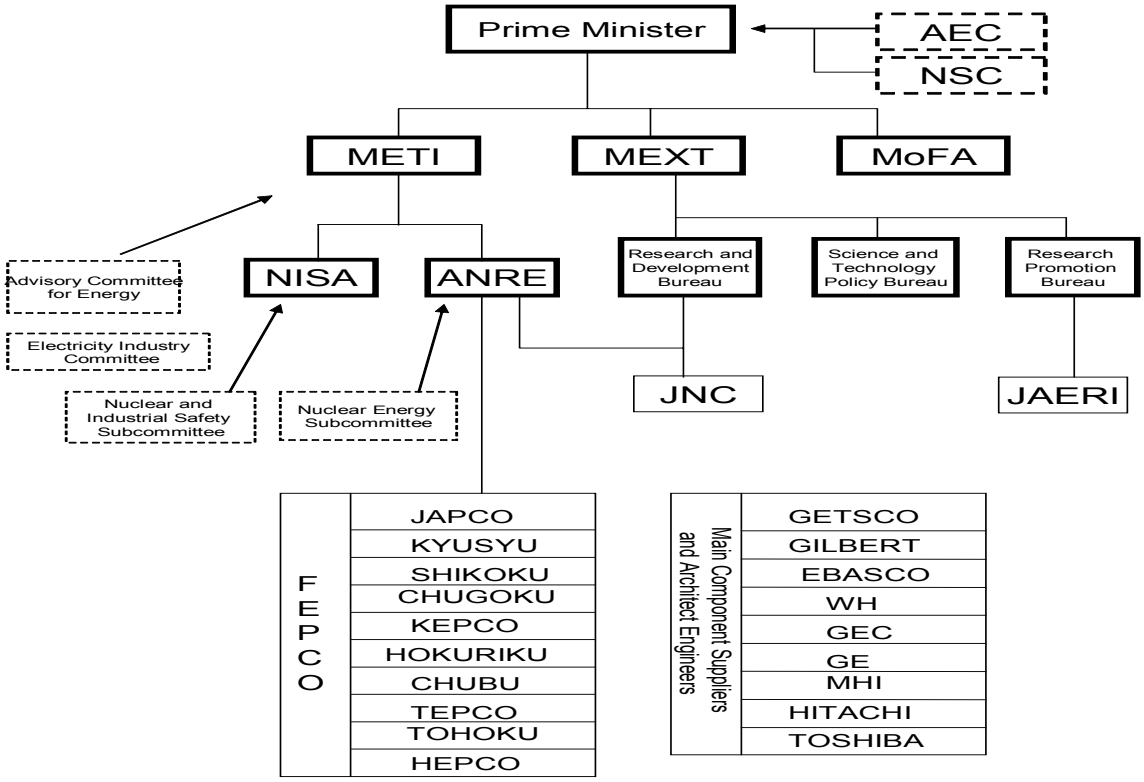


FIG.2. Japan's Organization Chart

Legend to Figure 2:

AEC: Atomic Energy Commission
NSC: Nuclear Safety Commission
METI: Ministry of Economy, Trade and Industry
ANRE: Agency of Natural Resources and Energy
NISA: Nuclear and Industrial Safety Agency
MEXT: Ministry of Education, Culture, Sports, Science and Technology
MoFA: Ministry of Foreign Affairs
JAERI: Japan Atomic Energy Research Institute
JNC: Japan Nuclear Cycle Development Institute
FEPCO: Federation of Electric Power Companies
HEPCO: Hokkaido Electric Power Co.
TOHOKU: Tohoku Electric Power Co.
TEPCO: Tokyo Electric Power Co.
CHUBU: Chubu Electric Power Co.
HOKURIKU: Hokuriku Electric Power Co.
KEPCO: Kansai Electric Power Co.
CHUGOKU: Chugoku Electric Power Co.
SHIKOKU: Shikoku Electric Power Co.
KYUSHU: Kyushu Electric Power Co.
JAPCO: The Japan Atomic Power Co.
TOSHIBA: Toshiba Corporation
HITACHI: Hitachi Ltd.
MHI: Mitsubishi Heavy Industries Ltd.
GE: General Electric Co.
GEC: The General Electric Co. Ltd.
WH: Westinghouse Electric Corporation
EBASCO: Ebasco Services Incorporated
GILBERT: Gilbert/Commonwealth International
GETSCO: General Electric Technical Services Co.

