JAPAN

(based on JC national report)

a) National framework for management of spent fuel and radioactive waste

After the accident, each nuclear power plant was accordingly shut down at the time of its scheduled periodic facility inspection and by May 2012, all nuclear power stations had suspended operations. Units 3 and 4 at the Kansai Electric Power Company's Ohi Power Station resumed operations in June 2012, but they too subsequently underwent periodic facility inspections and as of August 2014, there are no nuclear power stations in operation in Japan.

Japan has 48 power reactor units in service at the end of March 2014, following the decision to decommission Units 1 to 6 at the Fukushima Daiichi NPS. Japan's other nuclear facilities are as follows: 6 nuclear fuel fabrication facilities include 2 uranium enrichment facilities, 2 spent fuel reprocessing facilities, 2 radioactive waste interim storage facilities, 2 radioactive waste repositories, 14 research reactors, 8 research reactors currently under decommissioning, and 15 facilities which use more than a certain quantity of uranium or other nuclear fuel material.

According to Japan's new Strategic Energy Plan (April, 2014 Cabinet decision) the storage capacity of spent fuel will be expanded. Specifically, while studying a wide range of locations as possible sites for disposal, regardless of whether they are inside or outside the premises of a power plant, the government of Japan will strengthen its effort for facilitating construction and utilization of new intermediate storage facilities and dry storage facilities.

Regarding the nuclear fuel cycle policy, the government of Japan will steadily promote reprocessing and plutonium use in Light Water Reactors (LWRs) while taking into consideration past history and will seek the understanding of the relevant municipalities and the international community, and it will flexibly address measures in the mid- to long-term basis.

The government of Japan developed the policy for promoting radioactive waste disposal is following:

- Radioactive waste subject to geological disposal is high level radioactive waste and Long-lived low-heat generating radioactive wastes (TRU wastes)
- Low level radioactive wastes generated in nuclear power plants that are subject to near surface trench disposal and near surface pit disposal are already being disposed of with such methods. However, for intermediate depth disposal system, safety regulations have not been developed.

b) National legal and regulatory framework

In Japan's legal system relating to nuclear regulation, the Atomic Energy Basic Act is the most important piece of legislation and defines the basic principles of nuclear energy use. The Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors, which prescribes government regulations, and the Act for Establishment of the Nuclear Regulation Authority, which prescribes the competence of the regulatory authority, were enacted under this Act. Also, the law currently working for the promotion of spent fuel management is the "Act for Deposit and Administration of Reserve Funds for Reprocessing of Spent Fuel from Nuclear Power Generation" for securing the future costs for reprocessing in a safe, reliable and transparent manner. Meanwhile, the Final Disposal Act is applicable to taking necessary steps to systematically and securely carry out the final disposal of radioactive waste to be geologically disposed, such as vitrified waste of HLW generated from reprocessing of spent fuel. Other necessary legislation has been put in place such as the Act on Special Measures Concerning Nuclear Emergency Preparedness which stipulates responses to nuclear disasters.

The 1955 Atomic Energy Basic Act forms the basis of nuclear energy use in Japan. The objective of the Act is to secure future nuclear energy resources use and promoting academic and industrial development, thereby contributing to the welfare of mankind and the enhancement of life. The Act specifically limits the research, development and utilization of nuclear energy to peaceful purposes, prioritizes safety, ensures that operations are performed independently under democratic management, and that relevant information shall be made public to contribute to international cooperation.

The Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors (Reactor Regulation Act) The 1957 Reactor Regulation Act governs all aspects of nuclear energy use in Japan. Based on the Atomic Energy Basic Act, this Act limits the use of nuclear source material, nuclear fuel material, and reactors to peaceful purposes only. The Act seeks to prevent the release of radioactive material at abnormally high levels outside a plant or site, or any other disaster caused by nuclear materials or nuclear reactors. To ensure public safety, it seeks to protect nuclear materials by stipulating requisite regulations of the refining, processing, storage, reprocessing and disposal business and to address large scale natural disasters, terrorism or other criminal acts. It stipulates the regulation of International Controlled Material and the implementation of international conventions or other international commitments on nuclear use, research and development.

