National Report of JAPAN

For the Seventh Review Meeting

JOINT CONVENTION
ON THE SAFETY OF SPENT FUEL MANAGEMENT AND
ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT

October 2020

Cabinet Office
Ministry of Foreign Affairs
Ministry of Education, Culture, Sports, Science and Technology
Ministry of Health, Labour and Welfare
Ministry of Economy, Trade and Industry
Ministry of the Environment
Nuclear Regulation Authority

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Abbreviations and Acronyms

Abbreviation or Acronym	Expanded or Original Term
AL	Alert
ALARA	As Low As Reasonably Achievable
ALPS	Advanced Liquid Processing System
CAO	Cabinet Office
Cat-1 Waste Disposal	Category 1 radioactive Waste Disposal (geological disposal)
Cat-2 Waste Disposal	Category 2 radioactive Waste Disposal (intermediate depth disposal and near surface disposal)
CNO	Chief Nuclear Officer
DPC	Dual Purpose Cask
DRZ	Difficult-to-Return Zone
EAL	Emergency Action Level
EPR	Emergency Preparedness and Response
Final Disposal Act	Designated Radioactive Waste Final Disposal Act
GE	General Emergency
GSR Part 3	General Safety Requirements Part 3
HLW	High Level radioactive Waste
HR	Human Resources
IAEA	International Atomic Energy Agency
ICSA	Intensive Contamination Survey Area
IRMIS	International Radiation Monitoring Information System
IRRS	Integrated Regulatory Review Service
INES	International Nuclear and Radiological Event Scale
ISF	Interim Storage Facility
JAEA	Japan Atomic Energy Agency
JANSI	Japan Nuclear Safety Institute
JAPCO	Japan Atomic Power Company
JNES	Japan Nuclear Energy Safety Organization
JNFL	Japan Nuclear Fuel Ltd.
JPDR	Japan Power Demonstration Reactor
LLW	Low Level radioactive Waste
LWR	Light Water Reactor
METI	Ministry of Economy, Trade and Industry
MEXT	Ministry of Education, Culture, Sports, Science and Technology
MHLW	Ministry of Health, Labour and Welfare
MOE	Ministry of the Environment
MOFA	Ministry of Foreign Affairs
MTU	Metric Ton of Uranium

Abbreviation or Acronym	Expanded or Original Term
Notification on Doses	Notification to Establish Dose Limits in Accordance with the Provisions of the NRA Ordinance on Activity of Refining Nuclear Source or Nuclear Fuel Materials, etc.
NPP	Nuclear Power Plant
NPS	Nuclear Power Station
NRA	Nuclear Regulation Authority
NRA EPR Guide	NRA Guide for Emergency Preparedness and Response
Nuclear Emergency Act	Act on Special Measures Concerning Nuclear Emergency Preparedness
NUMO	Nuclear Waste Management Organization of Japan
OIL	Operational Intervention Level
PAZ	Precautionary Action Zone
Pharmaceuticals and Medical Devices Act	The Law on Securing Quality, Efficacy and Safety of Products including Pharmaceuticals and Medical Devices
Radiation Hazards Prevention Act	Act on Prevention of Radiation Hazards due to Radioisotopes, etc. (renamed to the RI Regulation Act in 2019)
RANET	IAEA Response Assistance Network
Reactor Regulation Act	Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors
RFS	Recyclable-Fuel Storage Company
RI Regulation Act	Act on the Regulation of Radioisotopes
SE	Site Area Emergency
SRRB	Specified Reconstruction and Revitalization Base
TEPCO	Tokyo Electric Power Company Holdings, Inc.
TRU waste	Trans-Uranic waste
UPZ	Urgent Protective action planning Zone
USIE	United System for Information Exchange in Incidents and Emergencies
WAC	Waste Acceptance Criteria

Section A Introduction

A-1 Current Status of Nuclear Facilities in Japan

Japan has the following types of nuclear facilities according to the definition provided in Article 2 of the Joint Convention as of the end of March 2020: nuclear power reactors, research reactors, nuclear fuel processing facilities for uranium enrichment or fuel fabrication, spent fuel interim storage facilities, spent fuel reprocessing facilities, radioactive waste interim storage facilities, radioactive waste disposal facilities, facilities which use more than a certain quantity of uranium or other nuclear fuel material, and facilities for handling radioisotopes. Among the above, spent fuel interim storage facilities and spent fuel reprocessing facilities correspond to "spent fuel management facility," and radioactive waste interim storage facilities and radioactive waste disposal facilities correspond to "radioactive waste management facility" defined in the Convention.

In Japan, 62 power reactors have been granted Reactor Installation Permits based on the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors, hereinafter referred to as the Reactor Regulation Act, and 15 units among them are under decommissioning having obtained Approval of Decommissioning Plans pursuant to the Act. As for research reactors, 10 of 22 licensed units are under decommissioning having obtained Approval of Decommissioning Plans pursuant to the Act.

There are 6 nuclear fuel processing facilities and 1 spent fuel interim storage facility that have been licensed. One of the 2 licensed reprocessing facilities is under decommissioning having obtained Approval of Decommissioning Plan pursuant to the Act.

Also, 2 radioactive waste interim storage facilities and 3 radioactive waste disposal facilities have been licensed.

209 facilities which use more than a certain quantity of uranium or other nuclear fuel material have been granted permission for nuclear fuel material use.

Under the Act on the Regulation of Radioisotopes, hereinafter referred to as the RI Regulation Act, which was renamed from the Act on Prevention of Radiation Hazards due to Radioisotopes, etc. in September 2019, 8,011 business sites that handle radiation

sources (referred to as “radioisotopes” according to the description in the Act) are licensed or registered.

A-2 Efforts Concerning the Safety of Spent Fuel Management and Radioactive Waste Management

The Nuclear Regulation Authority (NRA) developed the new regulatory requirements which reflected the lessons learned from the accident at the Tokyo Electric Power Company’s (TEPCO) Fukushima Daiichi Nuclear Power Station (NPS) and enforced those for commercial power reactors in July 2013, and those for nuclear fuel cycle facilities including "spent fuel management facilities" and "radioactive waste management facilities" defined in this Convention in December 2013.

Nuclear fuel cycle facilities have variety of structures and handle various types of nuclear material. Regulatory requirements are established for each type of facility, taking into account features specific to the facility type. Licensees shall comply with the "new" regulatory requirements specified in the Reactor Regulation Act, for their facilities which already received the permission prior to the enforcement of these requirements. Therefore, in order to resume operation of nuclear facilities except operating waste disposal facility, licensees shall obtain:

- Permit for the amendment of Existing Permit;
- Approval of Design and Construction Plan; and
- Approval of Operational Safety Program

through conformity review to the regulatory requirements newly set by the NRA. The NRA has received the applications for conformity review of, 27 nuclear power reactors, 8 research reactors, 6 nuclear fuel processing facilities, 1 spent fuel interim storage facility, 1 reprocessing facility, 2 radioactive waste interim storage facilities, and 2 radioactive waste disposal facilities.

Among the above,

- Unit 1 and 2 at the Kyushu Electric Power Company Sendai Nuclear Power Station;
- Unit 3 and 4 at the Kyushu Electric Power Company Genkai Nuclear Power Station;
- Unit 3 and 4 at the Kansai Electric Power Company Takahama Power Station;
- Unit 3 and 4 at the Kansai Electric Power Company Ōi Power Station; and
- Unit 3 at the Shikoku Electric Power Company Ikata Power Station

completed the conformity review and the pre-service inspections, and have been in commercial operation. Furthermore, 1 reprocessing facility, 5 nuclear fuel processing facilities, 7 research reactors, 2 radioactive waste interim storage facilities, have obtained the permission for the amendment of the existing permits, as of July 2020.

The NRA has continued to make efforts to improve regulatory requirements, for example by adopting state-of-the-art knowledge, even after the new regulatory requirements were established, and also has continued to address regulatory challenges including the reform of inspection system.

Based on the recommendations and suggestions made by the International Atomic Emergency Agency's Integrated Regulatory Review Service (IAEA's IRRS) mission which took place in January 2016, the NRA revised the Reactor Regulation Act and the Radiation Hazards Prevention Act renamed to the RI Regulation Act in 2019. By these revisions, the following improvements were introduced into the regulatory system:

(1) the reform of the inspection system for nuclear facilities;
(2) the requirement of consideration on decommissioning at an earlier stage in designing;
(3) the restriction of activities including excavation at intermediate depth and geological disposal site; and
(4) the streamlining of disposition for radioactive waste containing or contaminated by nuclear materials and radio-isotopes.

The new inspection system has been implemented since April 2020, and details about the inspection of spent fuel management facilities and radioactive waste management facilities are reported in Section G, H and K.

The major accomplishments done by the NRA since the last national report regarding the safety for spent fuel management and radioactive waste management are the revision of regulation on clearance system reported in Section E and F, the revision of regulation on near surface disposal reported in Section E, the revision of regulation on dual purpose cask for transportation and storage reported in Section E and K. Furthermore, the NRA has been making a study on regulatory framework for intermediate depth disposal for radioactive waste, e.g. core internals, which radioactivity exceeds the concentration limit for pit disposal and on regulation for uranium contaminated waste generated at facilities such as fuel fabrication facilities reported in Section K. Also regarding spent fuel management, from the safety point of

view, the NRA recommends as its opinion to shift from pool storage to dry storage for spent fuel that has been cooled for a certain period of time. Along with this, in order to remove obstacles and to achieve reasonable regulation, the NRA has revised relevant ordinances and guides, and in parallel the NRA's review process is ongoing for the transition to dry storage at nuclear power plant (NPP) sites within the framework of the existing regulation.

A-3 Current Status of TEPCO Fukushima Daiichi NPS

A-3-1 Efforts for Decommissioning of TEPCO Fukushima Daiichi NPS

TEPCO Fukushima Daiichi NPS unit 1 to unit 6 are designated as specified nuclear facility based on the Reactor Regulation Act, and they are regulated in accordance with the Implementation Plan pursuant to the Act which describes measures for the safety and protection of specified nuclear fuel materials.

Moreover, TEPCO is required to implement the measures for the decommissioning and treatment of contaminated water based on the "Mid-and-Long-Term Roadmap towards the Decommissioning of TEPCO Fukushima Daiichi Nuclear Power Station" [1] decided by the "Inter-Ministerial Council for Contaminated Water and Decommissioning Issues." Most recently, the 5th revision was made in December 2019, and the method of fuel debris retrieval was confirmed.

<Mid-and-Long-Term Roadmap towards the Decommissioning of TEPCO's Fukushima Daiichi NPS>

https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/20191227_3.pdf

For the purpose of stable management of radioactive waste in TEPCO Fukushima Daiichi NPS, with the long-term future decommissioning work in mind, the NRA established the Committee on Radioactive Waste Issues of the Specified Nuclear Facility in December 2015, and continued discussion from the viewpoint of safety regulation. Taking into account the progress of the work for storage and management of radioactive waste, the NRA made a decision in February 2019 to demolish the Committee and integrate its function into the Committee on Supervision and

[1]Mid-and-Long-Term Roadmap towards the Decommissioning of TEPCO Fukushima Daiichi Nuclear Power Station http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/index.html

Evaluation of the Specified Nuclear Facility, which was established in December 2012. The decision is intended to implement the oversight and evaluation more comprehensively and effectively.

TEPCO reported the Waste Management Plan for TEPCO Fukushima Daiichi NPS which describes the storage policy of radioactive waste, the amount of radioactive solid waste for the coming 10 years, and the installation policy of the radioactive waste facility at the Committee on Radioactive Waste Issues of the Specified Nuclear Facilities in March 2016, and has renewed it periodically about once a year.

According to the Waste Management Plan, TEPCO Fukushima Daiichi NPS has rubbles, secondary waste generated from water treatment and radioactive solid waste that has been stored in TEPCO Fukushima Daiichi NPS since before the accident on its site premises. The rubbles are stored in the outdoor temporary storage area or solid waste storage facilities depending on the surface dose rate, and the secondary waste generated from water treatment is stored in temporary storage facilities.

There are currently many temporary waste storage areas across TEPCO Fukushima Daiichi NPS premises. Approximately 450,000 m^3 of rubble is temporarily stored in outdoor temporary storage areas and approximately 22,000 m^3 is stored in solid waste storage facilities as of May 29, 2020. Approximately 1,300 used vessels and approximately 3,500 High Integrity Containers of secondary waste generated from water treatment are temporarily stored in storage facilities as of June 4, 2020.

TEPCO plans to reduce the volume of rubbles and to store it indoors, and to eliminate temporary storage areas outside of solid waste storage facilities by the end of FY 2028 to further reduce risk. To that end, solid waste incinerators have been installed as volume reduction facilities. Volume reduction of combustibles through incineration has started since the end of FY 2015 and an additional solid waste incinerator is being built with an expected completion date in FY 2020. Facilities to reduce the volume of metal and concrete are also expected to be completed in FY 2022. The 9th solid waste storage facility was completed in FY 2017 and 2 more facilities are scheduled to be built in the following years.

Secondary waste generated from contaminated water treatment will also be transferred to indoor storage and temporary storage area will be reduced as much as possible. In June 2019, TEPCO has started construction on a large waste storage facility with the expected start of operation date in FY 2021 to store adsorption columns. When

transferring the waste indoors, volume reduction treatment or stabilization treatment will be explored and implemented according to the characteristics of the waste.

On the other hand, final treatment and disposal method for rubbles etc. and secondary waste generated from water treatment has not been decided. To study the method and its safety, it is necessary to understand the characteristics of rubbles and waste. Therefore, the first Radioactive Material Analysis and Research Facility is currently under construction at the site and planned to operate from 2021.

Liquid radioactive waste, i.e. contaminated water, is being purified by multiple purification facilities including a multi-nuclide removal system (ALPS). Approximately 1.16 million m^3 of treated water containing tritium, which cannot be removed by these facilities and small amount of other nuclides, is being stored on site premises as of May 2020.

Appropriate treatment and storage of waste on site and the handling of treated water that contains tritium is a critical issue that needs to be addressed to facilitate progress in decommissioning and in contaminated water measures at TEPCO Fukushima Daiichi NPS.

A-3-2 Progress and Current Status of Off-Site Decontamination and Environmental Remediation

A-3-2-1 Decontamination

The whole area decontamination in Special Decontamination Area (SDA) was completed as planned at the end of March, 2017 where the national government, Ministry of the Environment (MOE), is responsible for. In the Intensive Contamination Survey Area (ICSA), where municipalities have been conducting the decontamination, it was terminated at the end of March 2018. This means that whole area decontamination was completed in 100 Municipalities among 8 Prefectures except in Difficult-to-Return Zone (DRZ). Subsequently, air dose rates in the environment have been decreasing and the effect of decontamination is confirmed.

In DRZ, as a result of the significant decrease in air dose rates and strong requests from local residents to return to their homes, the national government amended the law to set Specified Reconstruction and Revitalization Base (SRRB) for municipalities existing in the zone. In SRRB, MOE promotes to carry out environmental improvements, such

as house demolition, decontamination and waste management with the aim of lifting the evacuation orders between 2020 and Spring 2023. In March 2020, evacuation order was lifted in advance for parts of SRRB in Okuma, Futaba, and Tomioka Towns.

A-3-2-2 Interim Storage Facility (ISF) and Recycling

a ISF

ISF is a facility, in which contaminated soil and waste generated from off-site decontamination works in Fukushima are stored intensively and safely. The MOE started the construction of 9 reception and separation facilities and soil storage sites in 8 work areas to store and separate soil and waste generated from off-site decontamination, also 3 volume reduction facilities and 3 waste storage facilities to treat waste. In March 2020, operation of all the treatment process of soil and waste was started.

As of the end of March 2020, about 6.68 mil m^3 out of 14 mil m^3 of target transportation objects of removed soil and waste has been delivered to ISF. By the end of March 2022, MOE plans to transport almost all the soil and waste to the ISF, which are temporarily stored in Fukushima Prefecture, obtaining local understandings on the safety first basis.

b Recycling

As for soil and waste generated from decontamination in Fukushima Prefecture is to take necessary measures to complete the final disposal outside Fukushima Prefecture within 30 years from the start of ISF operation which is determined by the law. As the amount of final disposal outside Fukushima Prefecture should be reduced, MOE is making efforts for volume reduction and recycling. Currently demonstration project of recycling has been conducted in farmland development in Iitate Village in Fukushima Prefecture. The MOE, for example, is working to promote understanding of the safety of recycling by displaying flowers grown on a trial basis in the rooms of senior officials at MOE.

A-3-2-3 Environmental Remediation in Fukushima and Future Oriented Project

In response to the local needs in Fukushima, MOE will promote future-oriented initiatives to create and rediscover the strengths of the region from the environmental

perspective of de-carbonization, resource recycling, and coexistence with nature, in addition to environmental restoration. MOE will also engage in risk communication, public relations and information dissemination to address radiation health concerns, and strategically develop a cross-sectoral policy package through these efforts.

(Examples)

- Support for industrial creation (recycling facility for incombustibles will be operating in 2020 Autumn)
- Support for decarbonized town planning (compatibility both for development of town reconstruction and decarbonization)
- Support for Fukushima green regeneration
  (Expansion of tourists population by utilizing natural resources such as national park)
- Support for revitalization of local community (risk communication, information dissemination through Riprun Fukushima)

A-3-2-4 Consolidated Report of IAEA-MOE Experts Meeting on Environmental Remediation

The IAEA is now working on "Consolidated Report" with a content of IAEA-MOE Experts Meetings which were held 4 times in a row between 2016 and 2017. The MOE also helps the IAEA to share the past and latest information on environmental remediation in Fukushima. The report is planned to be published in March 2021.

For updated information, please check MOE web-site shown below:
http://josen.env.go.jp/en/

A-4 Preparation of the Report

This report describes measures taken for implementing the obligations under this Convention and is a compilation of information available at the end of March 2020, unless otherwise specified.

This report describes those measures article by article, and its description is mainly focused on the mechanism to ensure safety. In addition, response to challenges identified at the 6th Review Meeting are reported in Section K.

The Guidelines on the Structure of National Report, INFCIRC/604/Rev3, is taken into

account to develop this National Report. In Japan, multiple government organizations are in charge of implementation for the obligations under this Convention. Following list is general allocation of responsibility.

Sections defined by INFCIRC/604	Responsible organization
A	NRA, MOE
B	METI, NRA, MEXT
C	MOFA
D	NRA, MHLW
E	NRA, MHLW, METI
F	NRA, MEXT, CAO
G	NRA, METI
H	NRA
I	METI, NRA
J	NRA
K	NRA, METI
L	NRA

* NRA: Nuclear Regulation Authority; MOE: Ministry of the Environment; METI: Ministry of Economy, Trade and Industry; MEXT: Ministry of Education, Culture, Sports, Science and Technology; MOFA: Ministry of Foreign Affairs; MHLW: Ministry of Health, Labour and Welfare; CAO: Cabinet Office

A-5 Overview Matrix

	Long-term management policy	Funding of liabilities	Current practices / facilities	Planned facilities
Spent fuel	Reprocessing	Utilities shall pay contributions into fund management organization for reprocessing	Overseas Reprocessing	Japan Nuclear Fuel Ltd. (JNFL) Rokkasho Reprocessing facility (Under Pre-Service Inspection) / Recyclable-Fuel Storage Co. (RFS) Spent Fuel Storage Facility (under construction)
Nuclear fuel cycle wastes	Geological disposal, intermediate depth disposal and near surface disposal	Utilities shall pay contributions into fund management organization for disposal	Low Level Radioactive Waste (LLW) disposal facilities. High Level Radioactive Waste (HLW) storage facilities	Geological disposal and intermediate depth disposal
Radioactive waste from research facilities, etc.	Near surface disposal	Waste generator pays for the storage and disposal	On site storage	Near surface disposal
Decommissioning liabilities	Decommissioning of NPP	Utilities shall pay deposits into the Reserve Fund	Tokai Hamaoka (1,2) Genkai (1,2) Tsuruga (1) Mihama (1,2) Shimane (1) Ikata (1) Ohi (1,2) Onagawa (1)	TEPCO Fukushima Daiichi (1-6) TEPCO Fukushima Daini (1-4) Ikata (2)
Disused sealed sources	Return to manufacturers, Long-term Source user storage	Source user	Return to manufactures, Storage	-

Section B Policies and Practices

Article 32

1 In accordance with the provisions of Article 30, each Contracting Party shall submit a national report to each review meeting of Contracting Parties. This report shall address the measures taken to implement each of the obligations of the Convention. For each Contracting Party the report shall also address its:

(i) spent fuel management policy;

(ii) spent fuel management practices;

(iii) radioactive waste management policy;

(iv) radioactive waste management practices;

(v) criteria used to define and categorize radioactive waste.

Section B describes the national policy for promoting the spent fuel management and radioactive waste management in Japan and the operator's actions based on that policy. The policy and actions for the safety of spent fuel management and radioactive waste management are described in "Section G Safety of Spent Fuel Management" and "Section H Safety of Radioactive Waste Management", respectively.

B-1 Spent Fuel Management Policy

The management of spent fuel is a global challenge. Spent fuel is an unavoidable product of the use of nuclear energy, and it is essential to implement measures to resolve this challenge as a responsibility of the current generation so that the burden is not passed on to future generations. Therefore, Japan has been reinforcing and promoting efforts comprehensively to resolve the challenge of how to manage and dispose of spent fuel.