TABLE 6. STATUS OF NUCLEAR POWER PLANTS

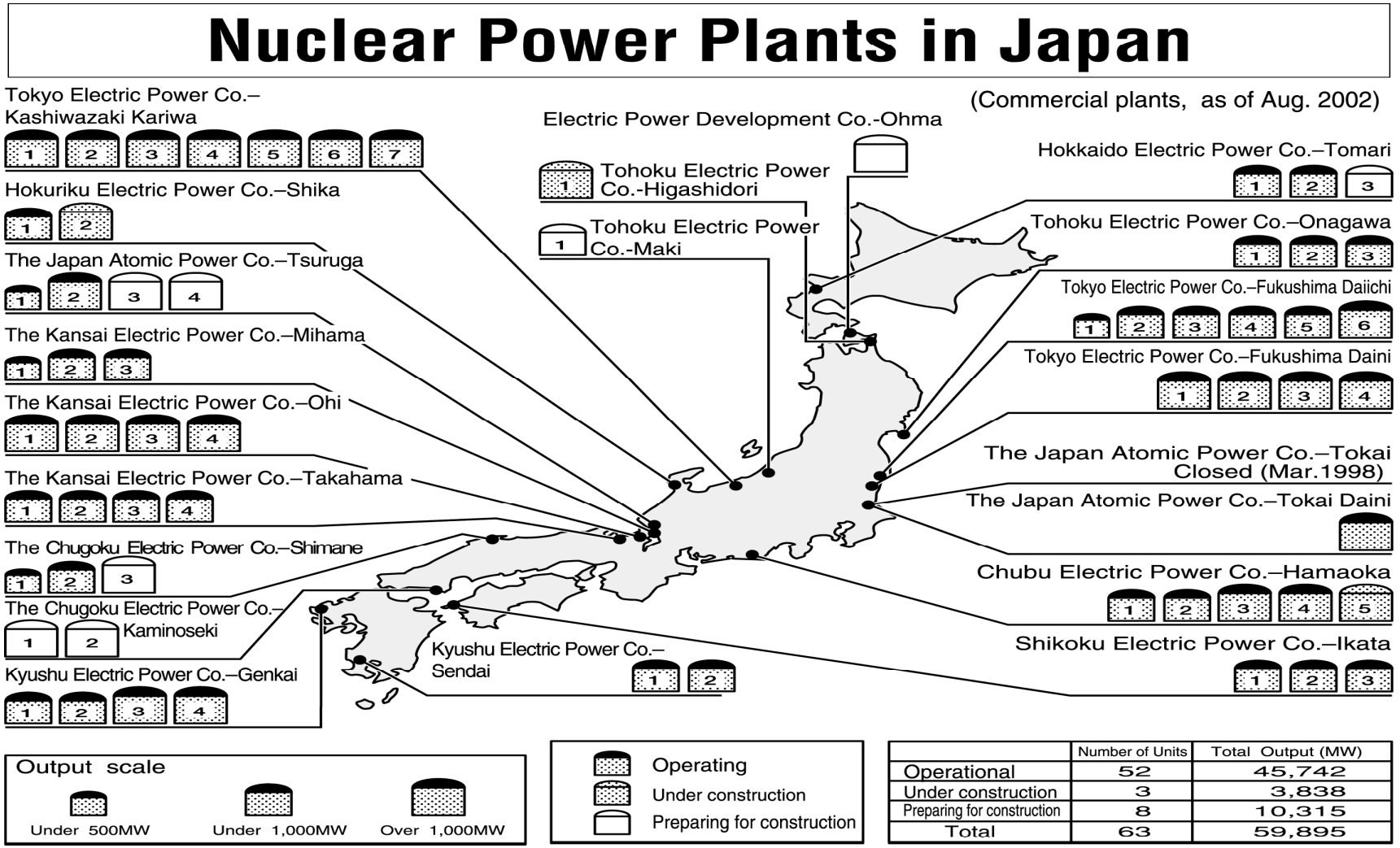
Station	Type	Capacity (Net) (MWe)	Operator	Status	Reactor Supplier	Construction Date	Criticality Date	Grid Date	Commercial Date	Decomission Date
FUKUSHIMA-DAIICHI-1	BWR	439	TEPCO	Operation	GE	25-Jun-67	10-Oct-70	17-Nov-70	26-Mar-71	
FUKUSHIMA-DAIICHI-2	BWR	760	TEPCO	Operation	GE/TOSHIBA	09-Jun-69	10-May-73	24-Dec-73	18-Jul-74	
FUKUSHIMA-DAIICHI-3	BWR	760	TEPCO	Operation	TOSHIBA	28-Dec-70	06-Sep-74	26-Oct-74	27-Mar-76	
FUKUSHIMA-DAIICHI-4	BWR	760	TEPCO	Operation	HITACHI	12-Feb-73	28-Jan-78	24-Feb-78	12-Oct-78	
FUKUSHIMA-DAIICHI-5	BWR	760	TEPCO	Operation	TOSHIBA	22-May-72	26-Aug-77	22-Sep-77	18-Apr-78	
FUKUSHIMA-DAIICHI-6	BWR	1067	TEPCO	Operation	GE/TOSHIBA	26-Oct-73	09-Mar-79	04-May-79	24-Oct-79	
FUKUSHIMA-DAINI-1	BWR	1067	TEPCO	Operation	TOSHIBA	16-Mar-76	17-Jun-81	31-Jul-81	20-Apr-82	
FUKUSHIMA-DAINI-2	BWR	1067	TEPCO	Operation	HITACHI	25-May-79	26-Apr-83	23-Jun-83	03-Feb-84	
FUKUSHIMA-DAINI-3	BWR	1067	TEPCO	Operation	TOSHIBA	23-Mar-81	18-Oct-84	14-Dec-84	21-Jun-85	
FUKUSHIMA-DAINI-4	BWR	1067	TEPCO	Operation	HITACHI	28-May-81	24-Oct-86	17-Dec-86	25-Aug-87	
GENKAI-1	PWR	529	KYUSHU	Operation	MHI	15-Sep-71	28-Jan-75	14-Feb-75	15-Oct-75	
GENKAI-2	PWR	529	KYUSHU	Operation	MHI	01-Feb-77	21-May-80	03-Jun-80	30-Mar-81	
GENKAI-3	PWR	1127	KYUSHU	Operation	MHI	01-Jun-88	28-May-93	15-Jun-93	18-Mar-94	
GENKAI-4	PWR	1127	KYUSHU	Operation	MHI	15-Jul-92	23-Oct-96	12-Nov-96	25-Jul-97	
HAMAOKA-1	BWR	515	CHUBU	Operation	TOSHIBA	10-Jun-71	20-Jun-74	13-Aug-74	17-Mar-76	
HAMAOKA-2	BWR	806	CHUBU	Operation	TOSHIBA	14-Jun-74	28-Mar-78	04-May-78	29-Nov-78	
HAMAOKA-3	BWR	1056	CHUBU	Operation	TOSHIBA	18-Apr-83	21-Nov-86	20-Jan-87	28-Aug-87	
HAMAOKA-4	BWR	1092	CHUBU	Operation	TOSHIBA	13-Oct-89	02-Dec-92	27-Jan-93	03-Sep-93	
IKATA-1	PWR	538	SHIKOKU	Operation	MHI	15-Jun-73	29-Jan-77	17-Feb-77	30-Sep-77	
IKATA-2	PWR	538	SHIKOKU	Operation	MHI	21-Feb-78	31-Jul-81	19-Aug-81	19-Mar-82	
IKATA-3	PWR	846	SHIKOKU	Operation	MHI	01-Nov-86	23-Feb-94	29-Mar-94	15-Dec-94	
KASHIWAZAKI KARIWA-1	BWR	1067	TEPCO	Operation	TOSHIBA	05-Jun-80	12-Dec-84	13-Feb-85	18-Sep-85	
KASHIWAZAKI KARIWA-2	BWR	1067	TEPCO	Operation	TOSHIBA	18-Nov-85	30-Nov-89	08-Feb-90	28-Sep-90	
KASHIWAZAKI KARIWA-3	BWR	1067	TEPCO	Operation	TOSHIBA	20-Jun-85	19-Oct-92	08-Dec-92	11-Aug-93	
KASHIWAZAKI KARIWA-4	BWR	1067	TEPCO	Operation	HITACHI	07-Mar-89	01-Nov-93	21-Dec-93	11-Aug-94	
KASHIWAZAKI KARIWA-5	BWR	1067	TEPCO	Operation	HITACHI	05-Mar-90	20-Jul-89	12-Sep-89	10-Apr-90	
KASHIWAZAKI KARIWA-6	ABWR	1315	TEPCO	Operation	TOSHIBA/GE	03-Nov-92	18-Dec-95	29-Jan-96	07-Dec-96	
KASHIWAZAKI KARIWA-7	ABWR	1315	TEPCO	Operation	HITACHI/GE	01-Jul-93	01-Nov-96	17-Dec-96	02-Jul-97	
MIHAMA-1	PWR	320	KEPCO	Operation	WH	01-Feb-67	29-Jul-70	08-Aug-70	28-Nov-70	
MIHAMA-2	PWR	470	KEPCO	Operation	WH/MHI	29-May-68	10-Apr-72	21-Apr-72	25-Jul-72	
MIHAMA-3	PWR	780	KEPCO	Operation	MHI	07-Aug-72	28-Jan-76	19-Feb-76	01-Dec-76	

Source: Informed Data from Japan to IAEA Power Reactor Information System as of 31-Jan-2003; Nuclear Power Plants In The World 2002, Japan Atomic Industrial Forum ; Outlook of Electric Supply Plan (March 2003), METI

TABLE 6. STATUS OF NUCLEAR POWER PLANTS (Continued)