Final Disposal Act The Final Disposal Act enacted in May 2000 provides for the following basic framework for systematically and securely carrying out the final disposal of high level radioactive wastes generated from spent fuel reprocessing (hereinafter referred to as "Designated Radioactive Wastes");

(i) development and public announcement of a basic policy and a plan (final disposal plan) for the final disposal of designated radioactive wastes by the Minister of METI
(ii) process for site selection for final disposal of designated radioactive wastes

(iii) securing of the expenses required for final disposal of designated radioactive wastes
(iv) implementing organization for final disposal of designated radioactive wastes.

Act for Deposit and Administration of Reserve Funds for Reprocessing of Spent Fuel from Nuclear Power Generation This law provides for the framework of deposit etc., to reserve funds for reprocessing of spent fuel etc., from nuclear power generation. The fund is managed by an organization designated by the Minister of METI (Fund Management Organization). The Minister of METI, every fiscal year, notifies utilities of the amount of deposit based on the amount of electricity generated by nuclear fuel, and utilities deposit the amount in the Fund Management Organization. This law was enacted in October 2005.

In light of the lessons learned from the Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station (Fukushima Daiichi NPS) accident on March 11, 2011, the Nuclear Regulation Authority (NRA) was established in September 2012. The NRA has centralized responsibility not only for the administration of nuclear regulation and nuclear security, which were previously handled by related administrative bodies, but also for the formulation of Nuclear Emergency Response Guidelines in accordance with the provisions of the Nuclear Emergency Act and the Act on Special Measures Concerning Nuclear Emergency Preparedness. The NRA has also been responsible since April 2013 for administrative matters concerning safeguards based on international commitments and the regulation of activities such as radiation monitoring and the use of radioactive isotopes.

The NRA regulates nuclear application in Japan, while the NRA Secretariat deals with related administrative matters. The NRA was established as an external bureau of the Ministry of the Environment. The Chairman and Commissioners of the NRA are appointed by the Prime Minister, with the consent of the Diet, in accordance with the provisions of the Act for Establishment of the Nuclear Regulation Authority, which aims for an independent, fair and neutral exercise of authority.

The NRA provides the Diet with an annual report via the Prime Minister, of its activities. The appointment and dismissal of the NRA Secretariat personnel is at the discretion of the NRA Chairman. The NRA can establish rules in order to implement laws and cabinet orders under its jurisdiction. The term of office of the Chairman and Commissioners is five years, with reappointment possible. The duty of the NRA is to ensure the safe use of nuclear energy, so it has the right to grant permission for the establishment of reactor facilities.

The NRA can formulate rules governing nuclear regulations, including measures to ensure operational safety and the protection of specified nuclear fuel material, safety regulations, and emergency measures. The NRA approves the design and construction of facilities, inspections, approval of Operational Safety Programs and decommissioning plans. In addition, it collects licensee reports of nuclear facilities and conducts on-site inspections, if necessary.

It has the authority to revoke permits for nuclear facilities or suspend their operations, to order additional safety measures, the dismissal of reactor chief engineers, decommissioning measures and other steps to prevent disasters.

c) Radioactive waste management, decommissioning and spent fuel strategy

The electric power utilities in Japan have concluded reprocessing contracts with the United Kingdom and French companies for a total of 5,600 MTU of spent fuel from light water reactors and 1,500 MTU of spent fuel from a gas cooled reactor. In accordance with these contracts, vitrified waste canisters are returned to the utilities and are stored in Vitrified Waste Storage Center of JNFL. As of the end of March 2014, 1,442 vitrified canisters had been returned from the United Kingdom and France. Return shipment of the 1,310 vitrified waste canisters from France started in 1995 and finished in 2007. Return shipment of the vitrified waste canisters from the United Kingdom started in 2010, and about 770 vitrified waste canisters will be returned in the next approximately five years. The Rokkasho Reprocessing Plant has been storing 346 vitrified waste canisters which were generated in active test.

High level liquid waste generated at the Tokai Reprocessing Plant of JAEA was stored in tanks within the facility and has been vitrified at the vitrification facility which started operation in January 1995. As of March 2014, about 415 cubic meters of liquid waste and 247 vitrified waste canisters are in storage. Vitrified waste is decided to undergo geological disposal based on the final disposal method.