As the current generation that has produced radioactive waste, the government of Japan will reinforce measures toward final disposal of high-level radioactive waste and take the initiative in solving this problem. However, the process will take a long time. In the meantime, spent fuel produced by nuclear power generation must be safely managed. It is therefore necessary to expand the capacity for storing spent fuel and is urgently important to broaden the range of choices for managing spent fuel while ensuring safety. It will enhance the flexibility of policy planning, and contribute to medium-term energy security.

Based on the above policy, it is necessary that the storage capacity of spent fuel will be expanded. Specifically, while studying a wide range of locations as possible sites, 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.

In order to resolve the issues related to the reprocessing and disposal of spent fuels and mitigate the risks for and the burden on future generations, the government will make efforts towards a nuclear fuel cycle that contributes to the reduction of the volume and harmfulness of high-level radioactive waste and effective utilization of resources while adequately taking the past history into consideration and continuing to gain the understanding of relevant municipalities and the international community, and will promote reprocessing and plutonium use in LWRs. Furthermore, the government will promote development of technologies for reducing the volume and harmfulness of radioactive waste in order to secure a wide range of options in the future.

As a measure to organize the business environment and achieve steady reprocessing which forms the basis of the nuclear fuel cycle, Japan has implemented the Spent Nuclear Fuel Reprocessing Implementation Act (see Section E). The bill establishes a scheme for securing funds related to reprocessing spent fuel, as well as an implementation body to be responsible for reprocessing. Based on this, the Nuclear Reprocessing Organization of Japan was established as an authorized corporation on October 3rd, 2016.

B-2 Spent Fuel Management Practices

B-2-1 Reprocessing of spent fuel generated from nuclear power generation

Electric utilities had sent spent fuel to the United Kingdom and French reprocessing companies since 1969; the export of spent fuel to foreign reprocessing plants has stopped in July 2001. Approximately 7,100MTU of spent fuel had been exported.

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, in Tokai village in Ibaraki Prefecture (reprocessing capacity: 0.7MTU

per day). 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. Later, the reprocessing test of the advanced thermal reactor MOX spent fuel was conducted until May 2007, and it was used for the development of reprocessing technology. The plant has reprocessed a total of approximately 1,100MTU of spent fuel since the commissioning.

In response to the amendment of the Reactor Regulation Act 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 the 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. The plant has reprocessed a total of approximately 430MTU for the pre-service inspection at the end of March 2008 for active testing to secure the safety function. Also, from November, 2007, vitrification testing began. It ended in 2013 after a temporary interruption due to the East Japan great earthquake. At the present time, the plant proceeds with management to meet the new requirements formulated by the Nuclear Regulation Authority, aiming at completion in the first half of 2022. Spent fuel storage has already begun at the 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 May 2020. As of the end of March, 2020, the amount of spent fuel stored in nuclear power plants of LWR in Japan amounts to approximately 16,000 MTU.

B-2-2 Offsite interim spent fuel storage

The amendment of the Reactor Regulation Act was enforced in 2000 to incorporate provisions on interim spent fuel storage. In response to this amendment, TEPCO and JAPC jointly established “Recyclable-Fuel Storage Company (RFS)” in 2005. After receiving the approval of previous regulatory scheme, RFS started construction of Recyclable-Fuel Storage Center in 2010 at Mutsu city, Aomori Prefecture, which is Japan’s first off-site interim spent fuel storage facility. In December 2013, the NRA

developed new regulatory requirements for nuclear fuel cycle facilities including spent fuel storage facility based on the TEPCO's Fukushima Daiichi Nuclear Power Station Accident. In January 2014, RFS applied to NRA for the review, and NRA is implementing its review at present. The Storage Center is the facility to store spent fuel generated from BWRs and PWRs in metallic dry casks, and is capable of storing a maximum of approximately 3,000MTU of spent fuel.

B-2-3 Management of spent fuel from research reactor facilities

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

B-3 Radioactive Waste Management Policy

The government of Japan developed the policy for promoting radioactive waste disposal as described below.

B-3-1 Radioactive waste subject to geological disposal

B-3-1-1 High level radioactive waste

In Japan, a site for geological disposal of high level radioactive waste is determined through three steps of the selection of "preliminary investigation areas", "detailed investigation areas" and "construction site of final disposal facility", in accordance with the "Final Disposal Act" in May 2003. (See Section E). The Nuclear Waste Management Organization of Japan (NUMO) was established as an organization to implement final disposal. In addition, utilities have deposited the reserve funds for final disposal to NUMO. The appeal to the public for candidate areas for literature survey on the possible installation of a final disposal facility was conducted by NUMO, but the literature survey has not yet been commenced.

Under these circumstances, the Japanese government revised fundamental policy based on the Final Disposal Act in May, 2015. In the new policy it was decided that Japan should take the initiative to solve the problem of high-level radioactive waste as the responsibility of the current generation that created the waste so as not to pass the burden on to future generations. Specifically, in order to ensure a deeper public

concern and understanding of the issue, central government is supposed to indicate the area considered higher suitability from a scientific perspective. The Japanese government published the "Nationwide Map of Scientific features for Geological Disposal" in July, 2017. While making efforts on the assumption of geological disposal, it is ensured that the future generation will be able to select the best disposal method (reversibility and retrievability). The technical reliability of geological disposal will be evaluated while proceeding with parallel surveys and research of alternative disposal options. In addition, structure of regional consensus building for citizens of various positions to participate in and supportive measures toward the sustainable development of communities to accept final disposal site will be considered.

As for international cooperation, Japan has been studying, and using as reference, cases in foreign countries where disposal site selection is in progress, and will continue to exchange views with the countries that have final disposal programs and also to promote multinational cooperation using cooperative frameworks of the IAEA, OECD/NEA, etc.

B-3-1-2 Long-lived low-heat generating radioactive wastes (TRU wastes) to be geologically disposed of

Agency for Natural Resources and Energy (ANRE), which is the affiliated organization of METI, amended the Final Disposal Act in 2007. According to this amendment, TRU wastes from reprocessing that need to be geologically disposed of and high level radioactive wastes that are returned from overseas reprocessing plants in exchange for TRU wastes were added to the wastes to be finally disposed of by NUMO, and generators of such radioactive wastes were legally requested to provide the cost needed for final disposal.

B-3-2 Radioactive wastes subject to disposal with active control

In Japan, disposal with active control is categorized by the following three types; "near surface trench disposal", "near surface pit disposal" and "intermediate depth disposal." 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.

B-3-3 Ban on sea dumping of radioactive waste

In compliance with the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1972) and its amendment to Annex I in 1993, it was decided that "the government of Japan will eliminate the option of sea dumping as a principle of low level radioactive waste in the future." Based on this decision, the Reactor Regulation Act was amended in May 2005, and sea dumping of radioactive waste was banned.

B-4 Radioactive Waste Management Practices

Operators, recognizing their responsibility concerning radioactive waste management, shall manage radioactive waste generated at their facilities in compliance with the Reactor Regulation Act, the Radiation Hazards Prevention Act and relevant regulations.

B-4-1 High Level Radioactive Waste Management Practices

Spent fuel generated in Japan, has been reprocessed by the Rokkasho Reprocessing Plant of JNFL, Tokai Reprocessing Plant of JAEA and reprocessing plants in the United Kingdom and France. (JNFL has reprocessed spent fuel in an active test and plans to complete the Rokkasho Reprocessing Plant in the first half of 2018.)

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 have been returned to the utilities and are stored at the Vitrified Waste Storage Center of JNFL. As of the end of March2020, 1,830 vitrified canisters have 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 380 vitrified waste canisters will be returned in about 3 times. The Rokkasho Reprocessing Plant has been storing 346 vitrified waste canisters which were generated in an 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 2020, about 365 cubic meters of liquid waste and 316 vitrified waste canisters are in storage. Vitrified waste canisters are decided to undergo geological disposal based on the Final Disposal Act.

B-4-2 Low Level Radioactive Waste Management Practices

For the business of waste based on the Reactor Regulation Act, please see Section H.

B-5 Criteria Used to Define and Categorize Radioactive Waste

Classification of radioactive waste based on the Reactor Regulation Act is described in Section E.

Section C Scope of Application

Article 3

1. This Convention shall apply to the safety of spent fuel management when the spent fuel results from the operation of civilian nuclear reactors. Spent fuel held at reprocessing facilities as part of a reprocessing activity is not covered in the scope of this Convention unless the Contracting Party declares reprocessing to be part of spent fuel management.
2. This Convention shall also apply to the safety of radioactive waste management when the radioactive waste results from civilian applications. However, this Convention shall not apply to waste that contains only naturally occurring radioactive materials and that does not originate from the nuclear fuel cycle, unless it constitutes a disused sealed source or it is declared as radioactive waste for the purposes of this Convention by the Contracting Party.
3. This Convention shall not apply to the safety of management of spent fuel or radioactive waste within military or defence programmes, unless declared as spent fuel or radioactive waste for the purposes of this Convention by the Contracting Party. However, this Convention shall apply to the safety of management of spent fuel and radioactive waste from military or defence programmes if and when such materials are transferred permanently to and managed within exclusively civilian programmes.
4. This Convention shall also apply to discharges as provided for in Articles 4, 7, 11, 14, 24 and 26.

The government of Japan declared, pursuant to paragraph 1 of Article 3 of the Convention, that reprocessing is part of spent fuel management, when Japan acceded to the Convention. Therefore the government of Japan includes the spent fuel stored in reprocessing facilities in the scope of the Convention.

The government of Japan did not make declarations provided for in paragraphs 2 and 3 of Article 3 of the Convention.

Section D Inventories and Lists

Article 32

2 This report shall also include:

(i) a list of the spent fuel management facilities subject to this Convention, their location, main purpose and essential features;

(ii) an inventory of spent fuel that is subject to this Convention and that is being held in storage and of that which has been disposed of. This inventory shall contain a description of the material and, if available, give information on its mass and its total activity;

(iii) a list of the radioactive waste management facilities subject to this Convention, their location, main purpose and essential features;

(iv) an inventory of radioactive waste that is subject to this Convention that:

(a) is being held in storage at radioactive waste management and nuclear fuel cycle facilities;

(b) has been disposed of; or

(c) has resulted from past practices.

This inventory shall contain a description of the material and other appropriate information available, such as volume or mass, activity and specific radionuclides;

(v) a list of nuclear facilities in the process of being decommissioned and the status of decommissioning activities at those facilities.

D-1 List of Spent Fuel Management Facilities

As Japan declared that reprocessing is a part of spent fuel management, spent fuel storage facility in Japan include nuclear reactor facility, spent fuel storage facility, and reprocessing facility. Spent fuel generated in nuclear power reactors is stored at spent fuel storage within each nuclear power station for a certain period of time, and is transported to spent fuel storage facility or reprocessing facility.

Spent fuel generated in research reactors is stored and managed mostly inside the said research reactor facilities.

The location, main purpose and features of these major spent fuel storage facilities are listed in Section L.

D-2 Inventories of Spent Fuel

Inventory and types of spent fuel stored in Japan are listed in Section L.

D-3 List of Radioactive Waste Management Facilities

In Japan, there are radioactive waste disposal facility and radioactive waste storage facility where radioactive waste is stored temporarily before final disposal. As types of waste repositories, there are a near surface disposal facility, i.e. trench type disposal facility, and a near surface disposal facility, i.e. pit type disposal facility. Very low level radioactive waste is disposed of trench type disposal facility, and solidified waste (homogeneous waste package or cemented waste package) in drums is disposed of pit type disposal facility. In waste storage facility, high-level radioactive vitrified waste packages generated by reprocessing are temporarily stored.

Radioactive waste storage facilities are also located in nuclear facilities defined by this Convention. Radioactive waste storage facilities within nuclear power plants include: waste treatment facility; solid waste depository where treated waste (homogeneous waste packages, cemented waste packages, other miscellaneous solids) in drums are stored; depository where replaced steam generators and other large solid wastes are stored; spent fuel pool where disused control rods and channel boxes are stored; and vessel where used ion-exchange resin is stored.

Radioactive waste storage facilities within fuel processing plants include: radioactive waste treatment equipment; and solid waste depository where treated radioactive waste is stored.

Radioactive waste storage facilities within reprocessing plants include: radioactive waste treatment equipment; waste depository where vitrified waste and high level liquid waste are stored; and waste depository where low level liquid waste and low level solid waste are stored.

Radioactive waste storage facilities within research reactors and major nuclear material usage facilities include: waste treatment equipment for low-level radioactive waste; and solid waste depository for drums of treated waste, etc.

Major radioactive waste storage facilities licensed under the RI Regulation Act include waste storage facility for containers containing processed waste generated at

radioisotopes use facilities. They are the spent fuel storage facilities which obtained the permission of waste disposal activity.

Radioactive waste management facilities licensed under the Medical Care Act include storage facilities for containers, etc. containing radioactive medical waste generated from medical facilities.

The location, purpose and characteristics of such radioactive waste storage facilities are listed in the Section L.

D-4 Inventories of Radioactive Waste

D-4-1 Radioactive Waste in Storage

In March 2020, the waste stored at nuclear power plants in radioactive waste interim storage facilities include approximately 700,000 of 200 liter drums of low level radioactive waste (LLW), 35 of disused steam generators, disused control rods, channel boxes, dumped ion-exchange resin as of the end of March 2020. In addition, rubble, trimmed trees, dumped protective clothing generated after accident, etc. [472, 500 m^3 in total], and waste from contaminated water treatment [4,713 of cesium absorber columns etc. and 597m^3 of sludge] have been temporarily stored in TEPCO Fukushima Daiichi NPS.

At facilities other than nuclear power plants, 2,492 of vitrified waste packages of high-level radioactive waste (HLW) and approx. 576 m^3 of high level liquid waste are stored in reprocessing facilities. Details of these inventories including the other radioactive waste are listed in Section L.

D-4-2 Disposed Radioactive Waste

Since 1992, LLW which contains comparatively low concentration of radionuclides stored at radioactive waste storage facilities in nuclear power reactor facilities have been transferred to the Japan Nuclear Fuel Ltd. (JNFL) radioactive waste disposal facility for disposal (pit disposal). The amount of waste currently at the disposal facility is listed in the Section L.

The JNFL disposal facility is currently in operation and has disposed ca. 310,000 drums (200-liter-drum equivalent) of waste as of the end of March 2020. At the Japan Atomic Energy Agency (JAEA) Nuclear Science Research Institute, about 1,670 tons of very low

level waste (concrete rubbles) resulting from the dismantling of the Japan Power Demonstration Reactor (JPDR) was disposed (trench disposal).

D-4-3 Radioactive Waste Resulting from Past Practices

In Japan, all radioactive waste including the one generated before the time the Convention entered into force for Japan is managed or was disposed of under the Reactor Regulation Act or the RI Regulation Act. Therefore, there is none to report under this item.

D-5 Nuclear Facilities under Decommissioning

D-5-1 Nuclear Power Reactors

As of the end of March 2020, 15 units in total are under decommissioning:

- Japan Atomic Power Company's (JAPCO) Tokai NPP;
- JAPCO's Tsuruga unit 1;
- The Tohoku Electric Power Company's Onagawa unit 1;
- The Chubu Electric Power Company's Hamaoka units 1 and 2;
- The Kansai Electric Power Company's Mihama units 1 and 2;
- The Kansai Electric Power Company's Ohi units 1 and 2;
- The Chugoku Electric Power Company's Shimane unit 1.
- The Shikoku Electric Power Company's Ikata unit 1;
- The Kyushu Electric Power Company's Genkai units 1 and 2;
- The JAEA's Fugen Advanced Thermal Reactor; and
- The JAEA's Monju Prototype Fast Breeder Reactor.

Since the last report, 5 NPPs have been granted the approval of the decommissioning plans. Details on the NPPs under decommissioning (name, classification, date of Approval of Decommissioning Plan, completion schedule for decommissioning) are listed in Section L4-1. Also, current situations of major decommissioning activities are shown below.

Reactor at JAPCO's Tokai NPS ceased operation in 1998. Decommissioning work has been conducted since December 2001. Equipment other than reactor such as turbines and feed water pumps was dismantled first and heat exchangers have been dismantled since 2006. Dismantling of the reactor vessel will begin in FY 2024 and will take around 6 years. Decommissioning is expected to be completed in FY 2030.

The JAEA's Prototype Advanced Thermal Reactor Fugen ceased operation at the end of March 2003, and has been under decommissioning following the approval of the decommissioning plan in February 2008. Until now, dismantlement of condenser and feed water heater as well as removal of tritium in heavy water system have been conducted, and dismantlement of equipment around the reactor is currently underway. The decommissioning is planned to be completed in FY 2033.

Regarding the JAEA's Prototype Fast Breeder Reactor Monju, a basic plan on decommissioning was developed in July 2017 in response to the Governmental decision of its transition to decommissioning in December 2016, and decommissioning work started following the approval of the decommissioning plan in March 2018. Currently fuel removal from the core is underway as the first step of the 4 steps in the decommissioning process. From FY 2023, dismantling preparation of sodium components and dismantlement of power generation equipment such as water-steam system are scheduled to be conducted as the second step. The decommissioning is planned to be completed in FY 2047.

Chubu Electric Power Company's Hamaoka units 1 and 2 ceased operation in January 2009. The decommissioning plan which set out both the basic decommissioning policy for units 1 and 2 and the activities in the first stage (dismantling preparation phase), was approved in November 2009. During the initial dismantling preparation phase, shipping of spent fuel and survey and investigation of contamination were completed. In February 2016, the decommissioning plan for the second stage (dismantling of systems and equipment outside the reactor) was approved. The decommissioning is planned to be completed in FY 2036.

TEPCO decided to decommission TEPCO Fukushima Daiichi units 5 and 6 as well as unit 1 to 4 which were severely damaged by the accident in March 2011. These 6 units are in a state of permanent shutdown prior to decommissioning stage. In addition, TEPCO decided to decommission TEPCO Fukushima Daini NPS unit 1 to 4 in July 2019.

D-5-2 Research Reactors

A total of 10 research reactors are in the process of being decommissioned:

- The JAEA's Japan Research Reactor No.2 (JRR-2), JRR-4, Transient Experiment Critical Facility (TRACY);
- The JAEA's Reactor Facilities of the Nuclear Ship Mutsu;

- The JAEA's 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).

Details on research reactors under decommissioning (name, classification, date of Approval of Decommissioning Plan) are listed in Section L.

In addition, the NRA is reviewing the application for decommissioning plan of JAEA Nuclear Science Research Institute's Tank-type Critical Assembly (TCA), Oarai Research and Development Institute's Japan Materials Testing Reactor (JMTR) and Toshiba Energy Systems & Solutions Corporation's Nuclear Critical Assembly (NCA).

D-5-3 Reprocessing Facilities

The JAEA's Reprocessing Facility received the approval of the decommissioning plan in June 2018, and is currently conducting equipment update to restart vitrification work of high-level radioactive liquid waste as of March 2020. The decommissioning is planned to continue for approximately 70 years hereafter through dismantling equipment in sequence following cleaning processes and decontamination of systems.

Section E Legislative and Regulatory System

E-1 Implementing Measures

Article 18 Implementing Measures

Each Contracting Party shall take, within the framework of its national law, the legislative, regulatory and administrative measures and other steps necessary for implementing its obligations under this Convention.

In Japan's legal system relating to nuclear regulation, the Atomic Energy Basic Act is the most primary piece of legislation and defines the basic principles of nuclear energy use in Japan.

Under this Act, the Act for Establishment of the NRA and the Reactor Regulation Act are enacted to ensure safety for nuclear use, and the RI Regulation Act is enacted to prevent radiation hazards.

As an act to enhance management of spent fuel and radioactive waste, by taking measures to achieve steady reprocessing and organizing the business environment for nuclear power generation, Japan has implemented the Spent Nuclear Fuel Reprocessing Implementation Act. Meanwhile, the Designated Radioactive Waste Final Disposal Act (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.

The other necessary legislation has been put in place such as the Act on Special Measures Concerning Nuclear Emergency Preparedness hereinafter referred to as the Nuclear Emergency Act, which stipulates responses to nuclear disasters.

The NRA settles the NRA Ordinances stipulating regulatory requirements in accordance with the Reactor Regulation Act or the RI Regulation Act. The Reactor Regulation Act prescribes such procedures as permits, approvals, and inspections required for installation and operation of nuclear facilities, etc. The Reactor Regulation Act clearly stipulates the NRA's authorities to revoke permits and suspend the operation of facilities, and impose penalties for violations of its provisions. Likewise, the RI Regulation Act prescribes such procedures as permits, registration and inspections required for the use

of radioisotopes and radiation generating apparatuses, etc. The RI Regulation Act clearly stipulates the NRA's authorities to revoke permits and suspend the use of them, and impose penalties for violation of its provisions.

E-2 Legislative Framework in Japan

Article 19 Legislative and Regulatory Framework

1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management.
2. This legislative and regulatory framework shall provide for:

(i) the establishment of applicable national safety requirements and regulations for radiation safety;

(ii) a system of licensing for spent fuel and radioactive waste management activities;

(iii) a system of prohibition for the operation of a spent fuel or radioactive waste management facility without a license;

(iv) a system of appropriate institutional control, regulatory inspection and documentation and reporting;

(v) the enforcement of applicable regulations and of the terms of the licenses;

(vi) a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and radioactive waste management.

3. When considering whether to regulate radioactive materials as radioactive waste, Contracting Parties shall take due account of the objectives of this Convention.

The related laws and ordinances to govern the safety of spent fuel and radioactive waste management are reported as follows.