Station	Type	Capacity (Net) (MWe)	Operator	Status	Reactor Supplier	Construction Date	Criticality Date	Grid Date	Commercial Date	Decommission Date
MONJU	FBR	246	JNC	Under Construction	MHI	10-May-86	05-Apr-94	29-Aug-94		
OHI-1	PWR	1120	KEPCO	Operation	WH	26-Oct-72	02-Dec-77	23-Dec-77	27-Mar-79	
OHI-2	PWR	1120	KEPCO	Operation	WH	08-Dec-72	14-Sep-78	11-Oct-78	05-Dec-79	
OHI-3	PWR	1127	KEPCO	Operation	MHI	03-Oct-87	17-May-91	07-Jun-91	18-Dec-91	
OHI-4	PWR	1127	KEPCO	Operation	MHI	13-Jun-88	28-May-92	19-Jun-92	02-Feb-93	
ONAGAWA-1	BWR	498	TOHOKU	Operation	TOSHIBA	08-Jul-80	18-Oct-83	18-Nov-83	01-Jun-84	
ONAGAWA-2	BWR	796	TOHOKU	Operation	TOSHIBA	12-Apr-91	02-Nov-94	23-Dec-94	28-Jul-95	
ONAGAWA 3	BWR	796	TOHOKU	Operation	TOSHIBA	23-Jan-98	26-Apr-01	30-May-01	30-Jan-02	
SENDAI-1	PWR	846	KYUSHU	Operation	MHI	15-Dec-79	25-Aug-83	16-Sep-83	04-Jul-84	
SENDAI-2	PWR	846	KYUSHU	Operation	MHI	12-Oct-81	18-Mar-85	05-Apr-85	28-Nov-85	
SHIKA-1	BWR	505	HOKURIKU	Operation	HITACHI	01-Jul-89	20-Nov-92	12-Jan-93	30-Jul-93	
SHIMANE-1	BWR	439	CHUGOKU	Operation	HITACHI	02-Jul-70	01-Jun-73	02-Dec-73	29-Mar-74	
SHIMANE-2	BWR	789	CHUGOKU	Operation	HITACHI	02-Feb-85	25-May-88	11-Jul-88	10-Feb-89	
TAKAHAMA-1	PWR	780	KEPCO	Operation	WH	25-Apr-70	14-Mar-74	27-Mar-74	14-Nov-74	
TAKAHAMA-2	PWR	780	KEPCO	Operation	MHI	09-Mar-71	20-Dec-74	17-Jan-75	14-Nov-75	
TAKAHAMA-3	PWR	830	KEPCO	Operation	MHI	12-Dec-80	17-Apr-84	09-May-84	17-Jan-85	
TAKAHAMA-4	PWR	830	KEPCO	Operation	MHI	19-Mar-81	11-Oct-84	01-Nov-84	05-Jun-85	
TOKAI-2	BWR	1056	JAPCO	Operation	GE	03-Oct-73	18-Jan-78	13-Mar-78	28-Nov-78	
TOMARI-1	PWR	550	HEPCO	Operation	MHI	02-Jul-85	16-Nov-88	06-Dec-88	22-Jun-89	
TOMARI-2	PWR	550	HEPCO	Operation	MHI	05-Aug-86	25-Jul-90	27-Aug-90	12-Apr-91	
TSURUGA-1	BWR	341	JAPCO	Operation	GE	24-Nov-66	03-Oct-69	16-Nov-69	14-Mar-70	
TSURUGA-2	PWR	1115	JAPCO	Operation	MHI	06-Nov-82	28-May-86	19-Jun-86	17-Feb-87	
TSURUGA-3	APWR	1538(Gross)	JAPCO	Planned		2006			2011	
TSURUGA-4	APWR	1538(Gross)	JAPCO	Planned		2006			2011	
HIGASHI DORI 1	BWR	1067	TOHOKU	Under Construction	TOSHIBA	24-Dec-98			Jul-05	
MAKI	BWR	796	TOHOKU	Planned		2006			2012	
SHIKA-2	ABWR	1358(Gross)	HOKURIKU	Under Construction	HITACHI	27-Aug-99			01-Mar-06	
HAMAOKA-5	ABWR	1325	CHUBU	Under Construction	TOSHIBA	19-March-99			01-Aug-05	
OMA	ABWR	1383(Gross)	Electric Power Development	Planned		Mar-05			Jul-10	
KAMINOSEKI-1	ABWR	1373(Gross)	CHUGOKU	Planned		2007			2012	
KAMINOSEKI-2	ABWR	1373(Gross)	CHUGOKU	Planned		2010			2015	
TOMARI-3	PWR	866	HEPCO	Planned		2003			2009	
SIMANE-3	ABWR	1373(Gross)	CHUGOKU	Planned		2004			2010	
JPDR-II	BWR	13	JAERI	Decommission	GE	01-Dec-60	22-Aug-63	26-Oct-63	26-Oct-63	06-Dec-82
TOKAI-1	GCR	159	JAPCO	Decommission	GEC	01-Mar-61	04-May-65	10-Nov-65	25-Jul-66	31-Mar-98

Source: Informed Data from Japan to IAEA Power Reactor Information System as of 31-Jan-2003 ; Nuclear Power Plants In The World 2002, Japan Atomic Industrial Forum ; Outlook of Electric Supply Plan (March 2003), METI



	Number of Units	Total Output (MW)
Operational	52	45,742
Under construction	3	3,838
Preparing for construction	8	10,315
Total	63	59,895

Fig. 3. Nuclear Power Statins in Japan

2.2. Nuclear Power Plants: Status of and Trends in Nuclear Power

2.2.1. Status of nuclear power plants

Table 6 and Figure 3 provide lists and locations of the nuclear power plants in operation, under construction and firmly planned, together with those out of service in Japan. As of the end of the fiscal year 2002, the total capacity of nuclear power generation is 45,742 MWe. The total capacity of nuclear power generation of plants under construction and firmly planned are 3,838 MWe (three plants) and 10,290 MWe (eight plants), respectively.

2.2.2. Performance of NPPs

Table 7 shows trends in the capacity factor by reactor type.

TABLE 7. TREND OF CAPACITY FACTOR (%)

	1988	1990	1995	1999	2000	2001	2002
Reactor Type							
-BWR	72,1 (18)	68.1 (37)	84.8 (49)	81.8 (28)	79.0 (28)	78.6 (28)	71.9 (29)
-PWR	68.4 (16)	75.3 (17)	74.2 (22)	79.1 (23)	83.3 (23)	84.3 (23)	87.3 (23)
-GCR	73.6 (1)	64.9 (1)	60.5 (1)	-	-		-
( ) : number of operating reactors	70.4 (35)	71.2 (39)	79.9 (49)	80.6 (51)	80.9 (51)	81.0 (51)	78.4 (52)
Average							

Source: METI Nuclear Data (August 2003)

2.2.3. Plant upgrading and plant life management

In Japan, nearly 30 years have passed since some power plants started operation. There is no indication of an increase in problems, but people are very concerned about the aging of nuclear power plants. In April 1996, MITI (formerly, METI) announced the "Basic Concepts on Aging of Nuclear Power Plants," which comprised two ideas: 1) MITI had the outlook that existing plants could be operated for a long term after MITI had made a technical evaluation of instruments as crucial factors in long-term operations; the instruments were important from the viewpoint of safety, but not easy to replace or repair, and 2) MITI requested that power companies should carry out technical evaluation and make long-term maintenance plans for each instrument including replaceable ones in plants by 30 years from the start of their operations.

MITI adjusted these concepts as specific measures in February 1999. According to these, electric companies reported to METI technical evaluations and long-term maintenance plans in 1999 and 2001, and METI judged the report to be appropriate.

2.2.4. Nuclear power development projections and plans

Table 8 lists future nuclear power plants to be built at either new or existing sites in Japan.

TABLE 8. EXPANSION OF NPPS IN FUTURE

Power Plant Name	Owner Name	Gross Capacity MW	Construction Start (FY)	Commissioning (FY)	Note
Namie Kodaka	TOHOKU	825	2009	2014	
Higashi-Dori	TOHOKU	1385	2007	2012	
Fukushima Daiichi-7	TEPCO	1380	2005-4	2009 -10	BWR
Fukushima Daiichi-8	TEPCO	1380	2005-4	2010 -10	BWR
Higashi-Dori-1	TEPCO	1385	2005	2011	
Higashi-Dori-2	TEPCO	1385	2005	2011	
SUZU-1	HOKURIKU	1350	2009	2014	
SUZU-2	HOKURIKU	1350	2009	2014	
Total 8 Power Plants		10,440			

Source: Outlook of Electric Power Supply Plan, METI (March 2003, FY)

The development of light-water reactors in Japan began with PWRs from Westinghouse and BWRs from G.E. As nuclear power technologies are incorporated by the domestic industry, successive expansion projects of nuclear power plants are of Japanese design and construction. Today, Toshiba, Hitachi and Mitsubishi Heavy Industries have emerged as Japan's representative suppliers of nuclear steam supply systems (NSSS). Construction of nuclear power plants is made possible by an industrial system with one or more of the above-mentioned three companies acting as the prime contractor (s), and forming a joint venture with contract engineers or construction companies as subcontractors.