A part of national demand for reprocessing had been covered by the reprocessing plant of the incorporated administrative agency, JAEA, which was commissioned in December 1980. This plant was built for the purpose of establishing reprocessing technology and of training and fostering engineers and technicians in Japan. The plant completed the reprocessing service contracted by the electric utilities in the end of March 2006. Since then, it has been utilized as a facility for developing technologies for reprocessing spent MOX fuel in light water reactors (LWRs), spent fuel in an advanced thermal reactor and spent fuel in a fast breeder reactor. The plant has reprocessed a total of approximately 1,100MTU of spent fuel since the commissioning.

The “Act for Deposit and Administration of Reserve Funds for Reprocessing of Spent Fuel from Nuclear Power Generation” (see Section E) was established that requires the operators to deposit the funds for spent fuel reprocessing in a fund administration corporation. The objective of “the Act” is to ensure the proper implementation of spent fuel reprocessing, disposal of radioactive wastes generated from reprocessing, and disassembling of reprocessing facilities. As a part of such steps, The Minister of METI designated “Radioactive Waste Management Funding and Research Center” (public interest incorporated foundation) as a non-profit “fund administration corporation” (October 2005) that is supervised by the Minister through supervisory orders and on-the-spot inspection.

In response to the amendment of the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors in 1979, a private reprocessing company, the Japan Atomic Fuel Service Co., Ltd. (presently, the Japan Nuclear Fuel Ltd., JNFL) was established in 1980, funded by the electric utilities. This company commenced construction of a commercial reprocessing plant with annual reprocessing capacity of 800MTU in Rokkasho village, Aomori Prefecture in 1993, based on the operating experience of the reprocessing plant of Japan Atomic Energy Agency (JAEA), considering the trends of domestic demand for reprocessing, and introducing technologies and experiences accumulated in the leading countries in the field of reprocessing. The reprocessing plant started pre-service inspection using actual spent fuel in 2006 aiming at commencement of operation in 2014. The plant has reprocessed a total of approximately 430MTU for the pre-service inspection at the end of March 2014. Spent fuel storage has already begun in a plant, completed in 1999, with the storage capacity of 3,000MTU. This plant has accepted a total of approximately 3,400MTU by the end of March 2014. As of the end of March, 2014, the amount of spent fuel stored in nuclear power plants of LWR in Japan amounts to approximately 14,000MTU.

The spent fuel from research reactor facilities is either returned to the USA, or is reprocessed or stored in Japan.

As of the end of March 2014, nuclear power plants being decommissioned are JAPCO's Tokai NPS, the JAEA's Fugen Advanced Thermal Reactor, and units 1 and 2 at the Chubu Electric Power Company's Hamaoka NPS. TEPCO has decided to decommission units 1 to 4 at Fukushima Daiichi NPS, which were damaged by the March 2011 accident, and also units 5 and 6 at the same plant. These six units are in a state of permanent shutdown prior to receiving approval for the decommissioning plan prescribed in the Reactor Regulation Act.

A total of 8 research reactors are in the process of being decommissioned: the JAEA's JRR-2, Reactor Facilities of the Nuclear Ship Mutsu, and Deuterium Criticality Assembly (DCA); Hitachi Ltd.'s Hitachi Training Reactor (HTR); Toshiba Corporation's Training Reactor-1 (TTR-1); the Rikkyo University Institute for Atomic Energy (RUR); the Tokyo City University (formerly the Musashi Institute of Technology) Research Reactor (MITRR); and the University of Tokyo Research Reactor (Yayoi).

The waste stored in the above-mentioned nuclear power plant storage facilities include ca. 700,000, 200-liter drums , 32 used steam generators in steam generator storage facilities, used control rods, disused channel boxes, spent ion exchange resin in spent fuel pools and other storage facilities, as of the end of March 2014. In addition rubble, trimmed trees, disused-protective clothing generated after accident, etc.[total 201,300m3], and secondary waste from contaminated water treatment[848 cesium absorption apparatus and absorption vessel etc. and Sludge 597m3] have been temporarily stored in TEPCO's Fukushima Daiichi NPS.

At facilities other than nuclear power plants, ca. 2,035 vitrified packages of HLW and ca. 415 m3 of high level liquid waste are stored in spent fuel reprocessing facilities. Details of these inventories included the other radioactive waste are indicated in Section L.