E-2-1 The Atomic Energy Basic Act

The Atomic Energy Basic Act promulgated in 1955 forms the basis of nuclear energy use in Japan. The objective of the Act is to secure future energy sources and promoting academic and industrial development, thereby contributing to the welfare of mankind and the enhancing quality of life. The Act specifically limits the research, development and use of nuclear energy to peaceful purposes, prioritizes safety, ensures it is performed autonomously under democratic management, and fruit shall be made public and contribute to international cooperation.

Moreover, the Act stipulates that the Atomic Energy Commission of Japan shall be established to ensure the democratic implementation of nuclear energy policy. Construction of reactors and the use of nuclear fuel materials will be governed by regulations stipulated in the Reactor Regulation Act.

After TEPCO Fukushima Daiichi NPS accident, Atomic Energy Basic Act was amended in September 2012. Regarding ensuring safety, contribute to protect lives, health, and wealth of nationals, preservation of the environment and national security was added as an objective of this act by this amendment. Furthermore, new provisions concerning the establishment of the NRA and the Nuclear Emergency Preparedness Commission were added. And a provision concerning the establishment of the Nuclear Safety Commission of Japan, which was abolished upon the establishment of the NRA, was deleted.

E-2-2 The Reactor Regulation Act

The Reactor Regulation Act stipulated in 1957 provides regulation for all aspects of nuclear use in Japan.

By the revision of the Act in 2012, the provision for prevention for the release of abnormal level of radioactive material by severe accident, regulation which considers the occurrence of large-scale natural disasters and the criminal acts including terrorist activities as well as safety objectives of the Atomic Energy Basic Act were added.

The objective of the Act was as follows:
"In accordance with the spirit of the Atomic Energy Basic Act, this Act is enacted for the purpose of providing necessary regulations on refining business, fabricating and enrichment business, interim storage business, reprocessing business and waste management business, as well as on the installation and operation of reactors while taking into consideration the possibility of large scale natural disasters, terrorist attacks, or other criminal acts, in order to ensure that the use of nuclear source material, nuclear fuel material and reactors are limited to peaceful purposes, and to ensure public safety by preventing hazards in the event that a severe accident at a nuclear facility causes discharge of an abnormal level of radioactive materials outside the factory or place of activity where the nuclear facility is installed, and by protecting nuclear fuel material. And it is also enacted for the purpose of providing necessary regulations on the use of international controlled material in accordance with treaties or other international agreements concerning the research, the development and the use of nuclear energy."

In this revision, severe accident measures have been added to the regulation on nuclear power reactors, reprocessing and fuel processing facilities. Periodic Safety Assessment of Continuous Improvement, which is the comprehensive safety assessment periodically conducted by licensees, is introduced. Licensees are obliged to submit the

result of the assessment to the NRA and make it publicly available. In addition, "back-fitting system" has been also introduced, which requires a nuclear facility to meet the latest regulatory requirements retroactively even if it were already permitted or approved.

The Reactor Regulation Act stipulates regulation on spent fuel storage, reprocessing and radioactive waste disposal, such as Permit of Business, Approval of Design and Construction Plan, Licensee's Pre-Service Inspection, Licensee's Periodic Inspection, Approval of Operational Safety Program, Nuclear Regulatory Inspection, regulatory procedures for decommissioning, and the duty to conform to regulatory standards. Radioactive waste management has been categorized into 3: category 1 waste disposal (geological disposal), category 2 waste disposal (intermediate depth disposal and near surface disposal), and waste interim storage (Table E2-1, Table E2-2). The Act also prescribes administrative penalties such as suspension of operations, revocation of permits, and criminal penalties such as imprisonment or a fine, in case that an operator fails to comply with the provisions of this Act.

Furthermore, this Act stipulates a system for an employee feedback system (whistle blowers) that an employee of licensees or any other persons are able to provide to the NRA the information about breaching the Act. In addition, this Act stipulates that it must be prohibited for the concerned persons to suffer any disadvantages.

Regarding specified nuclear facility where nuclear disaster has occurred, the Reactor Regulation Act stipulates that it can be partially applied to the facility as long as an action plan to implement necessary measures is created and such measures are appropriately taken to ensure the safety. The NRA has designated TEPCO Fukushima Daiichi NPS as Specified Nuclear Facility. The NRA Ordinance Concerning the Operational Safety of Reactor Facilities at TEPCO Fukushima Daiichi NPS and the Protection of Specified Nuclear Fuel Material has been enacted. This prescribes the steps to be taken to ensure safety at TEPCO Fukushima Daiichi NPS.

After the revision of the Reactor Regulation Act in 2012, the IAEA's IRRS mission hosted in January 2016 recognized the needs for the improvement of inspection system at the operational stage and other issues, which had been identified as future challenges by the NRA itself. The NRA made revision on the legislation including the Reactor Regulation Act in April 2017. The main contents of the revision of this Act were: (1) reform of the inspection system; (2) requirement for consideration on decommissioning

from the early stage of design; and (3) review of the regulatory system for disposal of radioactive waste generated from reactor decommissioning.

(1) Inspection system has reviewed to achieve further enhancement of safety by making inspection flexible, covering all aspects of licensees' activities related to ensure safety and checking issues by focusing on safety concerns. The new inspection system is different from previous one which checks various items to identify fitness of those inspection results in fragments. The new inspection system had been conducted as trial from 2018 to collect challenges for improvement. It has been fully operated since 2020 as a systematic inspection program.

(2) With regard to decommissioning of nuclear facilities, in order to invite licensees' early considerations for decommissioning at an early stage of design and facilitate more smooth transition from operation stop to decommissioning, licensees are required to prepare an policy on measures for termination of business (Decommissioning Policy) and disclose it to the public promptly after obtaining Permit of Business. Related regulations came into effect in October 2018, and licensees have developed the Decommissioning Policies and opened it to the public. This Policy should include the estimate of the amount of waste, the estimate of decommissioning cost and methods of raising funds, any other necessary items to implement decommissioning.

(3) Out of radioactive waste for cat-2 waste disposal, regulation on backfilling of the tunnel is established for intermediate depth disposal site for waste, e.g. core internals, which radioactivity exceeds the concentration limit for pit disposal. Activities such as excavation at intermediate depth disposal and geological disposal site are restricted.

Figure E2-1 Structure of Major NRA Ordinances on Safety of Spent Fuel Management and Radioactive Waste Management under the Reactor Regulation Act

the NRA Ordinance on Cat-2 Waste Disposal Business for Nuclear Fuel Material or Objects Contaminated with Nuclear Fuel Materials

the NRA Ordinance on Standards for the Location, Structure and Equipment of Cat-2 Waste Disposal Facilities (the Licensing Standards)

the NRA Ordinance on Technical Standards for Specified Cat-1 Waste Disposal Facilities or Specified Waste Storage Facilities (the Technical Standards)

Major Ordinance on nuclear facilities in general

The NRA Ordinance on Standards for Quality Management in Operational Safety of Nuclear Facilities (the Quality Management Standards)

Table E2-1 Radioactive Waste Management Prescribed in the Reactor Regulation Act Article 51(2)

Category	**Radioactive Waste Management**					
	Category- 1 (Cat-1) Waste Disposal	**Category- 2 (Cat-2) Waste Disposal**			**Waste Interim Storage / treatment**	
Name	Cat-1 Waste Disposal *1	Intermedi-ate Depth Disposal	Pit Disposal	Trench Disposal	Storage	Treatment
Business description	Final disposal by a method on the burial of radioactive waste in the excess of criteria defined by Order*2 as they have potential significant risks to human health.	Final disposal by a method on the burial of radioactive waste*4 at a depth of 70m and up from ground, and not exceeding criteria defined by Order*2.	Final disposal by a method on the burial of radioactive waste*5 above ground or less than 70m from ground, and not exceeding criteria defined by the rule*3 (limited to methods either to fix radioactive waste at waste disposal site with the engineered barrier structure or fix integrally radioactive waste at waste disposal site without the engineered barrier site)	Final disposal by a method on the burial of radioactive waste*5 above ground or less than 70m from ground, and not exceeding criteria defined by the rule*3 (excluding for methods either to fix radioactive waste at waste disposal site with the engineered barrier structure or fix integrally radioactive waste at waste disposal site without the engineered barrier site)	Storage of radioactive solid waste until final disposal is performed.	Processing radioactive liquid waste or radioactive solid waste to quality suitable for final disposal.

*1 The name of "geological disposal" is not based on the Reactor Regulation Act, but often used in order to distinguish other waste.

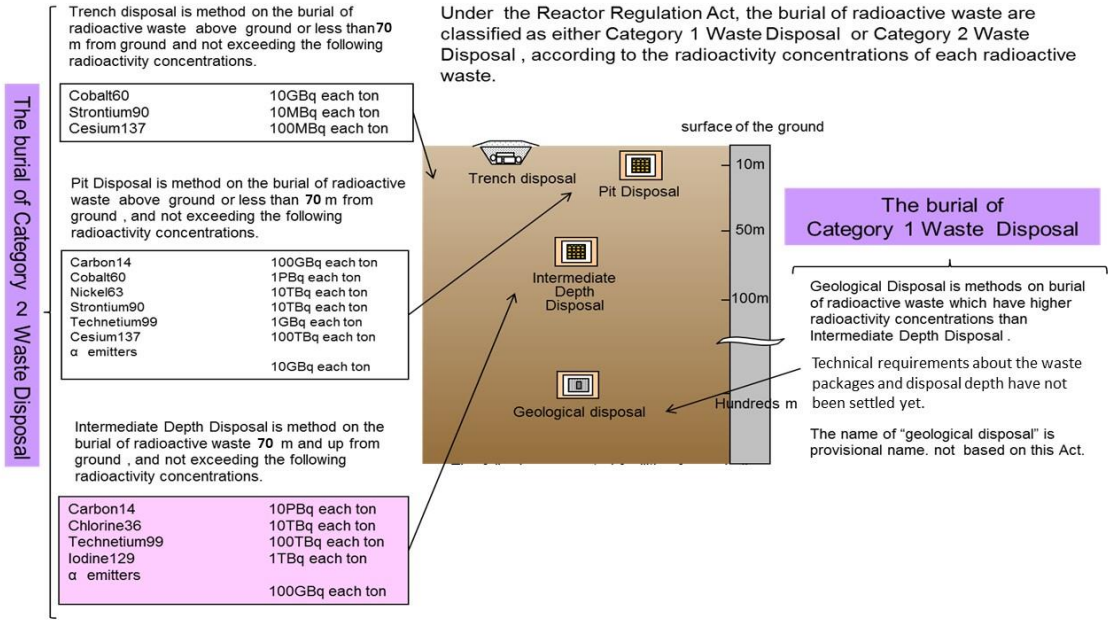
*2 The Order for Enforcement of the Act on the Reactor Regulation Act.

*3 The Rule on Cat-2 Waste Disposal of Nuclear Fuel Material and Materials Contaminated with Nuclear Fuel Material.

*4 Radioactive waste from fuel facilities (limited to a facility solely conducting the fabrication of fuel that assemblies that contain mixed uranium and plutonium oxide), research reactor, commercial power reactor or reprocessing facility.

*5 Excluding waste generated from uranium fuel fabrication facilities and uranium-using facilities

Table E2-2 Methods on the Burial of Radioactive Waste for Final Disposal



E-2-3 Major Revisions on Requirements under the Reactor Regulation Act

The major revisions of the regulatory requirements made by the NRA after 2017 are reported below.

E-2-3-1 Amendments on the NRA Ordinance on Dual Purpose Dry Cask (DPC) for Transportation and Storage

Regarding dry storage of spent fuel at commercial power reactor sites by DPC which could be used both for transportation and storage, the NRA established the reasonable regulation and procedure on the premise that its structural robustness meets stringent requirements for transportation. Specifically, the NRA has stipulated the design conditions for DPC such as the uniform seismic forces that are applicable to any candidate site. The NRA also added DPC into the system of Type Certification for Design and Type Designation when it is designed using the uniform values such as seismic forces. It allows the NRA to review only site specific conditions upon Installation Permit and Approval of Design and Construction Plan for each site, provided applicants have once obtained approval of Type Certification for Design and Type Designation for a certain DPC. For commercial power reactors, the NRA amended/established the NRA Ordinance on Standards for Installation Permit, the NRA Ordinance on Technical Standards, and relevant guides, and promulgated and

enforced them in April 2019.

Furthermore, in order to rationalize review processes for package design approval and packaging approval of the DPC, the NRA also revised the Notification on Technical Details for Off-Site Transportation of Nuclear Fuel Materials, etc. and established the Guide for application procedures, and enforced them in April 1, 2020.

E-2-3-2 Amendments on Regulations for Near Surface Disposal

In December 2019, the NRA revised the regulatory requirements for pit disposal and trench disposal among cat-2 radioactive waste disposal as follows:

- The required performances are clarified for waste facilities and waste packages, the requirements having been changed from previously prescribed specification-based criteria to performance-based criteria. Licensees shall formulate "Waste Acceptance Criteria (WAC)" to indicate specifications that satisfy the required performance of waste packages.
- The scenarios of safety assessments were organized in basic scenario (dose criterion: 0.01 mSv/y) and in alternative scenario (dose constraint: 0.3 mSv/y) in the previous regulation. In the revised (new) regulation, the scenarios are rearranged into “natural event scenarios” and “human intrusion scenarios.” Concerning natural event scenario, the result of assessment with the most conservative parameters scientifically reasonable shall not exceed the dose constraint 0.3 mSv/y, and the result with the most likely parameters scientifically reasonable shall not exceed the dose criterion 0.01 mSv/y. Since trench disposal has no engineered barriers to physically resist against human intrusion, the dose standard of human intrusion scenario is 0.3mSv/y, the same as that of the natural event scenario.
- The waste generated from reprocessing facilities, MOX processing facilities, RI facilities, etc. are able to covered by pit and trench disposals. This amendment does not include uranium waste.
- In order to reduce leakage of radionuclides, trench disposal facility shall install covered soil to avoid rainwater and groundwater infiltration and pit disposal facility shall install an engineered barrier (concrete pit) for containment and covered soil.

E-2-3-3 Amendments on Regulatory Requirements for Clearance

Japan has introduced the clearance system since 2005, and has more than 10 years’

experience. The NRA started work to revise the regulatory requirements for clearance in 2019, based on its experience of regulatory review of application for clearance.

The examination criteria established in September 2019 shows the selection method of radioactive material subject to radioactivity concentration evaluation of clearance, how to handle uncertainties in measurement and evaluation of radioactivity concentrations, the raised evaluation unit weight of 10 tons, and the introduction of sampling measurement methods.

The NRA established a new Ordinance on Clearance in August 2020 by abolishing the previous Ordinances provided per facility and integrating them into the new Ordinance. The new Ordinance on Clearance covers all materials and waste (excluding liquid and gaseous waste) generated from all nuclear facilities. Therefore, since the clearance level of various types of radionuclides needed to be defined, the clearance level of 257 types of radionuclides "for a widely common solid substance" as defined in the IAEA General Safety Requirements Part 3 (GSR Part 3) is incorporated into the new Ordinance, in conjunction with the clearance level of 17 types of radionuclides which Japan originally defined. The new Ordinance defines the clearance level of 274 types of radionuclides totally.

The details of the clearance system are reported in F4-5.

E-2-4 The RI Regulation Act

The purpose of the RI Regulation Act is, in accordance with the spirit of the Atomic Energy Basic Act, to provide regulations on the use, selling, leasing, waste management, and other handling of radioisotopes, the use of radiation generators, and the waste management and other handling of objects contaminated with radioisotopes or by radiation emitted from radiation generators (radioactively contaminated objects), thereby preventing radiation hazards caused by those activities, to secure specified radioisotopes and to ensure public safety. The Cabinet Order for Enforcement of the RI Regulation Act and the NRA Ordinance for enforcement thereof have been enacted under the RI Regulation Act.

All licensees and registrants for the use of radioisotopes or radiation generating apparatuses and waste disposal shall prepare the radiation hazard prevention program and appoint a Radiation Protection Supervisor, and notify the NRA of them before commencement of handling radioisotopes or radiation generating apparatuses. Those

licensees who own a storage facility or radiation generating apparatuses larger than a certain scale shall undergo a facility inspection prior to use and periodic inspections with regular intervals afterwards. Licensees and registrants also shall conform to the legal standards for facility and usage, measure doses within and at the boundary of their establishment as well as the exposure dose of radiation workers, conduct education and training, and provide health surveillance. When disposing of radioisotopes or of radioactive contaminants, the licensees and registrants shall ensure that storage within the facility or at disposal facility conform to the legal standards.

At the same time as the amendment of the Reactor Regulation Act in 2017 mentioned in E2-2, the Radiation Hazards Prevention Act was also amended in 2017 (renamed to the RI Regulation Act in 2019). In this amendment, special cases concerning the disposal of radioisotopes and radioactive contaminants were added. When licensees and registrants under the RI Regulation Act entrust disposal to disposal licensees under the Reactor Regulation Act, such radioisotopes and radioactive contaminants can be regarded as radioactive waste under the Reactor Regulation Act. Thus, the NRA is able to regulate waste disposal in waste disposal facility installed under the Reactor Regulation Act integrally and reasonably.

If necessary, NRA radiation inspectors conduct on-site inspections to check legal compliance with the standards. Licensees and registrants must notify the NRA when they cease to use radioisotopes or radiation generators and report any necessary subsequent measures.

E-2-5 The Nuclear Emergency Act

This Act was promulgated in 1999 to protect lives, bodies and properties of citizens from a nuclear disaster by strengthening nuclear disaster control measures, in cooperation with the Reactor Regulation Act, the Basic Act on Disaster Management, and other Acts concerning nuclear disaster prevention. To this end, the Nuclear Emergency Act stipulates special measures for the obligations, etc. of licensees concerning nuclear disaster prevention, the issuance of declaration of a nuclear emergency situation, establishment of nuclear emergency response headquarters, and the implementation of emergency response measures and other matters relating to a nuclear disaster, taking into consideration the particularity of a nuclear disasters. The act provides that licensees shall be responsible for taking full-scale measures for the prevention of the occurrence of a nuclear disaster and for taking, in good faith,

necessary measures with regard to the prevention of the progression of a nuclear disaster and nuclear disaster recovery effects. It also stipulates that the government shall take measures necessary for the implementation of emergency response measures and those necessary for the implementation of measures to prevent nuclear emergency and measures for restoration from nuclear emergency.

Following TEPCO Fukushima Daiichi NPS accident, the Nuclear Emergency Act was amended on September 19, 2012, including the enhancement of measures to prevent nuclear emergency, and the strengthening of the Nuclear Emergency Response Headquarters and other bodies in a nuclear emergency.

E-2-6 Spent Nuclear Fuel Reprocessing Implementation Act

To establish a scheme for the steady and efficient reprocessing of spent fuel, in accordance with the Government's policy, while the environment surrounding nuclear power business is undergoing change, Japan has amended the Spent Nuclear Fuel Reprocessing Fund Act in 2016. The bill establishes a scheme for securing funds related to reprocessing spent fuel, as well as an implementation body to be responsible for reprocessing, and authorized by the Minister of Economy, Trade and Industry. Nuclear Reprocessing Organization of Japan has established in 2016, whose main activities include the development of a master plan of overall nuclear reprocessing projects, collection of the expenses paid by electric power utilities, and commission of the reprocessing activities of spent fuels to a private entity (namely, Japan Nuclear Fuel Limited (JNFL)).

E-2-7 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");

- 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
- process for site selection for final disposal of designated radioactive wastes
- securing of the expenses required for final disposal of designated radioactive wastes

- implementing organization for final disposal of designated radioactive wastes.

The amendment of the Act in June 2007 newly added TRU wastes to be the subjects of geological disposal. The Minister of METI establishes the basic policy and based on this, provides for the final disposal plan. NUMO, which was established as an implementing organization based on the final disposal plan, carries out final disposal activities. Utilities shall pay deposits to the fund reserved for disposal, which is managed by RWMC designated by the Minister of METI. NUMO promotes site selection by a three-step procedure, that is, selection of the preliminary investigation area, detailed investigation area and the construction site for final disposal facility; NUMO obtains approval of the Minister of METI at each step. The three-step procedure for site selection is clearly defined.

E-2-8 Medical Care Act

The Medical Care Act has aimed to contribute for maintaining the public health and to protect the person who receives the medical treatment of good quality by providing regulatory requirements to the establishment and the management of hospitals and medical offices. When the radioisotope for medical use is used in hospitals or medical offices, the notification to the prefectural governor, the usage in the room which complies to the regulation, the disposal in the waste disposal facilities which complies to the standards are obliged. Moreover, the manager of the hospital or the medical offices is required to have the disposal facility that complies to the standards, and be able to consign the radioisotope to the contractor who is designated by the Minister of Health, Labour and welfare. In the designation, the Ministry of Health, Labour and welfare requires the periodic inspection, establishing the Radiation Hazards Prevention Program, notification of the terminating the waste management business, based on the Radiation Hazards Prevention Act.

E-2-9 Act on Clinical Laboratory Technicians.

In the Act on Clinical Laboratory Technicians, the registration standard of the Clinical Laboratory where the *in-vitro* examination is conducted is provided. For the usage of radioisotope for the *in-vitro* examination in the clinical laboratory, notification to the prefectural governor, the usage in the room which complies to the regulation, the disposal of radioisotope in the waste disposal facilities which complies to the standards

are obliged. Moreover, the manager of Clinical Laboratory can consign the radioisotope to the contractor who is designated by the Minister of Health, Labour and welfare.