The development of the Advanced Boiling Water Reactor (ABWR) started in 1978 as a project of international co-operation among five BWR vendors. The resulting conceptual design plan was highly evaluated by TEPCO and other Japanese utilities, and as a result, the ABWR was included in the third standardization program starting in 1981. The preliminary design and numerous development and verification tests were carried out by Toshiba, Hitachi and GE together with six Japanese utilities and the Japanese government. Two ABWRs, the Kashiwazaki-Kariwa Units 6 and 7, were ordered by TEPCO and began successful commercial operation in November 1996 and July 1997, respectively. Two more ABWRs are under construction at Hamaoka-5 and Shika-2, another ABWR is under licensing review at Ohma-1, and eight more ABWRs are in the planning stage. These eight future ABWRs will achieve a significant reduction in generation costs compared to the current ABWRs. The cost reduction is to be obtained by the following means: standardization, design modifications, and improvements in project management. In addition, all of the experience of the ABWRs currently operating will contribute to cost reduction.

2.2.5. Decommissioning information and plans

It is Japan's fundamental policy to dismantle and remove decommissioned nuclear power generation facilities that have completed their service life, while ensuring complete safety in that process. Based on this fundamental policy, the standard procedure (standard work schedule) is one of ‘safe storage plus disassembly/removal’. It is appropriate to choose a safe storage period of five to ten years and a disassembly/removal period of three to four years.

The estimated cost of reactor decommissioning in Japan (referring to precedents in other countries), is approximately 30 billion yen (1984 prices) for a 1,100 MW-class nuclear power plant, when its safe storage period is five years. The Agency of Natural Resources and Energy is implementing verification tests of reactor decommissioning technology such as techniques of decommissioning waste processing, and techniques of reactor remote dismantling, which are important in ensuring better safety and reliability.

2.3. Supply of NPPs

In Japan, five companies have provided steam generators for nuclear power plants: for BWRs these are Toshiba, Hitachi, G.E., and G.E. and Toshiba jointly, while for PWRs these are Mitsubishi, Westinghouse, and Westinghouse and Mitsubishi jointly.

Many companies are capable of supplying equipment and services to Japan's nuclear power industry. These range from the suppliers of major equipment and machinery to those supplying ordinary equipment or offering engineering services. They also include firms related to the nuclear fuel cycle or nuclear fuel recycling.

2.4. Operation of Nuclear Power Plants

Figure 2 shows the nine electric power companies which operate commercial light water reactors, and one company which is a producer and wholesaler of electricity from nuclear power in Japan.

Regarding nuclear power plant operator training in Japan, both the BWR and PWR groups have their own training centres. These were financed, built and utilized jointly by the member companies of each group, comprising electric power companies and contracted engineering firms. In addition, each electric power company has its own training facility. Engineering qualification tests for operator certification are conducted at training centres operated jointly by the member companies.

The representative suppliers of Japan's maintenance services are Toshiba, Hitachi and Mitsubishi. The electric power companies make contracts with these maintenance service companies. Efforts are made to enable the contractors to assume responsibility for repair and maintenance services for their nuclear power plants.

2.5. Fuel Cycle and Waste Management Service Supply

Fuel cycle activities in Japan comprise enrichment, conversion, fuel fabrication, zircaloy cladding, reprocessing and radioactive waste activities. Figure 4 shows the enterprises involved.

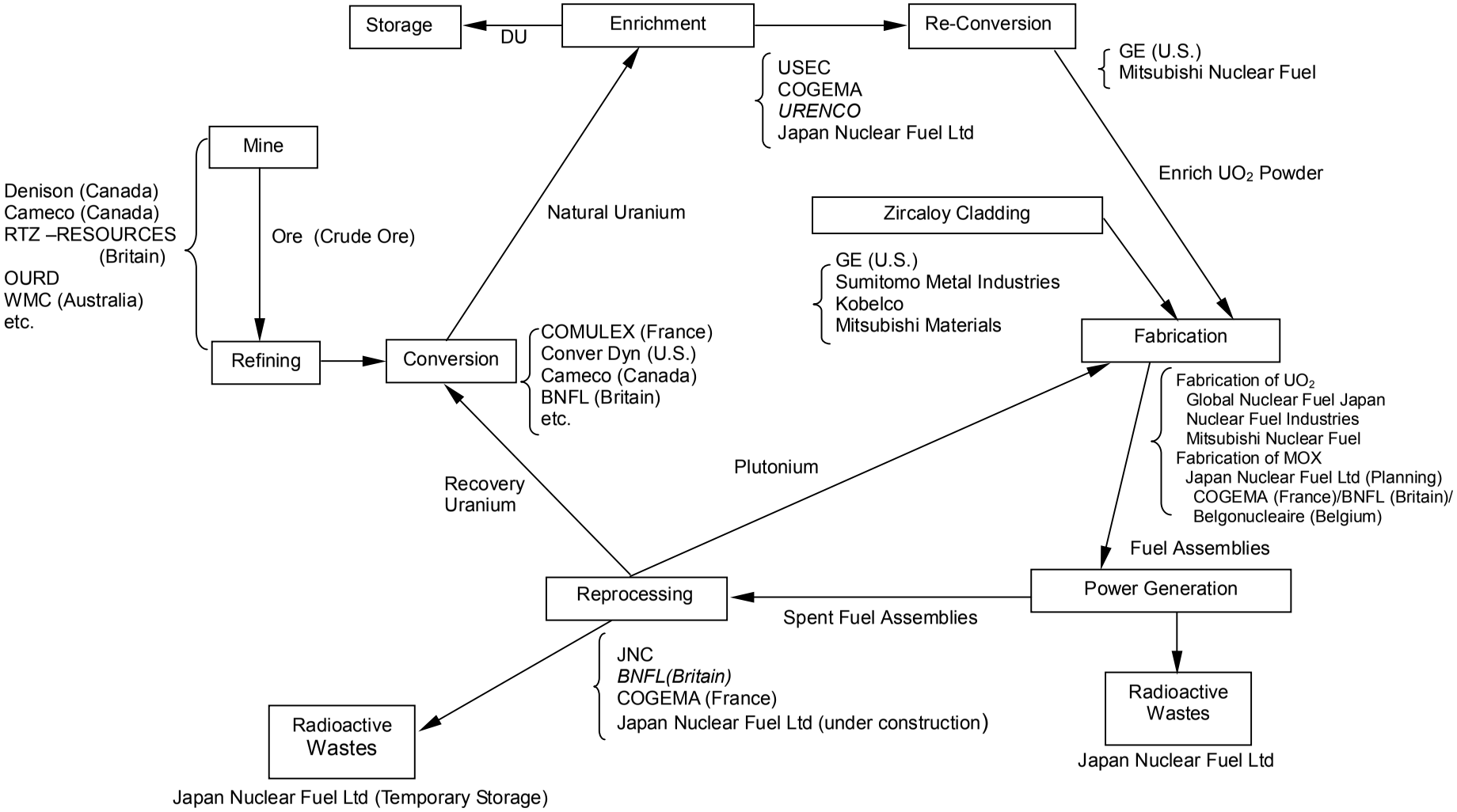


FIG. 4. Nuclear Fuel Cycle Diagram

2.6. Research and Development

2.6.1. R&D Organizations and Institutes

The Atomic Energy Commission (AEC), amongst other responsibilities, advises on R&D. The long-term program for the development and use of nuclear energy is revised by the AEC every five years; the latest revision was published in November 2000. Government responsibilities for R&D are shared between the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the Ministry of Economy, Trade and Industry (METI). MEXT is responsible for planning and administration regarding nuclear energy for science and technology. It has three bureaus, each with several divisions. MEXT plays a key role in nuclear research and development of many areas, including the nuclear fuel cycle, FBR, fusion research and accelerators. MEXT supervises the work of the Japan Nuclear Cycle Development Institute (JNC), which was established in 1998, and also that of the Japan Atomic Energy Research Institute (JAERI), established in 1956. JNC is the main channel for the development of advanced reactors and establishment of the fuel cycle. In both there is close collaboration with the private sector, including shared funding on some projects. Since 1985, the Nuclear Ship Research and Development Agency has been integrated in JAERI. The Agency of Natural Resources and Energy carries out various activities, which include studies of improvements in reactor design and approval of design modifications proposed by utilities, and decommissioning.