Since 1992, LLW stored at radioactive waste management facilities operated by commercial power reactors and that has a comparatively low concentration of radionuclides was transferred to a JNFL radioactive waste facility for disposal. The JNFL disposal facility is currently in operation and has disposed ca. 260,000 drums (200-liter-drum equivalent) of waste, as of the end of March 2014. At the JAEA Nuclear Science Research Institute's Tokai Research and Development Center, about 1,670 tons of very low level waste (concrete) resulting from the dismantling of the JPDR have been disposed of.

Table 1 Radioactive Waste In Storage (including spent fuel that is considered waste)

Route Waste Class	Processed (type)/Unprocessed	Total Current Volume (m3)	Estimated Disposal Volume (m3)	Distribution (%)							Planned Disposal Route (if known)
				RO	FFE	RP	NA	DF	DC/RE	ND	
All Classes	Processed	14045.74	14045.74	98	0	2	0	0	0	0	
All Classes	Unproc	223789.8	223789.8	56	5	10	29	0	0	0	
HLW	Processed	330.14	330.14	0	0	100	0	0	0	0	
LLW	Processed	13715.6	13715.6	100	0	0	0	0	0	0	
LLW	Unproc	223789.8	223789.8	56	5	10	29	0	0	0	

NEWMDB waste origin type codes:
RO – reactor operations
FFE – fuel fabrication & enrichment
RP – fuel reprocessing
NA – nuclear applications
DF - defence
DC/RE - decommissioning & remediation
ND - Not Determined

Table 2 Radioactive Waste Disposed (as disposed volume)

Waste Class	Processed (not)	Total Volume (m3)	Distribution (%)							Disposal Route Used
			RO	FFE	RP	NA	DF	DC/RE	ND	
All Classes	Processed	52123.8	100	0	0	0	0	0	0	

Table 3 Spent fuel in Storage (MTHM)

Type	Current Amount (NPP)	Current Amount (Research Reactors)
Total Spent Fuel Storage	16869	0
Wet storage (AR)	0	0
Wet storage (AFR)	0	0
Dry storage (AR)	0	0
Dry storage (AFR)	0	0
Total spent fuel held in storage for other countries (amounts also included above)	0	0

Table 4 Spent fuel sent for reprocessing (in the country or sent to another country) (MTHM)

Type	Current Amount (NPP)	Current Amount (Research

		Reactors)
Total amount Spent Fuel sent to Reprocessing (in your country)	0	0
Total amount Spent Fuel sent to Reprocessing (in another country)	0	0
Total amount of Spent Fuel received from another country for reprocessing and recycling	0	0
Total amount of Spent Fuel (MTHM) or radioactive waste (cubic metres) returned to country of origin for storage/disposal	0	0

Table 5 Example of a translation matrix (from NEWMDB) that can be used for transition from a national classification system to IAEA classification

National Waste Classification Name	VLLW	LLW	ILW	HLW
LLW	0	100	0	0
HLW	0	0	0	100

Table 6 Waste management facilities

Type	Planned	Construct.	Commiss.	In Operation	Shutdown	Decomm.	Other	Total
Spent Fuel Storage	0	0	0	24	0	0	0	
Spent Fuel Reprocessing and Recycling	0	0	0	0	0	0	0	
Spent Fuel Conditioning	0	0	0	0	0	0	0	
Spent Fuel disposal	0	0	0	0	0	0	0	
Waste processing	0	0	0	0	0	0	0	
Waste storage	0	0	0	56	0	0	0	
Waste disposal	0	0	0	3	0	0	0	

Table 7 Summary of major sources of waste

Type	Planned	Construct	Commiss.	In	Shutdown	Decomm.	Other	Total

				Operation				
Research reactors	0	0	0	8	13	8	0	0
Nuclear Power reactors	0	2	0	43	17	0	0	0
Spent Fuel Reprocessing and Recycling	0	0	0	2	0	0	0	0
Other	0	0	0	0	0	0	0	0

Table 8 Future prospects

Type	**Current amount**	**Estimated Current amount when prepared for disposal**	**Current Disposal Capacity**	**Total forecast at 2030**	**Disposal Capacity 2030**	**Total forecast at 2050**	**Disposal Capacity 2050**
Spent Fuel Storage							
Wet storage (AR)							
Wet storage (AFR)							
Dry storage (AR)							
Dry storage (AFR)							
Total amount Spent fuel sent to Reprocessing and Recycling							
Total amount Spent fuel disposed							
Waste in storage							
Waste disposal							