E-2-10 Act on Securing Quality, Efficacy and Safety of Products Including Pharmaceuticals and Medical Devices (Pharmaceuticals and Medical Devices Act)

As the safety requirements for manufacturing radioactive medicine, the rule for manufacturing and handling of radioactive medicine and the rule of pharmacy facilities, based on the Pharmaceuticals and Medical Devices Act are provided.

E-2-11 Allocation of Responsibilities of the Bodies Involved in the Different Steps

Roles are separated as follows. METI takes measures to promote the activities on management of spent fuel and radioactive waste in accordance with the "Spent Nuclear Fuel Reprocessing Implementation Act" (Section E2-6) and the "Final Disposal Act" (Section E2-7), and the NRA regulates the safety of business in accordance with the "Reactor Regulation Act" (Section E2-2), thus the responsibilities of institutions involved in the different steps are clearly divided according to the legislative framework.

E-3 Regulatory Body

Article 20 Regulatory Body

1. Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 7, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.
2. Each Contracting Party, in accordance with its legislative and regulatory framework, shall take the appropriate steps to ensure the effective independence of the regulatory functions from other functions where organizations are involved in both spent fuel or radioactive waste management and in their regulation.

E-3-1 Organization, Authority and Responsibilities of the NRA

The NRA is an organization for nuclear regulation in Japan. The mission of the NRA is "to protect the general public and the environment through rigorous and reliable regulations of nuclear activities." The NRA Secretariat deals with related administrative matters. The NRA was established as an external bureau of the MOE. 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 National Government Organization Act and the Act for Establishment of the NRA, which aims for an independent, fair and neutral exercise of authority. The term of office of the Chairman and Commissioners is 5 years, and reappointment is possible.

The NRA has to submit an annual report which contains status of execution of its duty to the National Diet via the Prime Minister, pursuant to the Act for Establishment of the NRA. The appointment and dismissal of the NRA Secretariat personnel is at the discretion of the NRA Chairman.

The duty of the NRA is to ensure safety of nuclear energy use. The NRA has authority to establish the NRA Ordinances in order to implement the Reactor Regulation Act or the RI Regulation Act, and it has the legal authority to grant permit for installation of reactor, for business such as spent fuel storage or waste disposal, or other nuclear related activities.

The NRA can formulate the NRA Ordinances governing nuclear regulations in detail

on these facilities, including measures to ensure operational safety and the protection of specified nuclear fuel material, and emergency measures. The NRA implements regulation including approval of design and construction plan, inspections, approval of operational safety program and approval of decommissioning plan. In addition, it collects licensees' reports of nuclear facilities and conducts on-the-spot inspections, if necessary. The NRA also has the authority to revoke permits of nuclear facilities or suspend their operations, to order additional safety measures, the dismissal of Chief Reactor Engineers or Chief Engineer for Nuclear Fuel Material, decommissioning measures and other steps to prevent disasters.

In March 2014, the NRA merged the Japan Nuclear Energy Safety Organization (JNES), which had advanced technical knowledge in order to increase its technical expertise. Accordingly, at the end of March 2014, the NRA Secretariat had approximately 1,000 personnel, including Inspectors and Nuclear Emergency Preparedness Officers stationed at nuclear sites. There were some fluctuations in the number of staff because of increasing the number of inspectors in line with the reform of the inspection system and the integration of function for Nuclear Disaster Preparedness into the Cabinet Office (CAO). The number of the NRA staff is 1,074 as of April 1, 2020.

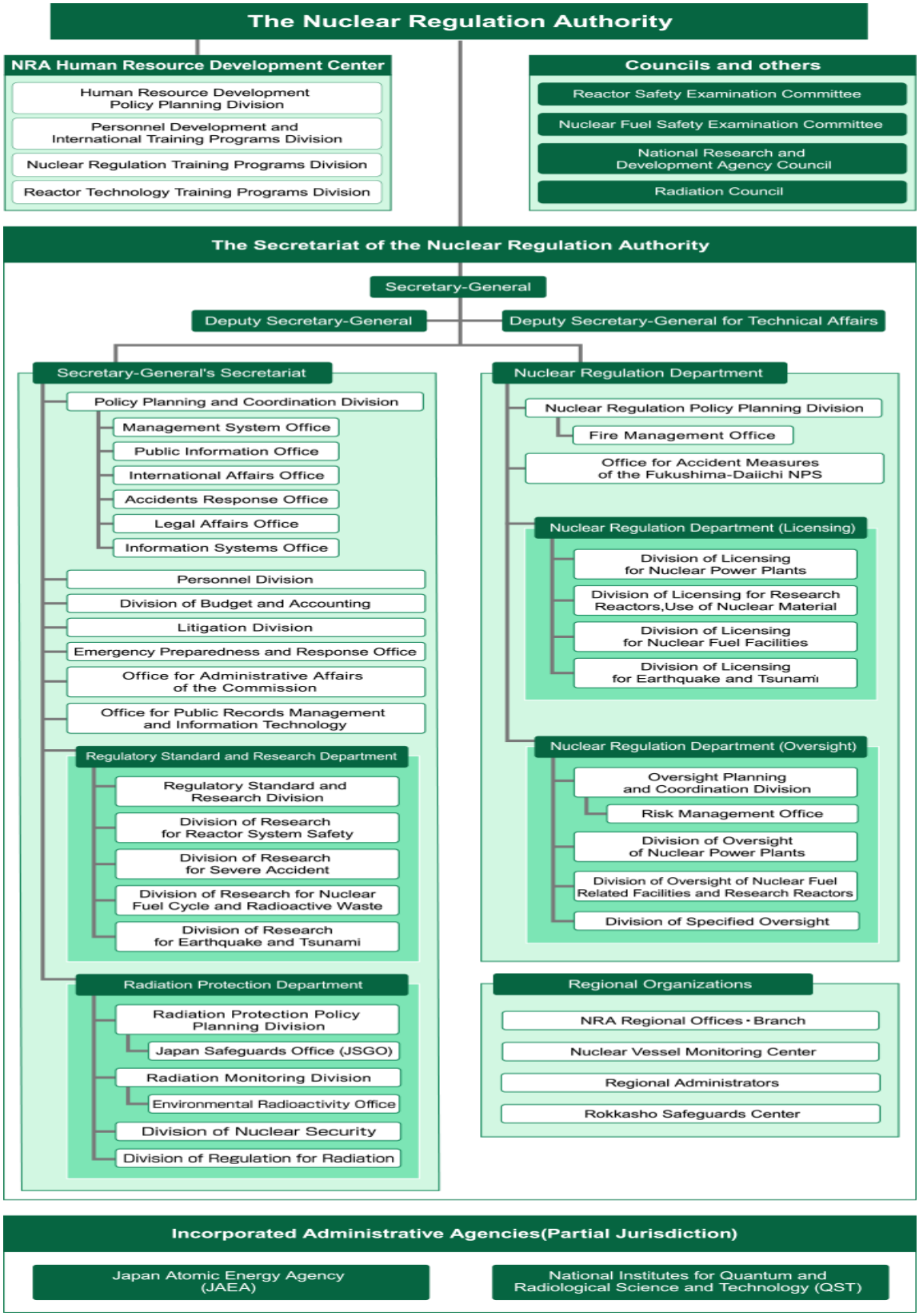
The NRA has the following committees and council composed of external experts designated by the NRA in accordance with the Act for Establishment of the NRA. They are the Reactor Safety Examination Committee, which conducts examines and reviews on the safety of nuclear power reactors, the Nuclear Fuel Safety Examination Committee, which conducts examines and reviews on the safety of nuclear fuel material, and the Radiation Council, which conducts reviews on the Technical Standards for the prevention of radiation damage. These Committees and Council consist of external experts appointed by the NRA.

The Secretariat of the NRA consists of the Departments of the Regulatory Standard and Research Department in charge of preparation of standards and guides and research on nuclear systems, severe accidents, nuclear fuel and nuclear waste, safety research related to earthquake and tsunamis, the Radiation Protection Department in charge of setup of the systems of nuclear emergency preparedness and response, physical protection of nuclear material, radiation monitoring regulation for radiation sources, and safeguards based on international commitments, and the Nuclear Regulation Department consisting of the Nuclear Regulation Policy Planning Division, the Group of Licensing for the nuclear facilities, and the Group of Oversight for the nuclear

facilities including the Oversight Planning and Coordination Division, in addition to the management divisions including the Policy Planning and Coordination Division, the Personnel Division, the Division of Budget and Accounting, the Division of Legal Affairs.

There are Nuclear Regulation Offices at 22 sites, with Operational Safety Inspectors and Nuclear Emergency Preparedness Officers permanently stationed at those offices.

Figure E3-1 Organization Chart of the NRA



E-3-2 Regulatory Resources of the NRA

E-3-2-1 Financial Resources

Financial resource for all NRA activities is defrayed out of the National Treasury. The NRA's draft budget is submitted to the Ministry of Finance and the NRA is funded by the national budget after being reviewed by the appropriate financial authorities and are determined based on the overall national financial situation.

The total budget of the NRA in FY 2019 is 58.4 billion yen.

E-3-2-2 Human Resources (HR)

a HR in the NRA

The NRA is composed of Chairman and 4 Commissioners who are appointed by the Prime Minister, with the NRA Secretariat which deals with related administrative matters. The NRA accepted personnel mainly from the part of Nuclear and Industrial Safety Agency (NISA), Nuclear Safety Commission, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and Atomic Energy Commission, and was established in September 2012. In April 2013, the NRA accepted the personnel from MEXT in association with the integration of Safeguard and Radiation Protection functions. In March 2014, the JNES, a technical support organization, was also merged into the NRA. And the NRA has been securing personnel with new graduates and other various specialties, by recruiting personnel with experience in industries or research institutes.

It is important that NRA maintains certain level of quality and quantity of HR, and improves technical expertise continuously to achieve independent scientific and technical decision making without depending on licensees' knowledge and experience.

Based on the recognition above, the NRA has formulated a Basic Policy for HR Development in June 2014 which clarifies the fundamental principles and outline of the policy for human resource development.
In this policy, the NRA is required to:

(1) assign adequate resource for study and training;
(2) associate human resource management with challenges or strategic importance for future organization; and
(3) encourage that the spontaneous desire of personnel to learn can be increased.

b HR Development in the NRA

As the nuclear regulation is one of the governmental administration field which requires highly technical judgment such as nuclear engineering, nuclear material control, assessment of countermeasure for earthquake and tsunami, geology and radiation protection, it is essential to secure the HR with required expertise and scale, and it is also essential to enhance the expertise of personnel continuously.

Therefore, the NRA have been utilizing the NRA HR Development Center, which was established in March 2014 in order to strengthen the HR development function toward the enhancement of the expertise of personnel, and have been developing HR in a planned manner by offering the various training program.
Specifically,

- Specialized training in regard to the nuclear regulation to the "Nuclear Inspectors" and "nuclear emergency preparedness officers" who required to be legally qualified;
- Practical training using real-scale equipment/facility and simulator, and training using plant simulator for enhancing response capability against severe accident; and
- Short-term overseas training to improve not only expertise but also internationality as well as training to improve language skill such as oral communication in English.

The NRA established the "basic policy on human development for the NRA" in order to clarify the basic concept for HR development of the personnel and to clarify the outline of measures for HR development. Based on this policy, the NRA has been promoting measures in HR development with the NRA HR Development Center as the driving force, by establishing the process for systematizing training which contribute to the improvement of expertise of the NRA personnel and for promoting skills transfer and knowledge management. With regard to the reform of the inspection system in accordance with the revision of the Reactor Regulation Act in 2017, toward the implementation of the new Nuclear Regulatory Inspection, employees who have acquired certain abilities through training have been granted nuclear inspection qualifications, thus inspectors to operate Nuclear Regulatory Inspections have been secured.

In addition, the NRA has sent the personnel to the foreign postgraduate research

institute and diplomatic establishments abroad (Embassy of Japan in the United Kingdom, Embassy of Japan in France, Permanent Mission of Japan to the International Organizations in Vienna) since FY 2016, in addition to professional graduate school and international organization.

Furthermore, the NRA has employed 249 experienced and 136 new graduates during April 1, 2014 and March 31, 2020, and has been promoting the measures to secure the personnel by diversifying the recruit for new graduates and by recruiting personnel with experience in industries or research institutes.

As reported in Section F2-1-2, the NRA is conducting the HR Development Project for Nuclear Regulation in collaboration with universities in order to develop HR who have necessary knowledge and capability for nuclear safety and nuclear regulation extensively, with a view to developing human resources who will be responsible for nuclear regulation in the future.

E-3-3 Ensuring Transparency and Openness at the NRA

E-3-3-1 Operation of Transparent and Open Administration

To clarify processes and discussions leading to final decisions, the NRA deemed a "Policy on Ensuring Operational Transparency of the NRA," this outlined the basic policies for 1) building of and information disclosure system eliminating the need for disclosure requests; 2) thorough public discussions; and 3) thorough document-based administrative actions as basic principles. According to this policy, the NRA decided to make the NRA Commission Meetings, conformity review meetings, and Study Team meetings open to the public, to publicly disclose the minutes and materials for those meetings.

In accordance with this policy, the NRA has to prepare summaries of all meetings which are attended by 3 or more Commissioners or interviews between the nuclear licensees and the NRA Commissioners, or officials of the Secretariat of the NRA, and make public the summaries. In addition, regarding the hearing from licensees for the conformity review, the NRA considered a procedure to make more detailed content open than the summary previously disclosed, and it started to disclose the transcription result by the automatic speech-to-text software since April 2019.

The NRA holds its Commission Meetings and other study meetings in public in

accordance with the “Policy on Ensuring Operational Transparency of the NRA" and the "Operational Guidelines for NRA Commission Meetings.” The NRA Commission Meetings and other study meetings are broadcast live on YouTube, and abridged editions of meetings not broadcast live are also released. The total time of movies released by the NRA in YouTube is more than 900 hours in FY 2019.

In addition, reference materials used at Commission Meetings, conformity review meetings and Study Team meetings are posted on the NRA website, so that the materials would be available before each meeting starts. The minutes of Commission Meetings are posted the following day, and those of various other meetings such as conformity review meetings and Study Team meetings around 1 week after the meeting.

In addition, Technical Information Committee, in which examines whether the latest findings require regulatory response, frequently used materials obtained from overseas regulatory agencies on the premise of non-disclosure, so this meetings itself conducted as closed. The transparency of such meetings have been ensured by publishing materials as far as possible and summary of the meeting minutes. However based on the importance of this meeting and further transparency, the NRA decided to make this meeting disclosed to the public in principle, and the meetings may be treated as closed meeting only if it handles non-disclosure information or if the meeting is deemed appropriate not to be disclosed. The NRA started the policy from June 2018.

In principle, the Chairman of the NRA holds regular press conference once a week, and Spokesperson of the NRA holds twice a week, and special press conference if required. The press conferences are also broadcasted (live or recorded), and the minutes are strived for uploading the same day for Chairman's press conference, the next day for Spokesperson, on the website.

E-3-3-2 Taking Opinions from Outside

One of the NRA's core value and principles refers to "We shall be open to all opinions and advice from Japan and the international community and avoid both self-isolation and self-righteousness."

Following this principle, the NRA, which is responsible for regulatory issues, has been inviting the external experts as the member of Study Team and utilizing their

knowledge, and has been conducting hearing from licensees in a positive manner. As for meetings with related specialists or licensees, the NRA conducted them in a positive manner under the condition of disseminating information by ensuring transparency, regarding that higher communication density contributes to acquire domestic and international knowledge, promotes understanding of regulation and building relationship for prompt emergency response.

Furthermore, the NRA solicited opinions from the Japanese nationals widely and positively not only by the public comment stipulated in the Administrative Procedure Act, when the NRA establishes the documents for new regulatory requirements, Guide for Emergency Preparedness and Response (NRA EPR Guide), Conformity Review Guide or the document for Nuclear Disaster Preparedness. For example, with regard to the new regulatory requirements, the NRA conducts public consultation on the draft prior to conducting the hearing on the provisions pursuant to the Administrative Procedure Act, and provided the people more opportunities for offering opinions.

In addition to accepting these public comments, the NRA also has organized system via internet and telephone for accepting questions and opinions constantly from people by opening its website and call center.

E-3-4 Ensuring NRA Independence

The NRA carry out its regulatory activities in a far, neutral and independent manner base on the approach to separate the regulation from the promotion of nuclear energy use.

The Chairman and Commissioners of the NRA are appointed by the Prime Minister with the consent of the Diet, and the NRA Chairman appoints the staff of the NRA, hence other authorities on the promotion side of nuclear energy have no involvement in the appointment and dismissal of staff.

From a fiscal perspective, the activities of the NRA are funded by the national budget, with budget proposals being submitted to the Ministry of Finance by the NRA via the MOE. The budget proposals undergo appraisal by the financial authorities, according to the fiscal situation of the Government as a whole, but the authorities tasked with promoting nuclear energy are not involved from a financial perspective either.

The NRA has a clear mandate. It engages in independent regulatory decision-making stipulated in the Reactor Regulation Act in such areas as permits, approvals, and inspections. Supplementary Provisions of the Act for Establishment of the NRA stipulates that officials of the NRA shall not be permitted to transfer to administrative organizations responsible for promotion of nuclear energy utilization in order to ensure the independence and impartiality of the regulations to retain the safety in nuclear energy utilization (No Return Rule). The NRA designated the concrete departments of ministries and agencies, to clarify operation of "No Return Rule" in 2015.

E-3-5 Ministry of Health, Labour and Welfare (MHLW)

The Ministry of Health, Labour and Welfare is responsible for the safety regulation of radioactive medical products, and the regulation related to the radioactive protection at the clinical laboratory.

The pharmaceutical safety and environmental health bureau is responsible for the safety regulatory requirements of manufacturing radioactive medicine, in accordance with the rule of manufacturing and handling, and rule of pharmacy based on the Pharmaceuticals and Medical Devices Act. And the Pharmaceuticals and Medical Devices Agency conducts periodical inspections of manufacturing facilities of radioactive medicines.

The pharmaceutical safety and environmental health bureau is also regulating safety concerning the consignment of the disposal of radioactive medicines.

The health policy bureau is responsible for the regulation for the radiation protection in the medical facilities equipped with radioisotopes for medical use based on the Medical Care Act and the relevant Ordinance for Enforcement, and also responsible for the regulation related to the radiation protection at the clinical laboratory equipped with the radioisotope for the *in-vitro* examination based on the Act on Clinical Laboratory Technicians and the relevant Ordinance for Enforcement.

Section F Other General Safety Provisions

This Section, from F1 to F6, mainly reports on the safety regulation under the Reactor Regulation Act.

In addition, the safety regulation under the RI Regulation Act is reported below. Radiation application can take a variety of different forms, for example, use of radioisotopes as a source of radiation beam or use of radiation generator components, sealed or unsealed source, and different radioactivity. Thus, the safety regulation applies flexible requirements depending on form and radioactivity such as licensing or registration. Regarding radioactive waste, it is stored at a facility where the waste was generated, and most of waste are collected, treated and stored by permitted waste management licensees. As reported at the beginning of Section H, any person who intends to conduct waste management business shall obtain permission from the NRA.

In the amendment of the RI Regulation Act in April 2017, it explicitly stipulates the legal responsibility of licensees and registrant including that of waste disposal business, "Licensees or registrants shall be responsible for improving business, enhancing education and training, and taking other necessary measures to prevent radiation hazard and protect specified RIs, while taking into account the latest knowledge on safety gained in research, development and usage of nuclear energy."

To carry out waste management business, an applicant is obliged to obtain permission of business, establish a Radiation Hazard Prevention Program and observe it, appoint a Chief Engineer of Radiation Handling, and undergo necessary inspections.

As for radiation control, the NRA Ordinance under the RI Regulation Act stipulates the licensees' obligations including setting of radiation controlled area and access control. The NRA Notice on Radiation Doses (the Radiation Doses Notice) defines the limit of radiation dose and concentration observed in the radiation controlled area and at the boundary of facility.

In the case of event which might cause or actually cause radiation hazard in the usage or transportation of radioisotopes, it is obliged as emergency measure to rescue or evacuate radiation hazard victims, prevent the spread of contamination and remove contamination, and implement access control. For licensees who use radioisotopes of

the certain amount or more, it is necessary to establish in advance the equipment for emergency measures, means of communication between the concerned organizations such as police, fire department or medical institutions, and include them in the Radiation Hazard Prevention Program.

As for termination of facility or usage, it is necessary to submit a notification, develop a decommissioning plan, and according to the plan, transfer radioisotopes, and finish decontamination. After completion, it is necessary to submit a final report.

F-1 Responsibility of the License Holder

Article 21

1. Each Contracting Party shall ensure that prime responsibility for the safety of spent fuel or radioactive waste management rests with the holder of the relevant license and shall take the appropriate steps to ensure that each such license holder meets its responsibility.
2. If there is no such license holder or other responsible party, the responsibility rests with the Contracting Party which has jurisdiction over the spent fuel or over the radioactive waste.

F-1-1 Primary Responsibility for Safety

The Atomic Energy Basic Act establishes the most basic policy concerning the nuclear energy use in Japan. This Act stipulates that "the research, development and use of nuclear energy shall be limited to peaceful purposes, aimed at ensuring safety and performed independently under democratic management. The results therefrom shall be made public to contribute to international cooperation."