2.6.2. Development of advanced and new-generation nuclear reactor systems

In addition to the LWRs for power production, Japan is active in developing other types of reactors, such as small LWRs, HTGRs and FBRs. JAERI is developing an integral-type reactor with thermal power up to 300MW aiming at multi-purpose uses such as small-grid electricity generation, heat supply and desalination, on the basis of the MRX ship reactor design. Toshiba Corporation and the Tokyo Institute of Technology are developing a natural circulation, simplified LSBWR with passive safety systems and a long operating cycle: within 100 – 300 MWe power capacity and 15 years core life.

HTGR development is at the stage of operation and testing of a test reactor. The principal focus of Japan's HTGR development program is the High-Temperature Engineering Test Reactor (HTTR) in the JAERI at Oarai site, Ibaraki Pref. Initial criticality of the HTTR was achieved in November 1998. This 30 MW (th) helium-cooled reactor is being utilized to establish and upgrade the technology of advanced HTGR, and to demonstrate the effectiveness of selected high-temperature heat utilization systems. The HTTR accomplished a full power operation of 30 MWth and a gas temperature of 850 ℃ at the reactor outlet in December 2001.Also, a project has been initiated to develop a 600 MWth gas turbine HTGR design for electricity generation.

JNC is conducting research and development (R&D) on FBRs and nuclear fuel reprocessing technology to establish an economical nuclear fuel cycle. The experimental fast reactor (JOYO) operated from 1982 to 2000 with the MK-II core (100 MWt). The reactor and its cooling system was upgraded to the MK-III core (140 MWt) and attained its initial criticality in July 2003. The performance test to confirm its regular functions is progressing. The prototype LMFR MONJU with a capacity of 280 MW(e) reached initial criticality in April 1994, and was connected to the grid in August 1995. Reactor operation was interrupted in December 1995 due to a sodium leak in the non-radioactive secondary cooling system. Legal application for improvement of the MONJU plant, mainly for countermeasures against sodium leakage, was permitted in December 2002. The MONJU reactor is considered a cornerstone for R&D activities and considerable effort is being made to resume its operation. In addition to this mainstream development work, a Feasibility Study on Commercialized Fast Reactor Cycle Systems is in progress with the objective of presenting an optimal commercialization vision of LMFR technologies and a research and development program.

2.7. International Co-operation and Initiatives

Bilateral nuclear power co-operation agreements have been concluded for the purpose of promoting the peaceful use of nuclear power while ensuring that nuclear power equipment and materials, including nuclear materials, have solely peaceful applications. Japan has concluded such bilateral nuclear power co-operation treaties with six nations: the United States, Britain, France, Canada, Australia and the People's Republic of China. Under these agreements, the parties exchange expertise and information on the peaceful use of nuclear power, and provide and receive nuclear equipment, materials and services.

Japan cooperates with Asian and developing nations through the Forum for Nuclear Cooperation in Asia, under the framework of the Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology, and under various bilateral co-operation agreements.

Japan, together with some Western countries, provides technology safety assistance to former USSR nations, and Middle and Eastern Europe nations, under bilateral or multilateral frameworks.

. Implementation of Research and Development by International Co-operation

- Co-operation in the activities of international organizations
  - Activities with IAEA: Japan has contributed to development and revision of IAEA nuclaer safety standards by dispatching experts to CSS, NUSSC, WASSC, RASSC and TRANSSC. Regarding the Convention on Nuclear Safety and Joint Convention of the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management, Japan has dispatched experts from the draft planning stage. Japan has also participated in review activities after submission of National Reports.
  - Activities with OECD/NEA: Japan has dispatched representatives to committees such as CSNI, CRPPH, RWMC, and CNRA since their establishment.
- Multilateral co-operation
  - Based on agreements, bilateral co-operation conferences are held regularly to exchange opinions related to safety with USA, France, Korea and China. Japan has participated in other international co-operation research endeavours including the OECD Halden Reactor Project and COOPRA.

Table 9 shows Japan's co-operation with major international organisations.

TABLE 9. CO-OPERATION WITH INTERNATIONAL ORGANIZATIONS

Organization	Outline of co-operation
IAEA	Promotion of peaceful uses of atomic energy (safety-related co-operation, technical aid to developing countries and R&D), and provision of safeguards to ensure that nuclear activities are not transformed for military purposes. Japan participates positively in INSAG (International Nuclear Safety Advisory group), NUSSAC (Nuclear Safety Standard Advisory Committee), ASSET (Assessment of Safety Significant Event Team), OSART and special studies to evaluate the safety of reactors in the former USSR. Japan made an Extra-budgetary Contribution to the IAEA for 1) the Expanded program of public understanding of nuclear energy (EPPUNE), 2) Nuclear Safety and 3) Waste Management and Disposal.
OECD/NEA	The purpose is to provide useful information to member countries through technological study and mutual co-operation regarding common problems in nuclear energy use in advanced countries. Japan participates actively in CNRA (Committee for Nuclear Regulatory Activities), CSNI (Committee for Safety of Nuclear Installation), RWMC (Radioactive Waste Management Committee) and NDC (Committee for Technical and Economic Studies on Nuclear Energy Development and the Fuel Cycle).

3. NATIONAL LAWS AND REGULATIONS

3.1. Safety Authority and the Licensing Process

Figure 5 shows the process of approval of or permission for nuclear power plants in Japan, as of September 2003.

3.2. Main National Laws and Regulations Concerning Nuclear Power

Figure 6 shows the main laws controlling nuclear power plants in Japan as of September 2003.

For the installation of a commercial nuclear power plant, it is necessary to go through licensing procedures based on more than 30 laws. Many of the laws also apply to general industrial facilities.

The main nuclear-related laws and regulations are systematized according to organization, research and development, regulations, and compensation based on the Atomic Energy Laws, as shown in Fig. 5. Among them, laws concerning the safety regulations of reactors are the Law for Regulation of Nuclear Source Materials, Nuclear Fuel Materials and Reactors (hereafter called LRNR) and the Electricity Utilities Industry Law (hereafter called EUIL). The purpose of the LRNR is to enforce regulations based on the potential danger of nuclear reactors and nuclear substances, whereas EUIL aims to provide a good supply of electricity, ensuring the safety of hydroelectric power plants, thermoelectric power plants and power transmission lines as well as nuclear power plants, with a view to a stable supply of electricity. Thus, the two laws stand on different viewpoints.

The main nuclear-related laws and regulations are as follows:

1. The Atomic Energy Basic Law (1955.12.19 - Publications)

   The research, development and use of nuclear energy shall be limited to peaceful purposes only, to ensure safety. The Act prescribes three principles:

   1) Under democratic management
   2) Voluntarily
   3) Freely available information

   Nuclear-related laws and regulations are enacted based on the spirit of the Act.

2. The Law for the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors (1957.6.10 - Publications)

   The Law, usually abbreviated as LRNR, prescribes regulations necessary for the installation and operation of reactors, refining, processing, and disposal of nuclear waste. Following are the main regulations concerning the installation and operation of reactors:

   - Permission for reactor installation (basic design)
   - Permission for construction plan (detailed design)
   - Pre-use inspection
   - Notification of operation plan
   - Measures taken for safety
   - Approval of safety regulations
   - Appointment of Chief Reactor Engineer
   - Periodical inspections

   LRNR excludes permission for a construction plan, pre-use inspection and periodical inspection, for which the Electricity Utilities Industry Law applies.

3. The Electricity Utilities Industry Law (1964.7.11 - Publications)

The Law intends to protect benefits, ensure safety, and facilitate sound development of electricity utilities for users of electricity:

- Main regulations for nuclear power plants
- Permission for construction plan (detailed design)
- Pre-use inspection
- Periodical inspections
- Appointment of Chief Electric Engineer and Boiler and Turbine Engineers
- Decree of conformity with technical standards (and subordinate rules specifying technical standards)

4. The Law concerning Prevention of Radiation Hazards due to Radioisotopes, etc. (1957.6.10 - Publications)

The Law intends to prevent radiation hazards by regulating the use and disposal of radioisotopes and the use of radiation producers. In a nuclear power plant, the Law applies when neutron sources are used or radioisotopes are employed for calibration of equipment.

5. The Special Law for Nuclear Disaster Measures (1999.12.17 – Publications)

- Taking quick initial action and ensuring integrated co-operation from the governments of the nation, prefectures and municipalities
- Strengthening the national emergency preparedness system for response to nuclear disaster
- Clarification of undertaker's role in preventing nuclear disasters

6 The Law on Compensation for Nuclear Damage (1961.6.17 - Publication)

Nuclear energy enterprises (electric power companies) owe no-fault liability for compensation to the injured when nuclear damage is caused by the operation of nuclear reactors and the like. In such cases, liability focuses on the nuclear energy enterprises concerned.

Nuclear energy enterprises are compelled to deposit a fixed amount of money (30 billion yen at the most) to cover the cost of measures taken to implement compensation for damage:

- To make insurance contracts for compensation for damage with private insurers
- To execute an indemnity contract with the government

When damage is more than the deposited amount for compensation, the government will assist if necessary.

7. Electric Power Development Promotion Laws:
(1974.6.6 - Publications)

- Electric Power Development Promotion Tax Law
- Special Account Law for Electric Power Development Promotion
- Law for the Adjustment of Areas Adjacent to Power-Generating Facilities
- Law on Special Measures Concerning Promotion of the Development of Nuclear Power Site Regions

These Laws intend to promote electric power development by returning benefits gained for the whole country from a stable supply of electricity through the siting of a power plant, to the local area.

The Electric Power Development Promotion Tax Law is for collecting the tax of the promotion for Electric Power Development (according to electric power sold), the Special Account Law for Electric Power Development Promotion is for clarifying the government accounts of the uses of the tax revenue, the Law for the Adjustment of Areas Adjacent to Power-Generating Facilities is for smoothly setting up generating facilities by the promotion of public institutions, and the Special Account Law for Electric Power Development Promotion is to promote the development of nuclear power plant site regions by giving financial assistance and so on, focusing especially on protection against the spread of nuclear accidents.

8. Specified Radioactive Waste Final Disposal Act (2000.6.7 – Publications)

The law prescribes the establishment of implementation for disposal, a funding mechanism for securing disposal costs, and a three-step site selection process.

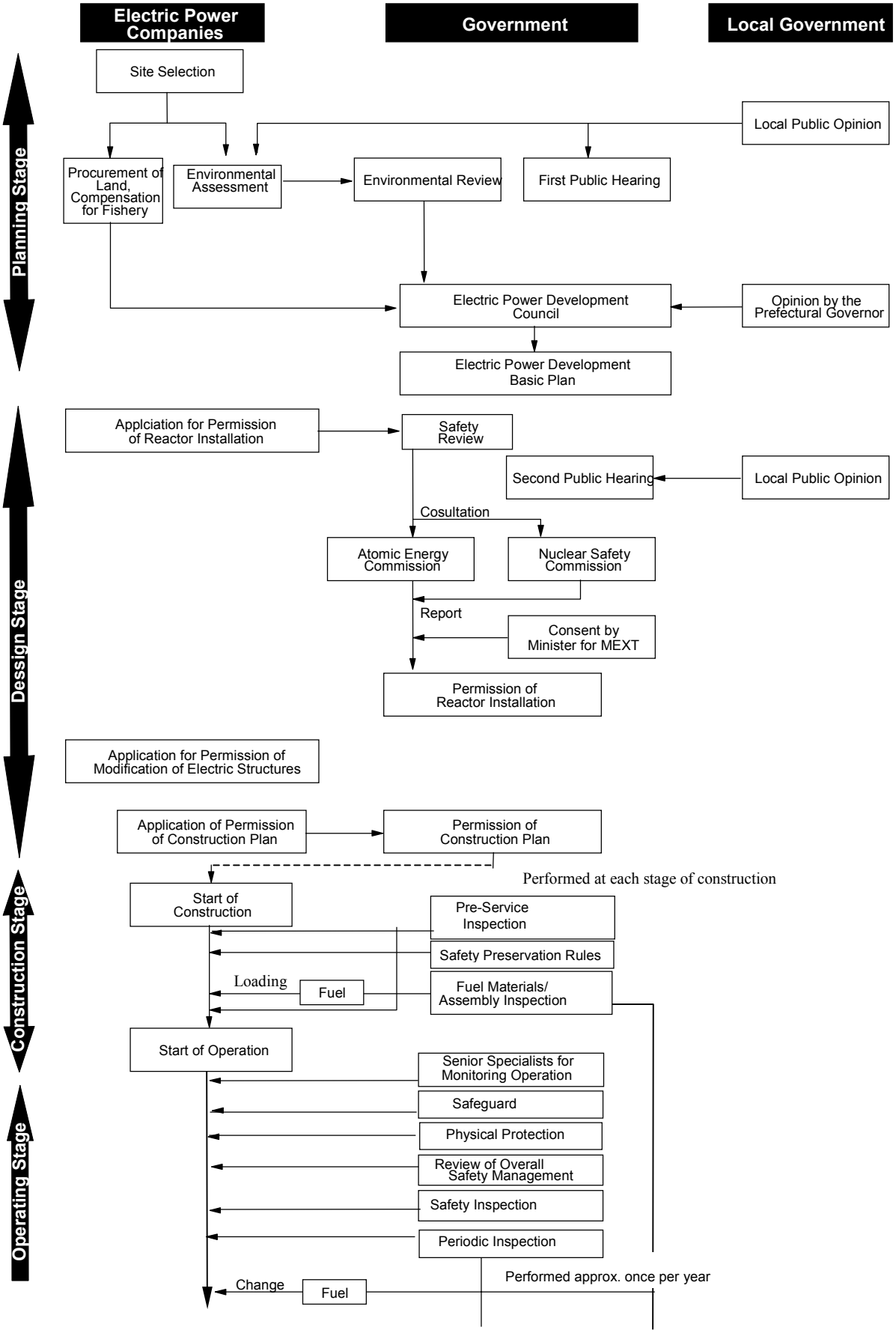


FIG. 5. Process of Approval or Permission of Nuclear Power Plant in Japan (As of September 2003)