The Reactor Regulation Act explicitly states the legal responsibilities of licensees, stipulating that "Licensees of nuclear energy activity, etc. shall be responsible for installing equipment or apparatus contributing to the improvement of the safety of nuclear facilities or strengthening protection of specified nuclear fuel material, proper and certain inspection of the said facilities, etc., enhancing education on operational safety or physical protection of nuclear fuel material, or taking any other measures for preventing disasters resulting from nuclear source material, nuclear fuel material, and reactors, while taking into account the latest knowledge on safety gained from research, development and use of nuclear energy." Furthermore, supplementary provisions of the Act for Establishment of the NRA stipulates that nuclear licensees shall be deeply aware that they have the primary responsibility for ensuring the safety of their nuclear facilities and settling any accident, and shall endeavor to further formulate voluntary measures with the aim of developing a system for thorough crisis management for each of their nuclear facilities in order to prevent the occurrence of an accident at said facilities and the expansion of disasters in the event of an accident, in addition to the measures that are required under the Reactor Regulation Act and the provisions of other laws and regulations.

F-1-2 Measures to Fulfill Responsibilities by Licensees

The regulation based on the Reactor Regulation Act prescribes the measures that licensees shall take to ensure operational safety, specifically measures concerning the operation and maintenance of facilities, and measures relating to transport, storage, and disposal. These measures are detailed in the NRA Ordinances pursuant to the Reactor Regulation Act.

Licensees shall establish Operational Safety Program and obtain the NRA approval. The NRA confirms all safety activities of licensees, including compliance status with Operational Safety Program in Nuclear Regulatory Inspections.

Licensees are also requested to disclose any non-compliance events which do not satisfy requirements for individual activity, by the provision of plant specific Operational Safety Program. This prevents concealment of non-compliance event by licensees.

Licensees are subject to penalties in the event of failure to meet its legal responsibilities; this can be cited as an institutional mechanism for ensuring that licensees fulfill its responsibilities. For example, in the event that a nuclear facility does not meet the Technical Standards prescribed by law and ordinances or that its operation contravenes regulatory requirements, the NRA may require licensees to adopt an operation method of the NRA's designation or order it to take any other measures deemed necessary, pursuant to the Act. If licensees violates this order, the NRA may revoke its permission or order it to suspend operation of the facility for a specified period not exceeding 1 year.

In the event that an operator installs a nuclear facility without permission, it shall be sentenced to imprisonment and/or a fine, pursuant to the Act. The same shall apply if licensees fails to obtain approval for its Operational Safety Program or amends it without approval, or if licensees and/or its employee fails to comply with Operational Safety Program.

F-1-3 Measures in the Absence of Licensees or Other Responsible Party

In Japan, since business which generates spent fuel or radioactive waste to be regulated by the Reactor Regulation Act is regulated under this Act, it is unlikely that unidentified spent fuel or radioactive waste will be found. It is rare that orphan nuclear

fuel material is found, but in case it is found, that nuclear fuel material is to be placed under the regulation by the Reactor Regulation Act.

In the event of revocation of a license, if there is no successor to the operator through merger or inheritance stipulated by the Act, the revoked license holder shall continue to be regarded as the license holder and responsible for “record keeping," "protective measures", "Operational Safety Program" and “physical protection” as prescribed in the Reactor Regulation Act, and shall be subject to regulation. In the event of the dissolution of the license holder, if there is no succession to the status of the operator through merger or inheritance stipulated by the Act, the liquidator or bankruptcy administrator shall be regarded as the license holder and responsible for “record keeping," "protective measures," "Operational Safety Program" and “physical protection” as prescribed in the Reactor Regulation Act, and shall be subject to regulation. In addition, the above-mentioned persons shall develop a Decommissioning Plan, have it approved by the NRA, carry out decommissioning, and obtain confirmation of the completion of decommissioning from the NRA.

In addition, if an orphan source to be regulated under the RI Regulation Act is found, as reported in J2-3, the owner of the discovery site or facility will manage it in compliance with the law, and in most cases, the Japan Radioisotope Association collects and properly manage orphan sources. With regard to the RI Regulation Act, in case of revocation of the license of waste disposal business, licensees concerned are still subject to its regulation, as once licensed, until the decommissioning work completes. In the event of dissolution, the Act prescribes that if there is no succession of the business through merger or inheritance, the liquidator shall take appropriate measures for decommissioning, such as removal of contamination by radioisotopes.

As described above, provisions are in place to ensure that revocation, dissolution or business succession does not create a situation in which no licensee exists and that the business in question is terminated by liquidator if there is no business succession.

F-2 Human and Financial Resources

Article 22

Each Contracting Party shall take the appropriate steps to ensure that:

(i) Qualified staff are available as needed for safety-related activities during the operating lifetime of a spent fuel and a radioactive waste management facility;

(ii) Adequate financial resources are available to support the safety of facilities for spent fuel and radioactive waste management during their operating lifetime and for decommissioning;

(iii) Financial provision is made which will enable the appropriate institutional controls and monitoring arrangements to be continued for the period deemed necessary following the closure of a disposal facility.

F-2-1 Efforts to Secure HR Infrastructure in Japan

F-2-1-1 Regulatory Requirements for HR of Licensees

In granting Permit of Business prescribed in the Reactor Regulation Act, the NRA checks that an applicant possesses the technical capability necessary to conduct the said business. In the case of licensees of reprocessing, the NRA checks that they have the technical capability to prevent and mitigate severe accident.

The Reactor Regulation Act stipulates that licensees must take the necessary measures to ensure operational safety, must set forth Operational Safety Program before commencing construction of a facility, and must obtain the approval of the NRA.

In terms of the measures that should be taken to ensure operational safety, there are regulatory requirements concerning the qualification of operators and the appropriate staffing. For example, the NRA Ordinance on Reprocessing Business stipulates that only those with the requisite knowledge shall operate equipment; and that reprocessing equipment shall only be operated when adequate staff are present. Moreover, it stipulates that licensees shall prepare check items to be confirmed before started-up, during and after operation, and also licensees shall oblige its personnel to comply with them.

Operational Safety Program, for example according to the NRA Ordinance on

Reprocessing Business, shall prescribe matters relating to operational safety education for those who operate and manage reprocessing facilities including the content of operational safety education and the policy on its implementation. Quality management system to be set in Operational Safety Program is required to contain HR provisions. It also contains that the competence required for personnel involved in duties that affect nuclear safety shall be identified, measures such as education and training should be implemented in the event of any shortfall in competence, and that the effectiveness of education and training shall be evaluated.

As a prerequisite for carrying out business, licensees must appoint staff with the relevant qualifications to chief engineer posts. Licensees of power reactor must appoint a Chief Reactor Engineer to supervise operational safety in reactor operation; licensees of fuel processing and reprocessing shall appoint a Chief Engineer for Nuclear Fuel Material Handling to supervise operational safety in the handling of nuclear fuel materials; licensees of spent fuel storage must appoint a Chief Engineer for Spent Fuel Handling to supervise operational safety in the handling of spent fuel; and licensees of waste management shall appoint a Chief Engineer for Radioactive Waste Handling to supervise operational safety in the handling of nuclear fuel materials and other radioactive waste.

For example, licensees of reprocessing business shall appoint a Chief Engineer for Nuclear Fuel Material Handling to supervise operational safety in handling of nuclear fuel material. A Chief Engineer for Nuclear Fuel Material Handling is to be selected from those who have passed a national examination conducted by the NRA to confirm whether an examinee has expertise and experience necessary to conduct the said duties and also has practical experience of more than 3 years of the said activity.

Furthermore, licensees of waste disposal business shall appoint a Chief Engineer for Radioactive Waste Handling to supervise operational safety in handling of nuclear fuel material or materials contaminated by nuclear fuel material. A Chief Engineer for Radioactive Waste Handling shall be selected from those who have a certificate of Chief Engineer for Nuclear Fuel Material Handling or Chief Rector Engineer. A certificate of Chief Reactor Engineer is granted to those who have passed a national examination conducted by the NRA to confirm whether an examinee has expertise and practical experience necessary to conduct the said duties.

F-2-1-2 HR Development for Regulation

The NRA recognizes that it is an important challenge for rigorous and reliable regulation to develop not only its staffs but also the HR who have necessary knowledge for nuclear safety and nuclear regulation extensively, therefore the NRA has conducted the HR Development Project for Nuclear Regulation with universities etc., since the FY 2016. The NRA examines details of proposed projects through document screening and interview for adoption. 15 adopted projects are being carried out as of April 2020. As some projects have completed, the NRA currently calls for new proposals. The NRA has been making an effort to maintain effective implementation of the project through evaluating its progress and plan for the next year when a project continues to the next year.

HR development in the NRA is mentioned in Section E3-2-2.

F-2-2 Financial Resources

In the process of licensing of a nuclear facility except for nuclear fuel material use facility, the NRA confirms that the applicant possesses the necessary financial basis based on the Reactor Regulation Act. As a prerequisite for application, the applicant has to submit a business plan that explains the financial base of the business in order to prove that it possesses the said necessary financial basis.

For disposal business, this financial basis is required to cover the entire project period including the period from closure to termination of license.

In the NRA Ordinance, nuclear licensees are required to clearly define necessary resources including personnel and facilities, and secure and manage them in order to ensure safety during the period of use of nuclear facility.

F-3 Quality Assurance

Article 23

Each Contracting Party shall take the necessary steps to ensure that appropriate quality assurance programmes concerning the safety of spent fuel and radioactive waste management are established and implemented.

F-3-1 Regulatory Requirements

The Reactor Regulation Act requires licensees to establish a system needed for quality management relating to activities for operational safety of nuclear facilities. As a specific requirement, establishment of a quality management system according to the standards set in the NRA Ordinance on Quality Management Standards is required at a licensing stage. Formerly, this requirement was one of the approval criteria for design and construction plan reviewed at the stage of detailed design. In accordance with the revision of the Reactor Regulation Act in April 2017, the requirement on a consistent quality management system from licensing stage to operation and decommissioning stage came into force in April 2020.

In line with the Quality Management Standards, in order to ensure that operational safety activities responding to different stages from commencement to decommissioning be conducted based on an appropriate quality management system, licensees are required to establish a quality management system in its Operational Safety Program and to plan, implement, evaluate and improve operational safety activities based on the system. Meanwhile continuous improvement of the quality management system itself is also required.

Specifically, for operational safety activities, the Quality Management Standards require establishment of a quality management system, leadership of chief executive officers, fostering and maintaining safety culture, resource management including HR, planning and implementation of activities, supervision, evaluation and improvement. As a common concept to these requirements, graded approach and systemic approach are adopted.

F-3-2 Licensees' Practice

To meet the above regulatory requirements, nuclear operators establish technical specifications and a quality management system, implement quality assurance activities, and maintain the effectiveness of the system based on Rules Related to Standards for a Framework Necessary for Quality Management of Nuclear Work to Secure Nuclear Facility Safety and Interpretation of Rules Related to Standards for a Framework Necessary for Quality Management of Nuclear Work to Secure Nuclear Facility Safety.

Operational Safety Program stipulates that a quality management system is subject to established, implemented, and continually improved to maintain its effectiveness. It outlines the "quality management system," "responsibility of the board," "resource management," "formulation of a plan for individual work and implementation of individual work," "evaluation and improvement," and stipulates specific requirements for each.

To meet HR requirements, personnel who engage in work that affects nuclear safety are required to be competent as measured by levels of education, training, skills, and experience. Licensees clarify the necessary level of competence for personnel and conduct education and training for personnel to reach the necessary level of competence as needed.

To meet procurement management requirements, nuclear operators conduct procurement, making clear requirements related to the approval of products, procedures, processes and facilities, requirements related to the personnel qualifications, and requirements related to quality management systems.

To prevent ordering from suppliers with inappropriate quality assurance structures, it is standard practice for nuclear operators to have suppliers submit a quality assurance plan and to directly audit the supplier to confirm that they are meeting the requirements.

Procured items are checked at delivery to confirm that they meet the requirements stipulated in the specifications. Licensees may directly check the supplier's manufacturing process when necessary. Quality of services is secured by stipulating in specifications that personnel with necessary expertise provides said service. This includes, for example, confirming that there is a technician that can perform specialized

work such as welding.

Audits are conducted on the quality assurance programs for operations of reactor facilities. Auditory independence is secured by having a department that provides objective assessments or persons outside of the nuclear facility conduct the audit. The department in charge of the audit is often organizationally structured to directly report to the board so that the insights that could improve the system gained from the audits can quickly reach the CEO.

F-4 Operational Radiation Protection

Article 24

1. Each Contracting Party shall take the appropriate steps to ensure that during the operating lifetime of a spent fuel or radioactive waste management facility:
   (i) the radiation exposure of the workers and the public caused by the facility shall be kept as low as reasonably achievable, economic and social factors being taken into account;
   (ii) no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection; and
   (iii) measures are taken to prevent unplanned and uncontrolled releases of radioactive materials into the environment.
2. Each Contracting Party shall take appropriate steps to ensure that discharges shall be limited:
   (i) to keep exposure to radiation as low as reasonably achievable, economic and social factors being taken into account; and
   (ii) so that no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection.
3. Each Contracting Party shall take appropriate steps to ensure that during the operating lifetime of a regulated nuclear facility, in the event that an unplanned or uncontrolled release of radioactive materials into the environment occurs, appropriate corrective measures are implemented to control the release and mitigate its effects.

F-4-1 Regulatory Requirements

Regulation on radiation control in the facilities for spent fuel interim storage, reprocessing, waste disposal and radioactive waste storage are detailed by the NRA Ordinances established by the NRA under the Reactor Regulation Act. Requirements such as dose limits, etc. are specified in the Notification to Establish Dose Limits in Accordance with the Provisions of the NRA Ordinance on Activity of Refining Nuclear Source or Nuclear Fuel Materials, etc (Notification on Doses).

It is required that reprocessing facilities shall establish Radiation Controlled Area, Preserving Area, and Surrounding Monitored Area, and facilities for spent fuel storage,

waste disposal, and waste storage shall establish Radiation Controlled Area and Surrounding Monitored Area. Radiation doses, concentrations and density in Radiation Controlled Area and dose limits outside the Surrounding Monitored Areas are specified in the NRA Notification on Doses.

Radiation controlled area must be clearly separated by a fence or wall from other areas with an identification sign, and is subject to measures, such as access control and lock control, depending on the risk of radiation.

A Preserving Area is out of radiation controlled area that requires special control to ensure the safety of reprocessing facilities.

The Preserving Area must be clearly separated from other areas by placing a sign or offering other means of identification and are subject to measures, such as access control, lock control and a restriction on objects to be brought out in accordance with the necessity of control.

A Surrounding Monitored Area is an area around a Radiation Controlled area, outside of which the dose limits set by the NRA are not likely to be exceeded. People are prohibited from living in this area. A fence must be placed along the boundary to restrict the entry of people, including habitation, other than those who enter the area to work.

For the purpose of radiation control of radiation workers, nuclear licensees are required to ensure that the dose of radiation workers should not exceed the dose limits set by the NRA and the concentration of airborne radioactive material inhaled by radiation workers does not exceed the concentration limits set by the NRA. If it is unavoidable due to an emergency such as disaster to a nuclear facility, licensees are allowed to engage radiation workers in emergency work within the dose limits set by the NRA. The dose limits set by the NRA are shown in the Table F4-1 below.

Table F4-1 Dose Limits

Item	Dose limits
A Radiation worker	
(1) Effective dose limit	100 mSv/5 years and 50 mSv/year
(2) Women	5 mSv/3 months in addition to the limit specified in (1)
(3) Pregnant women	1 mSv for internal exposure in addition to the limit specified in (1); for the period after the employee comes to know about the pregnancy until the baby is born
(4) Equivalent dose limit for the lens of the eye	100mSv/5years, and 50mSv/year
(5) Equivalent dose limit for the skin	500 mSv/year
(6) Equivalent dose limit for the surface of the abdomen of pregnant women	2 mSv; for the period after the employee comes to know about the pregnancy until the baby is born
B Radiation workers to engage in emergency work	
(1) Effective dose limit	100 mSv (250 mSv)[2]
(2) Equivalent dose limit for the lens of the eye	300 mSv
(3) Equivalent dose limit for the skin	1 Sv

F-4-2 Licensees Radiation Protection Program

In addition to measures required by regulation, such as compliance with the designation of radiation controlled areas and other areas and the dose limits, licensees have detailed radiation control measures in place, such as the use of a personal dosimeter with an alarm to measure a radiation dose at each entry into a Radiation Controlled Area. In Japan, based on the As Low As Reasonably Achievable (ALARA) concept, regulation for nuclear facilities having safety functions require licensees to design facilities with radiation protection measures including shielding, location of equipment, remote control, protection against radioactive material leakage, ventilation, etc., taking into consideration workability of radiation workers. This concept is also widely accepted by licensees. Essentially, in conducting radiation works, it is a basic understanding that unnecessary exposure should be avoided. In a nuclear facility in operation, 3 elements (time, distance and shielding) for reducing exposure are

[2] The dose rate limit in case any event described in any number of section 2, article 7th of the Notification Doses (NRA Ordinance No.8) occurred.

implemented, such as controlling access to radiation controlled areas, reducing the duration of work by performing radiation work in a planned manner, ensuring the distance from radiation sources, and installing a shield.

Based on the Reactor Regulation Act, licensees are required to record the dose of the radiation workers and store the records during the period required by the NRA Ordinance. The record is transferred to the organization designated by the NRA after 5 years from recording or concerned person is not a radiation worker anymore. The Radiation Effect Association is designated for this purpose.

F-4-3 Efforts for Dose Reduction in TEPCO Fukushima Daiichi NPS

In the early stages of the disaster at TEPCO Fukushima Daiichi NPS, the system for access control and dose data collection/processing got damaged and electronic dosimeters and battery charging equipment became unavailable, which led to the situation where individual dose control could not be adequately performed. Electronic dosimeters were secured in April 2011, then individual dose control became operable. Further, a new access control building began its operation in June 2013, and access control functions such as lending/return of electronic dosimeters were newly put in place.

Just after the disaster, radiation dose rate was high all over the site due to the widespread contamination by fallout and direct radiation from damaged reactor buildings. Workers needed to wear full face masks and protective suits almost all the places at the site to prevent body contamination and internal exposure. In order to reduce the contamination levels and the dose rates in the site, measures have been implemented such as installation of radiation shield against area of high dose rate like the operating floor of Unit 3, treatment to remove nuclides from highly contaminated water stored in temporary storage tanks, removal of high-dose-rate rubble and cutting down trees, removal of surface soil and deep plowing, and facing soil surface with mortar spraying or asphalt pavements.

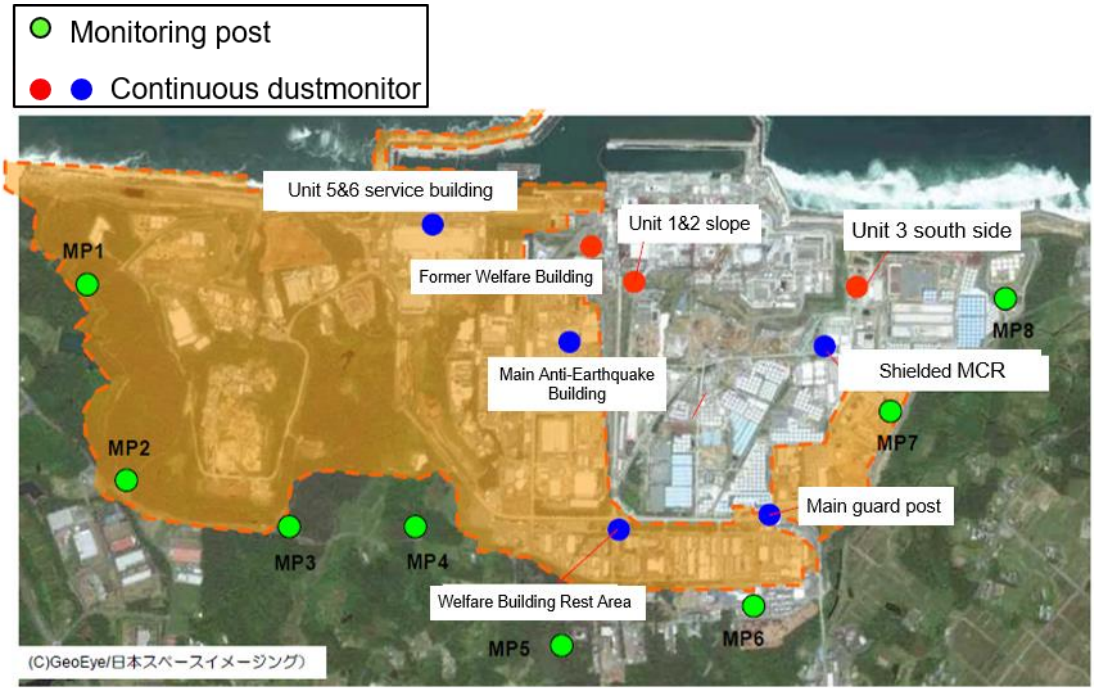
Due to the improvement of the site environment, areas were classified based on the contamination level from November 2011. For areas where concentration of radioactive material in the air was below the threshold value for wearing full face mask, disposable particle masks were worn during work. In March 2016, further progress enabled to expand the areas without full face mask up to about 90% of the site. At the same time,

wearing normal working clothes, instead of protective suits, became possible at these areas. Currently, 96% of the site does not require full face mask and special clothing. Continuous dust monitoring at 15 points at the site confirms that the concentration of radioactive materials in the air remains below the threshold value for full face mask.

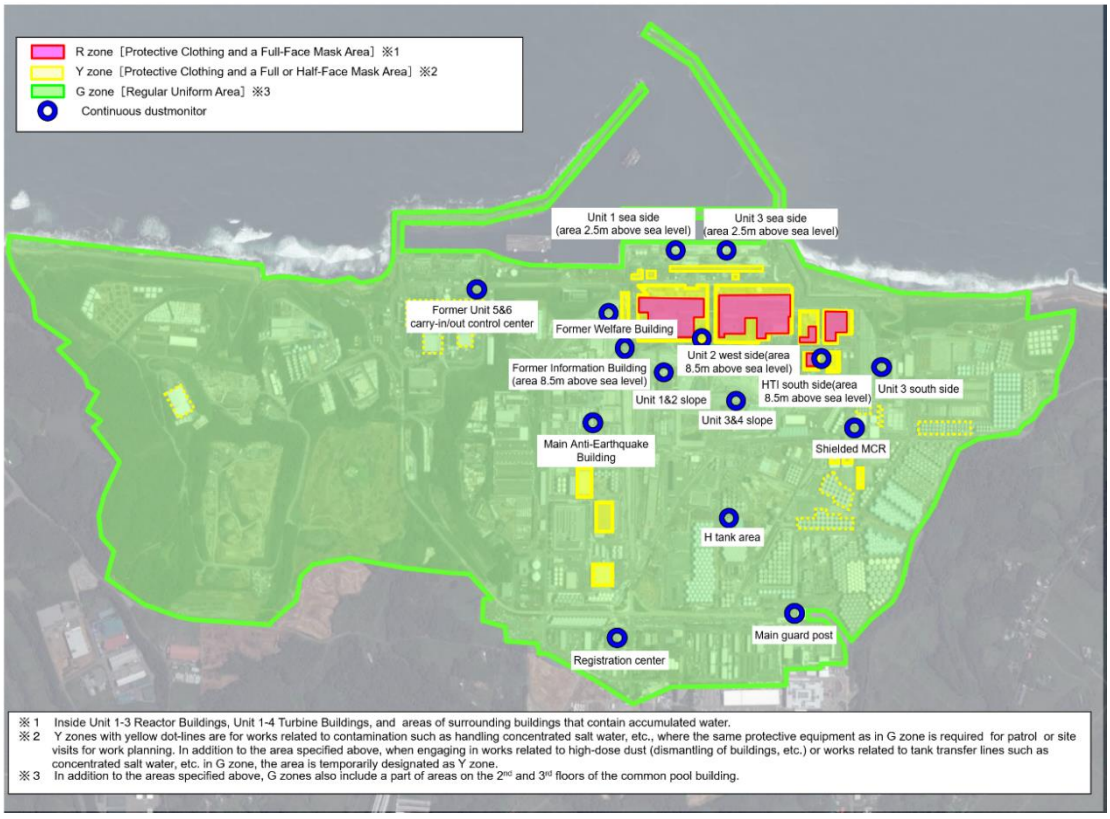
By September 2016, measures mentioned above led to the reduction of the dose rate at the height of the chest or ground surface became below 5 μSv/h at most of the site except some areas such as around unit 1 to 4 buildings. Along with dose reduction at the site, while the average of monthly exposure dose rate of workers in FY 2012 a year after the earthquake was about 2.2 mSv, it decreased to about 1 mSv in FY 2013 and it has been around 0.35mSv since FY 2016. Approximately 80 dose rate monitors have been installed at TEPCO Fukushima Daiichi NPS. Monitors can be moved to the areas where work is performed so that operators can monitor the air dose rate at work locations.

On the other hand, areas of high dose rate still remain around the reactor buildings, being obstacles for decommissioning work. In order to reduce the dose rates around the buildings, measures are being taken depending on the progress of the decommissioning work such as the removal of Unit 1/2 SGTS piping, which is highly contaminated by radioactive materials.

Figure F4-1 Transition of Full Face Mask Unnecessary Area at TEPCO Fukushima Daiichi NPS



The areas without full face mask as of Feb. 2015 in orange.



The areas without full face mask as of Aug. 2020 in green.

F-4-4 Release Control of Radioactive Gaseous/Liquid Waste

Licensees reduce the concentration of radioactive material in gaseous waste as much as possible by such means as filtration in an exhaust air system, radioactive decay over time, or dilution, and then, measure and monitor its release. In the case of liquid waste, licensees reduce the concentration of radioactive material as much as possible by filtration, evaporation, adsorbing with the ion exchange method, radioactive decay over time, or dilution in a drainage facility, and then, measure and monitor its release. Licensees prescribe and manage in their own Operational Safety Program to control the release of gaseous and liquid waste ensuring that the legally-prescribed radioactive material concentration limits outside supervised area shall not be exceeded. To ensure that release levels are below the legal limits outside the Surrounding Monitored Area, licensees decide the control targets based on the annual release quantity stipulated in their Installation Permit Application. They guarantee in their Operational Safety Program that they will not exceed those levels.

Furthermore, licensees set a target value for the exposure dose limit of the public living near nuclear facility (dose target value) to control the dose to which the public is exposed by the release of radioactive material to the environment during normal operation based on the concept of ALARA. Upon obtaining a Permit of Business, licensees decide an allowable annual volume or an average rate of the release as control target for the release of radioactive material to meet the dose target value and describe it in the Operational Safety Program subject to approval by the NRA. In Nuclear Regulatory Inspections, the NRA checks safety activities of licensees such as compliance status of the Operational Safety Program.

F-4-5 Clearance

Concerning radioactive materials generated in nuclear facilities, based on the idea that it is important to reuse the materials which has negligible low radioactivity with negligible low dose in terms of effective use of resources, Japan introduced the clearance system in 2005 with the enforcement of an amendment to the Reactor Regulation Act.

The NRA stipulates the clearance levels in the NRA Ordinance of clearance as to clear the materials which has negligible low radioactivity with negligible low dose from

regulation of the Reactor Regulation Act. This clearance levels is set for 257 types of radionuclides consist of those which are defined in the IAEA General Safety Requirements No. GSR Part 3 and also for 17 types of radionuclides which are originally defined by the NRA. For clearance of radioactive materials containing more than one radionuclide, the Ordinance stipulates that the condition for clearance is that the sum of the ratio between each radioactivity concentration (D) divide by individual clearance level (C) is less than 1 ($\Sigma D/C \leq 1$).

Clearance system in Japanese regulation has 2 steps: 1) approval of the methods for measuring and evaluating radioactivity concentration; and 2) confirmation by NRA.
In the 1st step the NRA reviews the application indicating the selection of radionuclide(s) to be evaluated, the measurement equipment and conditions the licensees' uses, and the uncertainty quantification. The NRA established a regulatory guide to review the application in the viewpoints listed below:

- Selection of radionuclides: radionuclides significant to estimate radiation dose shall be selected to satisfy over 90% of summation of D/C in the order of larger D/C.
- Maximum weight for evaluation unit: the maximum weight of evaluation unit shall not exceed 10 tons.
- Determination of radionuclide concentration: Upon the determination of the radionuclide concentration contained in the clearance material, measurement of radiation, nuclide vector, sampling analysis and statistic processing are conducted. With appropriate evaluation of uncertainties on above work, the upper limit of Σ D/C shall not exceed 1 when one-sided level of confidence is 95%.
- Selection of measurement equipment and condition of measurement: The appropriate measurement efficiency of measurement equipment shall be set. When reference source is used, appropriate geometry shall be maintained at the measurement.
- Prevention of contamination: Measures to prevent mixing measured material and unmeasured material shall be taken. Material shall be stored in the place without possibility of additional contamination.

In the 2nd step, as the NRA's confirmation, NRA inspectors confirm that licensees' process comply with the approved methods of measurements and evaluation.

The materials cleared from regulation of the Reactor Regulation Act could be reused as resources or be disposed of as general industrial waste under the environmental laws.

The Chubu Electric Power Co., the Chugoku Electric Power Co., the Kansai Electric Power Co., the Japan Atomic Power Co., and the JAEA have submitted 12 applications in total for approval of the methods for measuring and evaluating radioactivity concentration. The NRA has reviewed and approved 8 applications as of June 2020.

The NRA has been discussing the regulation for clearance of uranium waste, based on the IAEA General Safety Requirement No. GSR Part 3 and EU Council Directive 2013/59/EURATOM which describe the concept of clearance for the radionuclides of natural origins and artificial origin. (see Section K1-5 for details)

F-4-6 Environmental Radiation Monitoring

To evaluate the impact of the release of radioactive materials from nuclear facilities to the environment, and reflect the results to the release control and facility management, licensees carry out radiation monitoring including the ambient radiation dose measurement by monitoring posts and environmental samples.

To protect the health and safety of public, local governments in prefectures where reactor facilities are located also conduct radiation monitoring around nuclear facility.

After TEPCO Fukushima Daiichi NPS accident, the government developed a "Comprehensive Radiation Monitoring Plan" to ensure systematic implementation of environmental radiation monitoring related to this accident, which was decided in August 2011, and the 10th edition was published in April 2020 after revisions. Environmental radiation monitoring is conducted collaboratively by relevant ministries and local government of Fukushima Prefecture in accordance with the Comprehensive Radiation Monitoring Plan.

Environmental radiation monitoring data are uploaded on the website of the Monitoring Information of Environmental Radioactivity Level,[3] which is run by the NRA, enabling the general public to see the data in real time. Furthermore, in August 2019, Japan agreed on exchanging radiation monitoring data with the IAEA in the context of the International Radiation Monitoring Information System (IRMIS), a framework for collecting and sharing environmental radiation monitoring information of respective countries and then, started sending data to the IRMIS in February 2020.

In addition, as the NRA and the Fisheries Agency are making effort to improve

[3] http://radioactivity.nsr.go.jp/en/

transparency and credibility of sea area monitoring. The 2 organizations have been working in collaboration with the IAEA Environment Laboratory since 2014 to collect and analyze seawater and seabed soil near TEPCO Fukushima Daiichi NPS, and marine product samples in Fukushima Prefecture in order to conduct comparative analysis of radioactive monitoring data between laboratories. According to the project report released by the IAEA in July 2017, the IAEA highly evaluated that Japan's marine sample collection procedures follow the appropriate methodological standards required to obtain representative samples, and Japanese institutions which participated in the analysis of radionuclides in marine samples in sea area monitoring programs have high level of accuracy and competence.

F-4-7 Measures Taken to Prevent Unplanned and Uncontrolled Releases of Radioactive Materials into the Environment

The above-mentioned rules prescribe that the three-month-average of concentration of radioactive materials in air outside the Surrounding Monitored Area shall not exceed the concentration limits for discharge of gaseous radioactive waste, that the three-month-average of concentration of radioactive materials in water outside the boundary of the Surrounding Monitored Area shall not exceed the concentration limits for discharge of liquid radioactive waste. As for reprocessing facilities, it is prescribed that doses due to discharge of liquid radioactive waste monitored at the outlet to the ocean shall not exceed the dose limit for 3 months. The rules also stipulate that licensees shall immediately report to the NRA when any of these limits are exceeded, and report within 10 days on details of the event and corrective measures taken.

F-4-8 Measures to Mitigate the Effects of an Unplanned or Uncontrolled Release of Radioactive Materials into the Environment

Licensees establish in its Operational Safety Program the measures to be taken in the event of an emergency; these include the steps to be taken in the event of an unplanned or uncontrolled release of radioactive materials into the environment, to control the release and mitigate its effects.

For example, for reprocessing facilities with a large inventory of radioactive materials, it is set up that fire and explosion due to fine metal particles from fuel cladding or organic solvent, criticality accidents, leakage or loss of function due to damage or failure of equipment or piping, or spent fuel handling failure must not cause the risk of excessive radiation exposure to the public.

If a nuclear facility triggers an event prescribed in Article 10 of Act on Special Measures Concerning Nuclear Emergency Preparedness, i.e. detection of dose more than 5μSv/h around the boundary of the facility, emergency activities will be initiated according to the procedure in accordance with the said Act. Depending on the impact of the accident, a Declaration of Nuclear Emergency is issued and emergency measures such as evacuation will be taken. Emergency preparedness is reported in F5.

F-5 Emergency Preparedness

Article 25

1. Each Contracting Party shall ensure that before and during operation of a spent fuel or radioactive waste management facility there are appropriate on-site and, if necessary, off-site emergency plans. Such emergency plans should be tested with appropriate frequency.
2. Each Contracting Party shall take the appropriate steps for the preparation and testing of emergency plans for its territory insofar as it is likely to be affected in the event of a radiological emergency at a spent fuel or radioactive waste management facility in the vicinity of its territory.

F-5-1 Nuclear Emergency Response under the Nuclear Emergency Act

a Precautionary Protective Measures

Based on the Nuclear Emergency Act, nuclear licensees have the responsibility of preventing occurrence and expansion of a nuclear emergency and taking action for recovery from a nuclear emergency. Licensees must develop its EPR plan for each nuclear site and, prior to its development, must consult with the governor and the mayor where the nuclear facility is located, as well as to the governors of the neighboring prefectures. After developing the plan, licensees must submit it to the Prime Minster and the NRA and disclose the summary. The Prime Minister and the NRA may order licensees to make changes to the plan if it is considered to be inadequate for prevention of occurrence or mitigation of a nuclear emergency.

Licensees must establish a nuclear emergency preparedness organization for each nuclear site, deploy nuclear emergency preparedness personnel, and appoint a nuclear emergency preparedness manager and a deputy nuclear emergency preparedness manager. Also the current status of the personnel and the appointment above must be notified to the NRA. The NRA may order licensees to establish a nuclear emergency preparedness organization, allocate nuclear emergency preparedness personnel, appoint or dismiss the nuclear emergency preparedness manager or deputy manager if they are in violation of these requirement.

Upon occurrence of an event specified in the cabinet order, nuclear emergency preparedness managers must report it to the Prime Minister, the NRA and the governor and head of the city, town or village where the nuclear facility is located, as

well as to the governors of the neighboring prefectures. This notification is commonly called Article 10 Notification because it is required by Article 10 of the Nuclear Emergency Act. Events subject to Article 10 Notification is called specified events.

Licensees are required to install and maintain the necessary radiation measurement instruments to enable Article 10 Notification and to have in place the necessary nuclear emergency prevention equipment for the nuclear emergency preparedness organization to perform its duties, such as radiation hazard prevention equipment and emergency communication equipment, and to inspect and maintain the equipment. Radiation measurement instruments installed by licensees are subject to inspection by the NRA. The Prime Minister or the NRA can order licensees to take necessary actions if it is considered that licensees are in violation of these requirements. Licensees must keep a record of the doses detected by the installed radiation measurement instruments and disclose the record.

The Prime Minister designates a facility for each nuclear site that will be used as the center for emergency response actions and post-nuclear emergency actions. This facility is called an Off-site Center. Licensees must provide the Prime Minister with the necessary documents to take emergency response actions and post-nuclear emergency actions. The documents will be available at the Off-site Center.

The Government's emergency exercises are conducted in accordance with the plan developed by the Prime Minister.

Licensees must conduct emergency exercises, report the results to the NRA and disclose the summary. The NRA may order, through consultation with the Prime Minister, licensees to take action, such as improving the exercise procedures, if the exercises are considered to be inadequate for prevention or mitigation of a nuclear emergency.

The Nuclear Emergency Act provides for the obligation of other licensees to strive to cooperate. Licensees must strive to cooperate in the event of a nuclear emergency in a nuclear site of the other licensees by dispatching nuclear emergency preparedness personnel and providing nuclear emergency response equipment.

b Emergency Response Actions

In Japan, the Prime Minister declares a nuclear emergency situation based on Article

15 of the Nuclear Emergency Act.

If an event occurs that falls under the category of an emergency, the NRA will immediately provide the Prime Minister with information on the status of the event, the areas where emergency response actions should be taken, a brief description of the event, a proposed announcement on what needs to be communicated to residents in the areas, and proposed instructions on emergency response actions such as evacuation and sheltering. Following this, the Prime Minister will immediately declare a nuclear emergency.

When a nuclear emergency is declared, the Nuclear Emergency Response Headquarters will be set up. The Prime Minister will serve as the chief of the Nuclear Emergency Response Headquarters. The Headquarters will develop an implementation policy for emergency response actions and provide overall coordination of emergency response actions and post-nuclear emergency actions. In the area where the nuclear facility is located, local nuclear emergency response headquarters to perform some of the administrative work of the Headquarters will be set up.

Following the declaration of a state of nuclear emergency, the emergency response headquarters of the local government (prefecture, city, town or village) will be set up in the area where the nuclear facility is located. The local nuclear emergency response headquarters and the emergency response headquarters of the local government will set up a Nuclear Emergency Joint Response Meeting to exchange information on the nuclear emergency and develop cooperation in the implementation of emergency response actions.

If a specified event, which requires the Article 10 Notification, occurs, the nuclear emergency preparedness manager must immediately order the nuclear emergency preparedness organization to take emergency actions to prevention or mitigation of a nuclear emergency. Licensees must report the summary of the actions to the Prime Minister, the NRA, the governor and head of the city, town or village where the nuclear facility is located, as well as to the governors of the neighboring prefectures.

c Post-Nuclear Emergency Measures

Post-nuclear emergency measures include a survey of the concentration, density and dose of radioactive material, medical procedures including a medical examination of

residents and a mental and physical health consultation, public relations activities to prevent reputational damage, and measures to prevent expansion of the nuclear emergency or recover from the emergency. For measures following the nuclear emergency taken by administrative agencies and local governments, licensees must take actions such as dispatching nuclear emergency preparedness personnel and providing nuclear emergency response equipment.

F-5-2 Basic Disaster Management Plan

The Central Disaster Management Council formulated a Basic Disaster Management Plan based on the Disaster Countermeasures Basic Act and the Nuclear Emergency Act. The Basic Disaster Management Plan is a fundamental plan for the Government's disaster prevention measures to respond to various disasters in a comprehensive manner. In the Basic Disaster Management Plan, the section of nuclear emergency countermeasures defines basic issues on the nuclear emergency preparedness of the Government, licensees and local governments and their responsibility (sharing of responsibility). NRA EPR Guide applies to specialized and technical issues specific to nuclear emergencies.

Broadly speaking, the following measures are set forth in the Basic Disaster Management Plan:

- Precautionary protective measures: ensuring the safety of facilities; disseminating knowledge of disaster prevention; promoting researches on nuclear emergency prevention etc.; implementing measures to prevent recurrence; preparing for emergency response actions and recovery from a disaster; preparing for emergency response to an accident during the transport of nuclear fuel material, etc. outside a nuclear site
- Emergency response measures: collecting and communicating information immediately after the occurrence of an emergency; setting up an emergency contact system and an activity system; activities to provide protection, such as evacuation and sheltering-in-place, and information; activities to assist the life of nuclear accident sufferers; maintaining social order, including crime prevention; securing traffic for emergency transportation and conducting emergency transportation activities; rescue, first-aid, medical and fire extinguish activities; activities to procure and supply materials; activities related to health and hygiene; accepting voluntary support; emergency response to an accident during the transport of nuclear fuel material etc. outside a nuclear site; response to the complex of natural disaster and nuclear accident

- Measures to recover from a disaster: canceling the declaration of a Nuclear Emergency Situation; measures following the nuclear emergency; assisting accident sufferers in reconstructing their life etc.; abolition of the Nuclear Emergency Response Headquarters.

Local governments prepare their respective Local Disaster Management plans (Nuclear Emergency Preparedness Part) based on the Basic Act on Disaster Management and Act on Special Measures Concerning Nuclear Emergency Preparedness. Local governments provide basic measures in the plans based on NRA EPR Guide.

F-5-3 NRA Guide for Emergency Preparedness and Response (NRA EPR Guide)

Under the provisions of the Nuclear Emergency Act, the NRA must develop the NRA EPR Guide to ensure the smooth implementation of precautionary protective actions, emergency response actions and measures following the nuclear emergency and make the NRA EPR Guide available to the public without delay.

The purpose of the NRA EPR Guide is to allow licensees, the head of designated government organizations and designated local government organizations, local governments, designated public corporations, designated local public corporations, and others to take nuclear emergency actions in a smooth manner. The Guide went into effect on October 31, 2012 and, since then, they have been revised repeatedly. The goal of the Guide is to ensure the protective actions that avoid or minimize the severe deterministic health effects delivered by radiation, and reduce the risk of probabilistic effects towards inhabitants around the nuclear facility in case of emergency.

Described below are the main provisions of the NRA EPR Guide.

F-5-3-1 Preliminary Measures for Nuclear Emergency Preparedness and Response

a Establishment of the Nuclear Emergency Response Zone

In the event of a nuclear emergency, the magnitude of the impact on the surrounding environment due to the abnormal release of radioactive material or radiation and the time until the impact depend on the mode of the abnormal event, the characteristics of the facility, the weather conditions, the environmental conditions in the surrounding area, the living conditions of residents, and other factors.

Consequently, it is necessary to take the appropriate action in a flexible manner depending on the event that occurred. To take action to protect residents etc. against radiation exposure efficiently in a short time, it is necessary to, in advance, assume the occurrence of an unusual event, define areas that may be affected by the event, take into account factors, such as the characteristics of the facility, and to focus on taking measures particularly for nuclear emergencies.

Therefore, the Nuclear Disaster Countermeasure Priority Area is basically to be established for each facility considering its inherent risk and the degree of potential impact at the time of accident.

The Nuclear Disaster Countermeasure Priority Area is divided into 2 areas : the Precautionary Action Zone (PAZ) is the area where precautionary protective actions such as immediate evacuation shall be prepared before the release of radioactive material at a level different from the amount of radioactive material released during normal operation or shutdown in order to avoid or minimize severe deterministic effects due to radiation exposure even in the rapid progression of accident, and the Urgent Protective Action Planning Zone (UPZ) is an area where emergency protective actions should be prepared to reduce the risk of stochastic effects.