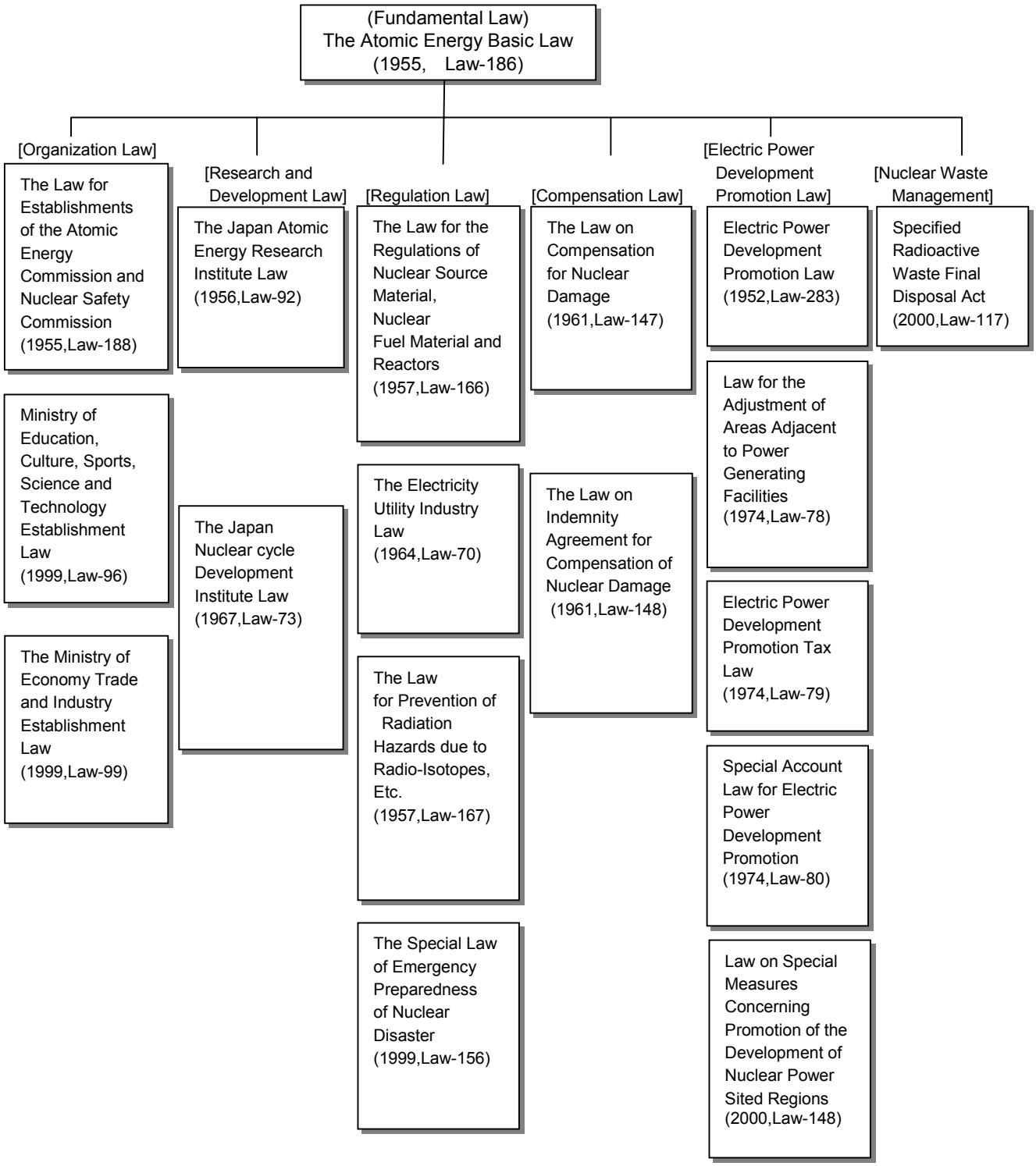


FIG. 6. Scheme Diagram of major Nuclear Laws in Japan (As of September 2003)

4. CURRENT ISSUES AND DEVELOPMENTS IN NUCLEAR POWER

4.1. Energy Policy

The Basic Law on Energy Policy-Making, which aims to indicate the general direction of future energy policies, was enacted in June 2002. Based on this law, the Advisory Committee of Natural Resources and Energy started examination of the Basic Plan for Energy Supply and Demand in April 2003. Considering the views and opinions of the public and of relevant administrative organs, the draft was drawn up and decided at a Cabinet meeting and reported to the Diet in October 2003. It is comprised of three basic policies: 1) Securing a stable energy supply, 2) Reducing the burden on the environment, and 3) Applying market principles. Promotion of nuclear power generation and nuclear fuel cycles is considered one measure to achieve these policies. The plan must be re-examined at least once every three years, and modified as necessary.

4.2. Privatization and deregulation

To investigate future reform of the electricity sector, a series of meetings of the Advisory Committee for the Natural Resources and Energy Agency's Electricity Industry Committee were held from November 2001 to February 2003. Finally, the Committee issued the "Framework of the Desirable Future Electricity Industry System" Report in February 2003, which indicates the framework and directions of the electricity industry reform.

Based on the Report, the Government of Japan amended the Electricity Utility Industry Law in June 2003 and is now examining in detail measures to implement new regulations and systems. In this reform, the scope of liberalisation will be extended (from 2004 for high-voltage over 500kW customers and from 2005 for all high-voltage customers), and new regulations will be introduced in order to ensure fairness and neutrality of the transmission/distribution segment: for example, introduction of conduct regulations (account unbundling, information firewalls and prohibition of discriminatory treatment) and establishment of a neutral transmission system organisation. Furthermore, a nationwide wholesale power exchange will be created in order to establish an investment environment for electric power source development, and 'pancaking' will be abolished for vitalization of the nationwide power trade.

As of now, eleven new entrants have submitted a notice of intent to establish an "Electric Company of Specified Scale," nine of which already supply electricity. Compared with power utilities, however, their combined share in the liberalized market (for specified-scale demand) remained at only 1.79%, as of July 2003.

4.3. Safety issues

The investigation of the falsification of a licensee's self-imposed plant inspection reports began in July 2000 upon the whistle being blown to METI on the falsification. In August 2002, TEPCO admitted that there were a total of 29 suspected falsification cases at 13 nuclear power units and subsequent investigations revealed 16 more such cases at 9 nuclear units. The authorities initiated their investigations, but also concluded that the technical problems did not have any immediate significant effect on safety.

In September 2002, the Nuclear and Industrial Safety Agency (NISA) was informed of the discovery of cracks and crack indications in the re-circulation piping of 12 units run by Chubu EPCo, JAPC, TEPCO and Tohoku EPCo. These cases are under review.

At one of TEPCO's Fukushima Daiichi units, compressed air was improperly injected into the containment vessel during leak rate inspections conducted in 1991 and 1992. This was revealed on 25 October, 2002. After examination, the NISA issued an administrative order closing down the unit for one year to permit a detailed inspection.

By mid-April 2003, TEPCO had closed all its 17 reactors to carry out pressure tests, either for periodic inspections (eight units) or for voluntary checks (nine units). Replacement power is provided by oil-fired reserve power plants as well as from increasing the use of LNG and imports from other utilities. TEPCO has also been advising consumers to save electricity. The closures have made the demand-supply situation tight as the reserve margin fell to 4% during winter. Seven units have been re-opened, but it is not clear when TEPCO will be able to re-open other units. This will depend on the results of inspections, on the implications of suspected cracks in respect to licensing conditions, and ultimately on the consent of local governments to restart.

The government has taken action following the discovery of the falsification of reports. A decision has been taken to reinforce the work of NISA with an independent organisation, the Japan Nuclear Energy Safety Organisation (JNES), which will strengthen the implementation of safety regulations. In addition, the government will replace the licensee's self-imposed plant inspection carried out by nuclear power operators by mandatory ones.

REFERENCES

[1] The New Long-Range Plan for Development and Utilisation of Nuclear Energy (Revised in November 2000)

[2] IAEA Energy and Economic Data Base (EEDB)

[3] IAEA Power Reactor Information System (PRIS)

[4] Organization and Staff of Electric Utilities and Related Corporations, Japan Electric Association

[5] Nuclear Power Yearbook, Japan Atomic Industrial Forum, Inc.