Out of the main facilities covered in this report, for the reprocessing facilities, the whole Nuclear Disaster Countermeasure Priority Area is set as the UPZ without the PAZ and its radius is set as 5 km since the threat assessment based on the IAEA safety standards demonstrated that there will be no possibility to cause severe deterministic effects delivered by radiation in off-site areas and that no stochastic effect will be caused outside a radius of 5 km from the facility.

As for spent fuel storage facilities (facilities which store spent fuel only in dry casks), radioactive waste disposal facility and waste storage facility, no Nuclear Disaster Countermeasure Priority Area is required since the threat assessment demonstrated that no event requiring off-site protective actions is assumed.

b Nuclear Emergency Category and Emergency Action Level (EAL)

In Japan, emergency situations are divided into 3 categories: an alert (AL), a site area emergency (SE) and a general emergency (GE).

An AL is a phase in which, in a nuclear facility, even though there are no immediate radiation effects or likeliness of such effects to the public at that point, an unusual event occurs or may occur and preparations need to be made to collect information, conduct emergency monitoring and implement protective actions such as the evacuation of those who need to evacuate in the phase of a SE. In this phase, licensees must immediately report the occurrence of an event in the AL category and the state of the facility to the Government. The Government must confirm the occurrence of the AL event based on the information from licensees and provide it to the local governments, the public and other stakeholders without delay. The Government and the local governments must start to prepare for the implementation of relatively time-consuming protective actions in the PAZ near the nuclear facility.

A SE is a phase in which, in a nuclear facility, an event that may have radiation effects on the public occurs and preparations need to be made to take main protective actions, such as evacuation in an emergency, in the surrounding area of the facility. In this phase, licensees must immediately report the occurrence of an event in the SE category and the state of the facility to the central government and the local governments. Also, it shall take necessary emergency measures to prevent the occurrence or spread of nuclear disasters and report on the outline of such measures. The Government must confirm the occurrence of the SE, and provide information to the local governments, the public and other stakeholders without delay. The Government, the local governments and licensees must enhance the information collection activities to grasp the development of the event by emergency monitoring and other means and, mainly in the PAZ, must prepare for the implementation of precautionary protective actions, such as the evacuation of basically all residents, etc., and evacuate those who need to evacuate in the phase of a SE.

A GE is a phase in which, in a nuclear facility, an event that is very likely to have radiation effects on the public occurs and protective actions need to be taken promptly to avoid or minimize the severe deterministic health effects and reduce the risk of the probabilistic effects. In this phase, licensees must immediately report the occurrence of an event in the GE category and the state of the facility to the Government and the local governments. In addition, licensees shall take necessary emergency measures to prevent the occurrence or expand of nuclear disasters and report on the outline of such measures. The Government must confirm the occurrence of the GE and provide information to the local governments, the public and other stakeholders without delay. The Government and the local governments must take precautionary protective actions

in the PAZ, such as the evacuation of basically all residents and the administration of stable iodine. In the UPZ, sheltering must be implemented and as in the PAZ, precautionary protective actions, such as evacuation, need to be taken, depending on the scale and the temporal development of the event.

As for the nuclear power plants, the EAL, which is used to determine the nuclear emergency category, is defined in the NRA EPR Guide for each of the 3 emergency categories and for each of the 3 reactor types (BWR, PWR and FBR), as well as for TEPCO Fukushima Daiichi units 1 to 4, and for the condition that no nuclear fuel material exists in the reactor vessel, as in the case of a reactor under decommissioning. Following EALs are provided concerning spent fuel management facilities and radioactive waste management facility, which is the scope of this Joint Convention.

Table F5-1 EAL of Reprocessing Facilities

Alert (AL)	1	In case of boiling the (liquid) solution when the function described in article 35 of the NRA Ordinance On Standards for the Location, Structure, and Equipment of Reprocessing Facilities (NRA Ordinance No.27, 2013) is lost.
	2	In case the power supply from all the AC bus is lost, and the situation continues for 30 minutes or more.
	3	The water level of the spent fuel storage pool cannot be maintained, and the water level of the storage pool cannot be measured for a period longer than the limited value.
	4	The control room environment deteriorates, and the possibility to make the obstacle for the operation and the control of the reprocessing facilities are caused.
	5	The function of the equipment for the communication inside the facility or function of a part of communication equipment between inside and outside of the facilities are lost.
	6	There is possibility of loss of a part of the function of safety equipment due to fire, explosion or flooding in the vital area.
	7	There is possibility of explosion by the hydrogen in the cell, or fire or explosion by the organic solvent etc. is caused or has a risk to be caused, when the safety function described in the article 1-3 of the NRA Ordinance on Standards for the Location, Structure, and Equipment of Reprocessing Facilities is lost.
	8	There is high possibility of the status that the management of nuclear fuel material by the geometry control, by the mass control and other methods is damaged or lost and other high possibility of criticality in the reprocessing facilities.
	9	In case the earthquake of Japanese seismic scale is 6th or bigger occurs in the city, town or village where the nuclear installation site is located.
	10	In case the high tsunami warning is announced in the sea district for alarm including the nuclear installations.
	11	In case a significant failure etc. of the reprocessing facilities concerned causes which the responsible person on site decides the need for precaution.
	12	In case an external event which exceeds the design basis decided in the new safety regulatory requirements occurs. (tornado, flooding, typhoon, and eruption of volcano, etc.).
	13	In case the Chairman or the deputy judges to the necessity to establish the nuclear emergency alert headquarters when a risk which the event caused by other than reprocessing facilities might influence on the reprocessing facilities.
Site Area Emergency (SE)	1	The water level of spent fuel pool reaches to the level of 2 meters up from the top of the irradiated fuel assemblies.
	2	It becomes impossible to use the Main Control Room
	3	All the function of equipment for the communication in the nuclear site

		or all functions of the equipment for the communication between inside and outside of the nuclear site are lost.
	4	A part of function of safety equipment etc. is lost due to fire, explosion or flooding.
	5	The radioactive material leaks out the building from the cell.
	6	The nuclear fuel material reaches critical in the reprocessing facilities.
	7	In case the radiation dose rate described in the article 10 of the Act on Special Measures Concerning Nuclear Emergency preparedness exceeds the limitation or the radioactive material described in the act is detected at the site boundary of the nuclear installation. (The case of transport to the outside of the nuclear installation is excluded).
	8	The event which the protection measures need to be prepared or a part of protection measures need to be started causes around the nuclear installation, which there is a possibility radioactive materials or radiation is released to the outside of the nuclear installation, for example, the event resulted by other than reprocessing facilities.
General Emergency (GE)	1	In case of boiling continues when the function described in article 35 of the NRA Ordinance On Standards for the Location, Structure, and Equipment of Reprocessing Facilities (NRA Ordinance No.27, 2013) lost and volatilized radioactive materials is generated or may be generated.
	2	In case of the water level of spent fuel pool decrease to the top of the irradiated spent fuel assemblies.
	3	In case of large volume of radioactive material is released to the building from the cell.
	4	The nuclear fuel material reach criticality (status the chain reaction of nuclear fission is maintained) inside the facility for the reactor operation (excluding the reactor core).
	5	In case the radiation dose rate described in the article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness exceeds the limitation or the radioactive material described in the act is detected at the site boundary of the nuclear site. (The case of transport to the outside of the nuclear installation is excluded).
	6	Events where the sheltering of the resident around the nuclear site need to be started due to abnormal level of radioactive materials or radiation release or its possibility, for example, the case where a reprocessing facility is impacted by events occurred around the reprocessing facility.

Table F5-2 EAL of Spent Fuel Storage Facility that Uses Dry Cask to Store Spent Fuel, Waste Disposal Facility and Waste Management Facility

Alert (AL)	1 In case the earthquake of Japanese seismic scale is 6th or bigger occurs in the city, town or village where the nuclear installation site is located. 2 In case the high tsunami warning is announced in the sea district for alarm including the nuclear installations. 3 In case a significant failure etc. of the facilities concerned causes which the responsible person on site decides the need for precaution. 4 In case the Chairman or the deputy judges to the necessity to establish the nuclear emergency alert headquarters when a risk which the event caused by other than the facility might influence on the facility.
Site Area Emergency (SE)	1 In case the radiation dose rate described in the article 10 of the Act on Special Measures Concerning Nuclear Emergency preparedness exceeds the limitation or the radioactive material described in the act is detected at the site boundary of the nuclear site. (The case of transport to the outside of the nuclear site is excluded). 2 The event which the protection measures need to be prepared or a part of protection measures need to be started causes around the nuclear site, which there is a possibility radioactive materials or radiation is released to the outside of the nuclear site, for example, the event resulted by other than a nuclear facility.
General Emergency (GE)	1 In case the radiation dose rate described in the article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness exceeds the limitation or the radioactive material described in the act is detected at the site boundary of the nuclear installation. (The case of transport to the outside of the nuclear installation is excluded). 2 Events where the sheltering of the resident around the nuclear site need to be started due to abnormal level of radioactive materials or radiation release or its possibility, for example, the case where the facility is impacted by events occurred around the facility.

c Operational Intervention Level (OIL)

In a GE, after release of radioactive material, due to the spread of the radioactive material, there are likely to be found places with a high air dose rate in a relatively wide area. To prepare for such an event, the Government, the local governments and licensees need to conduct emergency monitoring promptly, determine the necessary protective actions to be taken by evaluating the monitoring results against the criteria for the implementation of protective actions and take the actions.

After release of radioactive material, in areas where the high air dose rate is continuously measured, urgent protective actions, such as the evacuation of residents, will be taken within a few hours to a day to minimize the impact of radiation exposure

from the ground surface. In areas where the relatively low air dose rate is measured, early protective actions, such as temporary relocation, will be taken within a week to avoid unnecessary exposure.

Operational Intervention Levels (OILs), which are generally indicated by measurable values, such as the air dose rate and the concentration of radioactive material in environmental samples, are specified as the criteria for determining whether these protective actions should be taken. Table F5-3 shows the relationship between the OILs and the protective actions.

Table F5-3 OILs and Protective Actions

	Classification	Description	Default Values	Outline of Protective actions
Urgent protective actions	OIL1	Criteria for advising local residents to evacuate or to shelter in place within a few hours, in order to prevent radiation impact from ground surface, inhalation of re-suspended radioactive material, or inadvertent ingestion intake	500μSv/h (air radiation dose rate when measured 1m above the ground)	Identification of zones within a few hours and subsequent evacuation (including ordering those who cannot easily move to shelter indoors temporarily)
	OIL4	Criteria for conducting decontamination to prevent inadvertent ingestion intake and external exposure via skin contamination	βrays:40,000 cpm (Counting rate measured by detector at several centimeters off the skin) βrays:13,000 cpm(Value 1 month later) (Counting rate measured by detector at several cm off the skin)	Contamination screening of those who are ordered evacuation or relocation and prompt primary decontamination when the results exceed the criteria
Early protective actions	OIL2	Criteria for restricting ingestion of local products and advising local residents, to temporarily relocate within a week or so, in order to prevent radiation impact from ground surface, inhalation of re-suspended radioactive material, or inadvertent ingestion intake	20μSv/h (Air radiation dose rate measured at 1m from ground)	Identification of zones within a day or so and restriction of ingestion of local products, as well as temporary relocation within a week or so
Restriction on intake of food and drink	Food and drink screening standards (corresponding to OIL3)	Criteria for identifying areas where measurement of radionuclide concentrations in food and drink should be carried out in preparation for possible food and drink restrictions at OIL6	0.5μSv/h (Air radiation dose rate measured at 1m from ground)	Identification of zones where radionuclide concentrations in food and drink should be measured

	Classification	Description	Default Values			Outline of Protective actions
	OIL6	Criteria when restricting food and drink intake in order to prevent radiation exposure via ingestion intake	Nuclide	Drinking water, milk, dairy products	Vegetables, cereals, meat, eggs, fish, other	Screening and analysis of radionuclide concentrations in food and drink within a week, and prompt restrictions on food and drink intake if results exceed the criteria
			Radioactive iodine	300Bq/kg	2,000Bq/kg	
			Radioactive cesium	200Bq/kg	500Bq/kg	
			An alpha radioactive nuclide of plutonium and transuranic elements	1Bq/kg	10Bq/kg	
			Uranium	20Bq/kg	100Bq/kg	

d Development of an Emergency Monitoring System

In an emergency, information on the air dose rate from radioactive material in the environment, the concentration of airborne radioactive material and the concentration of radioactive material in environmental samples provides the basis for appropriately implementing protective actions for residents and those engaged in disaster prevention work. Measures will be taken to prevent loss of the emergency monitoring function.

In the implementation of emergency monitoring, the Government will supervise emergency monitoring; develop an implementation policy; develop a plan for conducting emergency monitoring and a mobilization plan; provide instructions on the implementation of the monitoring and overall coordination; collect and disclose data; evaluate the results of the monitoring and change the implementation plan as the event develops; and conduct wide-area monitoring such as marine monitoring and aerial monitoring. The local governments will develop the emergency monitoring plan and conduct emergency monitoring in nuclear emergency planning zones. Licensees will provide information on the source of the radioactive material released and cooperate in emergency monitoring in the surrounding area of the facility and other areas.

If the situation develops into a site area emergency, the Government will set up an Emergency Monitoring Center in the Off-site Center with the necessary functions to conduct emergency monitoring in the area where the nuclear facility is located, so that the Government, the local governments and licensees can work together to conduct emergency monitoring.

The Emergency Monitoring Center consists of the Government, the prefecture where

the nuclear facility is located, the neighboring prefectures, the designated public organizations, licensees, and supporting organizations, and is responsible for collecting information on environmental radiation levels due to the nuclear emergency and providing information to be used to determine whether OIL-based protective actions should be taken and information to be used to evaluate radiation effects from the nuclear emergency on the residents, etc. and the environment.

e Development of Medical Care in a Nuclear Emergency

A medical care to allow specified first-aid emergency health care institutions to provide health care in a nuclear emergency and a chain of command are in place even under normal circumstances to provide necessary health care activities quickly and accurately in a nuclear emergency. Those described below are put in place: "Nuclear Emergency Core Hospital" which accepts those who get injured regardless of contamination and provide appropriate care in case of exposure; "Nuclear Emergency Medical Cooperative Institution" which supports medical care and nuclear emergency response actions implemented by local governments; "Advanced Radiation Emergency Medical Support Center" which provides advanced and specialized medical care that could not be provided at Nuclear Emergency Core Hospital and provide advanced and specialized education and training; "Core Advanced Radiation Emergency Medical Support Center" which assumes a central and leading role among Advanced Radiation Emergency Medical Support Centers; and "Nuclear Emergency Medical Support Center" which supports Nuclear Emergency Medical Core Hospitals and build networks within related medical institutions in ordinary times as well as make arrangements for dispatching nuclear emergency assistance medical teams in a nuclear emergency.

The Government designates the Core Advanced Radiation Emergency Medical Support Centers, Advanced Radiation Emergency Medical Support Centers and Nuclear Emergency Medical Support Centers, and reviews them for compliance with the facility requirements basically every 3 years. The prefecture and the city, town or village within Priority Area for Nuclear Disaster Prevention Measures designates and registers Nuclear Emergency Core Hospitals and Nuclear Emergency Medical Cooperative Institutions, and review them for compliance with the facility requirements basically every 3 years.

f Intake of Stable Iodine

In order to prevent or reduce internal exposure to thyroid from radioiodine in a nuclear emergency, intake of stable iodine at an appropriate timing is important. Thus, in PAZ, immediate evacuation and intake of stable iodine are to be executed as precautionary protective actions in the event of general emergency. For this purpose, in PAZ, providing stable iodine at ordinary times is implemented.

In UPZ, sheltering-in-place is taken as a protective action in the event of general emergency. The NRA determines the need for intake of stable iodine along with the need for evacuation or temporary relocation according to the facility status or emergency monitoring results, then accordingly residents are to take stable iodine based on the instruction of the Nuclear Emergency Response Headquarters or local governments. For this purpose, in UPZ, providing stable iodine at schools or community centers on the way of evacuation or temporary relocation is put in place.

Even in UPZ, for areas where protective immediate evacuation may be needed in the same way as in PAZ, providing stable iodine in preparation could be implemented in the same manner as in PAZ when local governments determine that it is necessary.

g Setting-up of an Off-Site Center

The Local Nuclear Emergency Response Headquarters of the Government and the Emergency Response Headquarters of the local governments set up a Nuclear Emergency Joint Response Meeting to exchange information in the event of a nuclear emergency and an Off-site Center as a center for implementing nuclear emergency response actions in a coordinated manner in the area where the nuclear facility is located.
The Off-site Center is located in an area, considering the guidelines for PAZ and UPZ and has the necessary systems in place to maintain its function as the primary emergency facility to take the necessary actions for radiation protection and emergency actions such as alternative facility and multiple lines of communication channels.

F-5-3-2 Emergency Response Measures

a Comprehending an Unusual State and Taking Emergency Response Actions

Upon being informed of an AL or SE by licensees, the Government and the local governments will start to prepare for the implementation of protective actions towards

a GE and provide information to residents.

Upon being informed of a GE by licensees, residents in the PAZ will be required to evacuate and residents in the UPZ will be required to take precautionary protective actions, such as sheltering, in principle. If an abnormal level of radioactive material is released or likely to be released from the nuclear facility, residents in areas other than those where precautionary preventive actions are taken will shelter in place as needed in consideration of the condition of the facility and the release of radioactive material. Based on the results of emergency monitoring, protective actions are implemented, such as evacuation, temporary relocation, and restrictions on eating and drinking, also in areas other than those where precautionary protective actions were taken.

b Emergency Monitoring

In the event of an alert, the Government, the local governments, licensees, and the relevant designated public organizations will prepare for emergency monitoring. In the event of a site area emergency, the Government will set up an Emergency Monitoring Center, make a request for the necessary personnel under the mobilization plan and start emergency monitoring.

c Evacuation, Temporary Relocation and Sheltering-in-Place

If an abnormal level of radioactive material and radiation are released or likely to be released into the surrounding area of the nuclear facility, depending on the nuclear disaster countermeasure priority area, in principle, all residents in the PAZ will be required to evacuate immediately, and residents in the UPZ will be required to shelter in place when the situation develops into a GE. Subsequently, a phased-evacuation will be considered depending on the state of the nuclear facility. In addition, after radioactive material are released, areas exceeding OIL 1 will be identified based on emergency monitoring within a few hours and residents will be evacuated subsequently, and areas exceeding OIL 2 will be identified within a day or so and residents will be temporarily relocated subsequently.

In the event of a GE, depending on the disaster countermeasure priority area, evacuation will be implemented in the PAZ in principle. However, sheltering will be implemented if it is more appropriate than evacuation. In the UPZ, sheltering-in-place will be implemented until a phased-evacuation or other OIL-based protective actions are taken as a matter of principle.

F-5-4 Nuclear Emergency Exercises

With regard to nuclear emergency exercises, there are various kinds including the one conducted by the Government based on the Nuclear Emergency Act, the one by local administrative agencies based on the Disaster Countermeasures Basic Act. To check the effectiveness of emergency response systems in accordance with the Nuclear Emergency Act, previously, nuclear emergency exercises were carried out by themselves or jointly by the national and local governments and nuclear operators. However, lessons learned from TEPCO Fukushima Daiichi NPS accident, these exercises are under review. Future exercises must now incorporate lessons learned from TEPCO Fukushima Daiichi NPS accident, including the possibility of an unprecedented complex earthquake-tsunami-nuclear accident disaster, as well as incorporating more realistic evacuation exercises.

The following describes about training regarding mainly on facilities of concern in this report. In addition, the training (Comprehensive Nuclear Disaster Prevention Drill) jointly conducted by the Government, local governments, nuclear licensees, has been conducted mainly for nuclear power reactors. The most recent drill was carried out for 3 days in November 2019 in Shimane region, which was concerning establishing an initial system promptly, decision making about radiation protection cooperation with central and local organizations, residents relocation to the inside and outside of the prefecture, and indoor evacuation.

Also, in 2020, the Comprehensive Nuclear Disaster Prevention Drill is planned in the Onagawa area, which is the affected area by the Great East Japan Earthquake.

F-5-4-1 Exercises Planned by Licensees

In accordance with the Nuclear Emergency Act, licensees must conduct nuclear emergency exercises, report the results of the exercises to the NRA and disclose the summary.

Activities in the exercises of licensees include scenario without pre-shared training and sharing of good practice through mutual visits of licensees.

For example, in reprocessing facilities, individual training programs on individual procedures to improve the skills to perform work procedures and a comprehensive

training program that combines several individual training programs are conducted. The individual training programs include, for example, reporting training to ensure that licensees can promptly communicate with the related organizations inside and outside; familiarization training to respond severe accident to ensure that upon nuclear emergency, emergency actions to secure power supply and water sources will be taken in a prompt and appropriate manner; rescue training to ensure that those who get injured will be taken out of a controlled area, decontaminated and treated; and evacuation instruction training to ensure that visitors will be instructed to evacuate upon emergency and those other than the emergency response personnel will be instructed to evacuate when a state of emergency is declared.

In the comprehensive training program, more extensive training is conducted with the participation of the facility as well as the head office. For example, in a facility, training is provided on reporting, rescue, monitoring, evacuation instructions, and severe accident response. In the head office, training is provided on setting up a nuclear site emergency support center and media relations.