Appendix. 1

INTERNATIONAL, MULTILATERAL AND BILATERAL AGREEMENTS

AGREEMENTS WITH THE IAEA

• Amendments to Articles VI Of the Agency Statute	Ratified:	31 May, 2000
• Agreement on privileges and immunities	Entry into force:	18 April, 1963
• NPT-related safeguards agreement INFCIRC/255	Entry into force:	2 December, 1977
• Additional Protocol	Entry into force:	16 December, 1999
• Regional Cooperative Agreement for Research, Development and Training Related Nuclear Science and Technology (RCA)	Entry into force:	4 June, 2002

MAIN INTERNATIONAL TREATIES

• Non-Proliferation Treaty	Entry into force:	8 June, 1976
• Convention on physical protection of nuclear material	Entry into force:	27 November, 1988
• Convention on early notification of a nuclear accident	Entry into force:	10 July, 1987
• Convention on assistance in the case of a nuclear accident or radiological emergency	Entry into force:	10 July, 1987
• Vienna Convention on civil liability for nuclear damage	Non-Party	
• Protocol to amend the Vienna Convention on civil liability for nuclear damage	Not signed	
• Convention on supplementary compensation for nuclear damage	Not signed	
• Convention on nuclear safety	Entry into force:	24 October, 1996
• Joint convention on the safety of spent fuel management and on the safety of radioactive waste management	Entry into force:	24 November, 2003

BILATERAL AGREEMENTS[1]

• Agreement for: (i) provision of information (ii) provision of nuclear materials, facilities and equipment (iii) transfer of patent rights (iv) use of facilities and equipment (v) provision of technical aid and services (The above content is an example only. Other forms of co-operation are not to be neglected.)	Canada Effective Date: Agreement Revised: (valid for 10 years, terminated thereafter by notice 6 months prior to the said termination)	27 July, 1960 2 September, 1980
• Agreement for: (i) provision and exchange of information (ii) provision of nuclear materials, facilities and equipment (iii) provision of services (iv) other means	United Kingdom Effective Date: Agreement Revised (valid for 30 years)	15 October, 1968 12 October, 1998
• Agreement for: (i) exchange of experts (ii) exchange of information (iii) provision of nuclear materials, facilities and secrecy technologies (iv) provision of services (v) co-operation in mining and the exploitation and use of mines	France Agreement Revised (valid for 45 years starting on the effective date of the current Japan-France Agreement. Terminated thereafter by notice 6 months prior to the said termination date.)	19 July, 1990
• Agreement for: (i) exchange of experts (ii) provision and exchange of information (iii) provision of nuclear materials, facilities and secrecy technologies (iv) provision of services (v) other means	Australia Effective date: (Valid for 30 years, terminated thereafter by notice 6 months prior to the said termination date.)	17 August, 1982
• Agreement for: (i) exchange of experts (ii) provision and exchange of information (iii) provision of nuclear materials, facilities and secrecy technologies (iv) provision of services (v) other means	China Effective date: (Valid for 15 years, automatically extended thereafter for 5 years unless notice is provided 6 months prior to the termination date)	10 July, 1986
• Agreement for: (i) exchange of experts (ii) provision and exchange of information (iii) provision of nuclear materials and facilities (iv) provision of services (v) other means	USA Effective date: (Valid for 30 years, terminated thereafter by notice 6 months prior to the said termination date.)	17 July, 1988

[1] Source: Nuclear Power Pocket Book 1994, Japan Atomic Industrial Forum, Inc.

Appendix 2

DIRECTORY OF THE MAIN ORGANIZATIONS, INSTITUTIONS AND COMPANIES INVOLVED IN NUCLEAR POWER-RELATED ACTIVITIES

NATIONAL ATOMIC ENERGY AUTHORITY

Atomic Energy Commission (AEC)
c/o Cabinet Office
Central Government Building No. 4, 7F
3-1-1 Kasumigaseki, Chiyoda-ku
Tokyo, Japan

Tel.: +81-3 3581 6690
Fax: +81-3 3581 9827
http://aec.jst.go.jp/

GOVERNMENT ORGANIZATIONS

Ministry of Education, Culture, Sports,
Science and Technology (MEXT)
2-2-1 Kasumigaseki, Chiyoda-ku
Tokyo, Japan

Tel.: +81-3 5253 4160
Fax: +81-3 5253 4162
http://www.mext.go.jp/

Ministry of Economy, Trade
and Industry (METI)
1-3-1 Kasumigaseki, Chiyoda-ku
Tokyo, Japan

Tel.: +81-3 3501 1991
Fax: +81-3 3508 8447
http://www.meti.go.jp/

Ministry of Foreign Affairs (MoFA)
2-11-1 Shibakouen, Minato-ku
Tokyo, Japan

Tel.: +81-3 6402 2598
Fax: +81-3 6402 2593
http://www.mofa.go.jp/index.html

CORPORATIONS RELATED TO NUCLEAR POWER

Japan Atomic Energy Research Institute (JAERI)
Office of Planning
14-1, Suehiro-cho, Kashiwa-shi, Chiba Prefecture

Tel: +81-4-7142-2400
Fax: +81-4-7142-2419
http://www.jaeri.go.jp/

Japan Nuclear Cycle Development Institute (JNC)
Executive Office for Policy Planning and Administration
4-49, Muramatsu
Tokai-Mura
Naka-Gun, Ibaraki Prefecture

Tel: +81-29-282-1122
Fax: +81-29-282-4917
http://www.jnc.go.jp/

Nuclear Power Engineering Corporation (NUPEC)
Safety Information Research Center
1-8, Toranomon 4-Chome
Minato-ku, Tokyo

Tel: +81-3-4512-2500
Fax: +81-3-4512-2600
http://www.nupec.or.jp/

Japan Atomic Industrial Forum Inc. (JAIF)
Department of Information & Research
2-13, Shiba-daimon 1-Chome
Minato-ku, Tokyo

Tel: +81-3-5777-0750
Fax: +81-3-5777-0760
http://www.jaif.or.jp/

Japan Nuclear Energy Safety Organization (JNES)
Fujita Kanko Toranomon Bldg., 3-17-1
Toranomon, Minato-ku, Tokyo

Tel: +81-3-4501-1111
http://www.jnes.go.jp

OWNERS/OPERATORS

The Federation of Electric Power Companies (FEPCO)
Nuclear Power Department
9-4, Otemachi 1-Chome
Chiyoda-ku, Tokyo
Tel: +81-3-3279-2187
Fax: +81-3-3241-1780
http://www.fepc.or.jp/

Hokkaido Electric Power Co., Inc. (HEPCO)
Higashi 1-Chome, Ohdori
Chuoku, Sapporo
Tel: +81-11-251-1111
http://www.hepco.co.jp/

Tohoku Electric Power Co., Inc. (TOHOKU)
7-1, Ichibancho 3-Chome
Aoba-ku, Sendai
Tel: +81-22-225-2111
http://www.tohoku-epco.co.jp/

Tokyo Electric Power Co., Inc. (TEPCO)
1-3, Uchisaiwai-cho
1-Chome, Chiyoda-ku, Tokyo
Tel: +81-3-3501-8111
http://www.tepco.co.jp/

Chubu Electric Power Co., Inc. (CHUBU)
Ichibanchi Toshin-Cho,
Higashi-ku, Nagoya
Tel: +81-52-951-8211
http://www.chuden.co.jp/

Hokuriku Electric Power Co., Inc. (HOKURIKU)
15-1, Ushijima, Toyama
Tel: +81-76-441-2511
http://www.rikuden.co.jp/

Kansai Electric Power Co., Inc. (KEPCO)
3-22, Nakanoshima 3-chome
Kita-ku, Osaka
Tel: +81-66-441-8821
http://www.kepco.co.jp/

Chugoku Electric Power Co., Inc. (CHUGOKU)
4-33, Komachi
Naka-ku, Hiroshima
Tel: +81-82-241-0211
http://www.energia.co.jp/

Shikoku Electric Power Co., Inc. (SHIKOKU)
2-5, Marunouchi,
Takamatsu
Tel: +81-87-821-5061
http://www.yonden.co.jp/

Kyushu Electric Power Co., Inc. (KYUSHU)
2-1-82, Watanabe-Dori,
Chuo-ku, Fukuoka
Tel: +81-92-761-3031
http://www.kyuden.co.jp

Japan Atomic Power Co., Inc. (JAPCO)
6-1, 1-Chome, Otemachi,
Chiyoda-ku, Tokyo
Tel: +81-3-3201-6631
http://www.japc.co.jp/

Central Research Institute
of Electric Power Industry (CRIEPI)
http://criepi.denken.or.jp/

World Association of Nuclear Operators (WANO) http://www.wano-tc.or.jp/

[2] Source: Nuclear Power Pocket Book 1994, Japan Atomic Industrial Forum, Inc.

FUEL CYCLE

Japan Nuclear Cycle Development Institute (JNC)
4-49, Muramatsu, Tokai-Mura, Naka-Gun, Tel: +81-29-282-1122
Ibaraki Prefecture http://www.jnc.go.jp/