The Nuclear Emergency Act requires that a nuclear operator reports the results of emergency exercises to the NRA. The NRA may order, through consultation with the Prime Minister, licensees to improve the drill procedures and take other necessary actions if the results of the exercises are determined not to be adequate for preventing occurrence or development of a nuclear disaster. The Basic Plan on Disaster Preparedness states that the NRA will evaluate the results of exercises for severe accidents. The NRA developed indices for the evaluation of nuclear operator emergency exercises and evaluates the exercises, opens to the public to lead to the future development by taking opportunities such as the Nuclear Energy Disaster Prevention Drill.

F-5-4-2 Exercises Drawn Up by the Local Governments

Local governments should put the drills into effect periodically based on Disaster Countermeasures Basic Act.

In the drills conducted by the relevant prefectures, the local governments (including the governor), the bodies in charge of field response, such as police, fire services, the Japan Coast Guard and Japan Self-Defense Forces, and nuclear operator should

participate usually. And, some exercises on evacuation of residents or screening tests for evacuation from emergency zones are carried out with the bodies in charge of field response.

Besides, national government conducts several training (for the beginners, for drivers of transport services, e.g. bus drivers, for nuclear emergency preparedness headquarter staff) and table top exercises at headquarter are carried out for local government organs personnel who are in charge of nuclear emergency preparedness.

F-5-4-3 Participation in International Exercises

Japan is a Contracting Party to the Convention on Early Notification of a Nuclear Accident, and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. Pursuant to the provisions of these conventions, and notification is provided without fail in an emergency, Japan consistently participates in the Convention Exercise (ConvEx) organized by the IAEA.

F-5-5 Information Dissemination to the Public and Neighboring Countries

F-5-5-1 Measures for Providing Information to the Public

As one of the examples of enhancing information dissemination of disaster management plans to the public, Japan conducts emergency exercises at national and local levels targeting local residents. At emergency exercises, the residents in the areas likely to require evacuation will conduct evacuation as well as radiation survey. Furthermore, local authorities explain a disaster management plans to the residents prior to the exercises.

The former nuclear regulatory organization, NISA, launched its emergency information mailing service in July 2008 enabling people to register their mobile phone e-mail address in advance and promptly receive emergency information. This system was inherited by the NRA in September 2012 (and is now called N-alert). During a nuclear emergency, the media will provide information to local residents. Press briefings, covered in television and radio broadcasts, will be held as required at the local Off-site Centers and at the Emergency Response Center in Tokyo.

Besides, websites will be utilized as one of the means for information dissemination to the public.

F-5-5-2 Providing Information to Neighboring Countries

Japan is an island nation surrounded by ocean in East Asia, and shares no land borders with any countries. However, since its neighboring countries – China and South Korea – also possess reactor facilities, it is important for the three countries to share information in case of a nuclear accident from the lessons learned from TEPCO Fukushima Daiichi NPS accident. In order to make an information sharing framework, the three regulatory authorities inaugurated the Top Regulator's Meeting on Nuclear Safety (TRM), a meeting among senior regulators among Japan, China and South Korea in August 2008. In 2015, the three countries organized Working Group on Emergency Preparedness and Response to establish a system for sharing emergency information, and smooth information sharing under emergency circumstances. By taking the opportunity of disaster prevention drills of respective countries, the three countries have also been conducting Joint Emergency Drill since 2017.

Besides the aforementioned framework among the three countries, as its existing tool for provision of information, Japan has been actively disseminating information within the framework of the United System for Information Exchange in Incidents and Emergencies (USIE) which is managed by the IAEA Incident and Emergency Centre.

F-5-5-3 Response in the Event of a Nuclear Accident or Radiological Emergency in a Neighboring Country

To implement the provisions of the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, Japan has designated the MOFA as the National Warning Point and National Competent Authority for an Emergency Abroad for the event of a nuclear accident or radiological emergency occurring outside the territory of Japan. In the event of a radiological emergency outside the territory of Japan, including that in a neighboring country, MOFA will receive the notification provided through all kinds of channels, share it immediately with the National Competent Authority for a Domestic Emergency and other relevant authorities, and take any necessary action.

In relation to the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, the National Assistance Capabilities of relevant organizations within Japan have been registered in the IAEA Response Assistance Network (RANET), and Japan satisfies the Article 2 Section 4 of the Convention on Assistance.

F-6 Decommissioning

Article 26

Each Contracting Party shall take the appropriate steps to ensure the safety of decommissioning of a nuclear facility. Such steps shall ensure that:

(i) qualified staff and adequate financial resources are available;

(ii) the provisions of Article 24 with respect to operational radiation protection, discharges and unplanned and uncontrolled releases are applied;

(iii) the provisions of Article 25 with respect to emergency preparedness are applied; and

(iv) records of information important to decommissioning are kept

F-6-1 Human and Financial Resources

F-6-1-1 Human Resources

The NRA approves Decommissioning Plan established by nuclear licensees who intend to start decommissioning and Operational Safety Program which has been changed due to decommissioning start. This Operational Safety Program clarifies the staff, organization and its responsibilities or its authorities necessary to ensure the safety of decommissioning. It also describes the establishment and implementation of Implementation Plan of Operational Safety Education for workers and managers including subcontractors, which ensures a system for workers to acquire knowledge necessary for operational safety management is guaranteed. The NRA checks safety activities of licensees, including conformity to Operational Safety Program in Nuclear Regulatory Inspection.

F-6-1-2 Financial Resources

Electric utilities have deposited funds for decommissioning of commercial power reactors using the Dismantling Reserve Funds. (See Section B)

F-6-2 Radiation Protection

The regulations on radiation protection applied to operating nuclear facilities which are described in Article 24 (Section F4), are also applicable to nuclear facilities in the process of being decommissioned.

F-6-3 Emergency Preparedness

Nuclear facilities under decommissioning are required, in compliance with the Act on Special Measures Concerning Nuclear Emergency Preparedness, to prepare for the emergency unless the NRA confirms, specifies and excludes them from the obligation.

F-6-4 Preservation of Records for Critical Information on Decommissioning

Even in the decommissioning period, it is obligatory to keep records including inspection records of equipment and radiation management records in line with the records on operational stages. Furthermore, particularly to decommissioning, the records related to decommissioning are specified in the NRA Ordinances on Commercial Power Reactors. Licensees are obliged to make and store records on method, period and the name of equipment decommissioned, as each process of decommissioning work is finished.

This makes licensees to keep records showing that the decommissioning was carried out properly, and enables the NRA to confirm that the decommissioning was carried out without any safety problems and that the decommissioning based on the decommissioning plan was completed.

F-6-5 Measures for Decommissioning to Require Special Attention for Safety

For decommissioning which requires special attention for safety, the NRA sets up a Safety Oversight Team to continuously confirm licensees' activities to secure safety. For example, the said teams have been established for the decommissioning of JAEA's Prototype Fast Breeder Reactor Monju where nuclear fuel has still been loaded and special care is needed for handling sodium as coolant, and for the decommissioning of JAEA's Reprocessing Plant, namely Tokai Reprocessing Plant, where vitrification of high-level radioactive liquid waste which contains highly concentrated radioactive materials has been left undone.

The Oversight Team for "Monju" established in January 2017 has conducted review of a decommissioning plan and hearing on the status of removal of nuclear fuel assemblies through meetings. The Oversight Team has also carried out field investigation at site.

The Oversight Team for "Tokai Reprocessing Plant" established in January 2016 has

conducted review of a decommissioning plan, hearing on implementation status of vitrification etc. to reduce risk and confirmation on countermeasures against tsunami and earthquake etc.

Section G Safety of Spent Fuel Management

Japan declared that reprocessing is a part of spent fuel management (see Section C). According to this declaration and Article 2 of the Joint Convention, storage at nuclear reactors, spent fuel interim storage business and reprocessing business in Japan correspond to the spent fuel management.

In this report, safety of spent fuel interim storage facility and reprocessing facility where the main purpose of business is spent fuel management, is described.

The Reactor Regulation Act stipulates requirements on Permit of Business for its start, Approval of Design and Construction Plan prior to construction work, Licensees' obligation on conducting Pre-service Inspection and Periodic Inspection, Approval of Operational Safety Program and Nuclear Regulatory Inspection by the NRA for reprocessing and spent fuel interim storage. Under the said Act, regulatory requirements are established as the NRA Ordinance: Licensing Standards for the stage of Permit of Business, and Technical Standards for the stage of Approval of Design and Construction Plan.

In this report, Section G3 describes regulation on Permit of Business; Section G4 mainly on Approval of Design and Construction Plan; Section G5 on safety assessment both in the process of Permit of Business and Approval of Design and Construction Plan; and Section G6 on Licensee's Pre-service Inspection and Licensee's Periodic Inspection, Approval of Operational Safety Program and Nuclear Regulatory Inspection by the NRA.

In Japan, 2 reprocessing facilities have obtained Permit of Business.

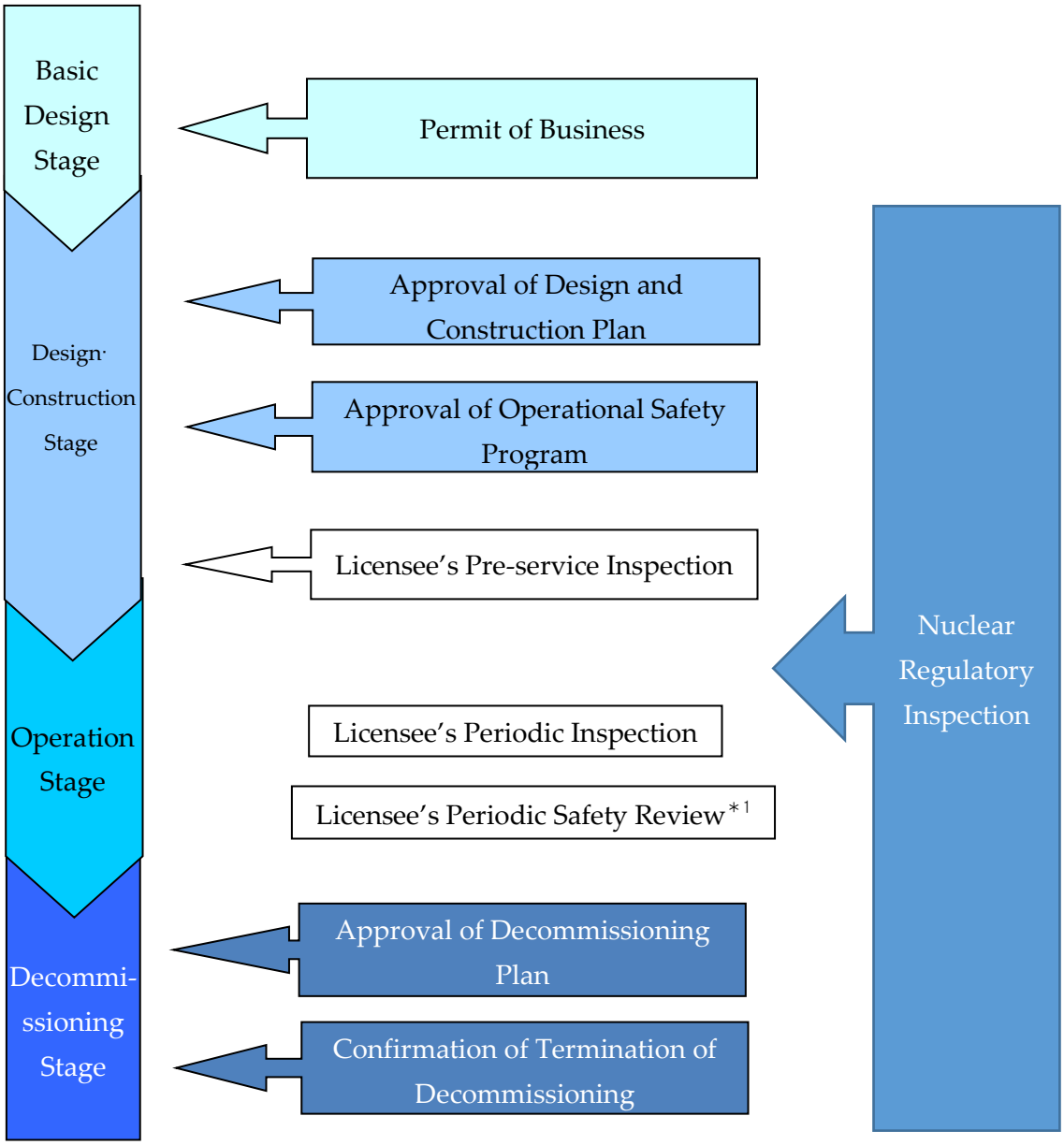
Reprocessing is a process of retrieving uranium and mixed uranium-plutonium oxide as useful material by shearing, dissolving and chemically separating uranium, plutonium and fission products from spent fuel after the certain period of storage inside the NPPs and reprocessing facilities. Retrieved uranium is reused for uranium fuel and mixed uranium-plutonium oxide is reused for MOX fuel.

JNFL Rokkasho Reprocessing Facility obtained Permit of Business in 1992 and its spent fuel storage facility has already completed in 1999 and begun its operation as reported in B2-1. The reprocessing facility is now under Pre-service Inspection. Licensees

submitted the application for permission to Change of Business in January 2014 following the enforcement of the new regulatory requirements in December 2013. After review meetings and amendments of the application, the NRA permitted the amendment of Business Permit in July 2020. Separated fission products are vitrified as high level radioactive waste, and transuranic waste and low level radioactive waste are generated through manufacturing processes. The safety on these reprocessing facilities are reported in this section, and the disposal of radioactive waste including from reprocessing facilities are stated in Section H.

MOX fuel facility located next to Rokkasho Reprocessing Facility is now under conformity review. JAEA Tokai Reprocessing Facility is under decommissioning as mentioned in Section D5-3 and F6-5.

Figure G-1 Outline of Safety Regulation Flow for Spent Fuel Interim Storage Business and Reprocessing Business



*1 : spent fuel interim storage business

Evaluation of the implementation status of operational safety activities and evaluation of the reflection status of the latest technical knowledge in operational safety activities / periodically not exceeding 10 years after the start date of activity

reprocessing business

Periodic Safety Assessment of Continuous Improvement of reprocessing facilities / periodically not exceeding 6 months after the start date of use of facility or the end date of periodic inspection

G-1 General Safety Requirements

Article 4

Each Contracting Party shall take the appropriate steps to ensure that at all stages of spent fuel management, individuals, society and the environment are adequately protected against radiological hazards.

In so doing, each Contracting Party shall take the appropriate steps to:

(i) ensure that criticality and removal of residual heat generated during spent fuel management are adequately addressed;

(ii) ensure that the generation of radioactive waste associated with spent fuel management is kept to the minimum practicable, consistent with the type of fuel cycle policy adopted;

(iii) take into account interdependencies among the different steps in spent fuel management;

(iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;

(v) take into account the biological, chemical and other hazards that may be associated with spent fuel management;

(vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;

(vii) aim to avoid imposing undue burdens on future generations.

G-1-1 Prevention of Criticality and the Removal of the Residual Heat

Licensees of spent fuel interim storage business are required that spent fuel interim storage facility shall have adequate measures so that spent fuel is not at risk of reaching a state of criticality in compliance with regulatory requirements set by the NRA. Licensees are also required to adequately remove decay heat of the spent fuel with passive system.

For equipment with safety functions in reprocessing facilities, measures to prevent nuclear fuel material from reaching criticality must be taken by way of managing geometries of components that contain nuclear fuel material, managing concentration, mass or isotopic composition of nuclear fuel material, or managing geometries, concentration or material of neutron-absorber, or by way of combining these, or by any other appropriate means so that there is no risk that nuclear fuel material may reach

criticality in the event of any single failure or malfunction of component or single operational error thereof by an operator occurring in any single unit for handling nuclear fuel material, which are anticipated during operation in compliance with regulatory requirements set by the NRA.

And for facilities have safety functions, in case of 2 or more single units are located, measures to prevent nuclear fuel material from reaching criticality must be taken by way of maintaining proper layout of respective single units, using neutron shielding between respective single units or by way of combining these so that eliminate possibility of nuclear fuel material may reach criticality in the event of any single failure or malfunction of component or single operational error thereof by an operator, which are anticipated during operation.

On criticality, measures are required assuming severe accidents in addition to designing facilities with safety functions. As measures against severe accident concerning criticality, facilities that have a function to prevent criticality in a cell must have

- equipment necessary to achieve and maintain subcritical state;
- equipment necessary to isolate the flow path of ventilation ducts connected to the equipment at which a criticality accident occurred;
- equipment necessary to discharge radioactive material outside of the ducts installed within the cell in the case where the inside of the ducts are pressurized;
- equipment necessary to mitigate the impact due to discharge of radioactive material in the event of a criticality accident.

Regarding heat removal, spent fuel receiving and storage facilities in a reprocessing plant are required to remove decay heat of spent fuel safely, and product storage facilities are required to be constructed in such a way that decay heat can be removed safely in compliance with the NRA Ordinance.

G-1-2 Minimizing Generation of Radioactive Waste

The NRA hosted the IAEA's IRRS mission in January 2016 and its follow-up mission in January 2020. In those processes, the NRA decided to urge licensees to take necessary actions voluntarily to realize considerations on decommissioning of the facility and measures to control the generation of radioactive waste from the design phase stated in the IAEA safety standards.
Specifically, the NRA will issue a technical document explaining design examples to

consider minimizing generation of radioactive waste and incorporate them into the implementation of Decommissioning Policy explained in Section E-2-2 and the new inspection system so that licensees are encouraged to take proactive actions.

G-1-3 Interdependence in Different Stage of Spent Fuel Management

Spent fuel is stored in spent fuel storage facilities at nuclear power plant for a certain period after it is taken out of the reactor core and is under regulation for nuclear reactors. The period for spent fuel to be stored in spent fuel interim storage facility after transported is stipulated as spent fuel interim storage business, and the period for spent fuel to be stored and reprocessed in reprocessing facility is stipulated as reprocessing activity. All the regulations for nuclear reactors, for spent fuel interim storage business and for reprocessing business are based on the Reactor Regulation Act, and the consistent regulation is conducted without being interrupted, considering that various steps of spent fuel management are dependent mutually.

G-1-4 Effective Protection of Individuals, Society and the Environment

The Atomic Energy Basic Act aims to contribute to protecting people's lives, health, and property, and preserving the environment through ensuring safety based on the established international standards.

The Reactor Regulation Act aims to protect people’s lives, health and property and preserve the environment through necessary regulation in accordance with the spirit of the Atomic Energy Basic Act. Its objective include ensuring public safety by preventing hazards resulting from nuclear source material, nuclear fuel material and nuclear reactors. Thus the Reactor Regulation Act stipulates necessary requirements so that individuals, society and the environment can be protected appropriately by implementing them.

G-1-5 Consideration for Biological, Chemical and Other Risk Associated with Spent Fuel Management

For spent fuel interim storage facility in Japan, regulatory requirements set by the NRA requires prevention of damage due to external impact such as natural phenomenon. Moreover, for reprocessing facility, regulatory requirements set by the NRA requires that safety function may not be impaired due to a leak of chemicals, and requires the prevention of damage by fire and/or explosion by organic solvent, other flammable

liquid or hydrogen, and damage by the external impact such as natural phenomenon.

G-1-6 Avoidance of Impacts on Future Generation

As reported in G1-3, for a certain period of time after being removed from the core at the nuclear installation, after being stored in the nuclear installation, it is transported to the spent fuel storage facility for storage and is stored and reprocessed at the reprocessing facilities. As described regarding spent fuel storage and reprocessing in G2 and later, the system is that spent fuel management is properly managed so that the risk of spent fuel management will not increase in the future.

G-1-7 Avoidance of Undue Burdens on Future Generations

Another Act stipulates how to secure the cost for reprocessing spent fuel.
(see Section B and E2-6)

G-2 Existing Facilities

Article 5

Each Contracting Party shall take the appropriate steps to review the safety of any spent fuel management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility.

The Joint Convention entered into force in Japan on November 24, 2003. At that time, the spent fuel management facilities where licensed were the reprocessing facilities. Japan confirmed that the obligations described in the Joint Convention were fulfilled by the national law and regulations when it joined this Convention. In addition, measures have been taken to enhance safety, part of which are reported as below.

G-2-1 The Back-Fitting System and Conformity Review

The back-fitting system was introduced upon the amendment of the Reactor Regulation Act in 2012, and licensed nuclear facilities are required to conform to the latest regulatory requirements (the Licensing Standards for installation permission and the Technical Standards for construction approval). When the NRA finds that nuclear facilities do not conform to the regulatory requirements, the NRA may order licensees of the nuclear facility to suspend use/operation, modify, repair, or transfer the location of the nuclear facility, specify operating method or order other actions necessary for operational safety.

In the NRA Ordinances enacted in July 2013, regulatory requirements for nuclear power reactors were established, and in the NRA Ordinances enacted in December 2013, regulatory requirements for spent fuel interim storage facility, reprocessing facilities, radioactive waste storage facilities and radioactive waste disposal facilities were established respectively.

It is not possible to resume operations without passing the conformity review which is the regulatory procedure to confirm that the existing nuclear facilities in Japan comply with the latest regulatory requirements (except for waste disposal facilities already in operation).

G-2-1-1 Spent Fuel Interim Storage Facilities

The conformity review of spent fuel interim storage facilities is composed of the review of the amendment of existing business license, the review of Design and Construction Plan, and the review of Operational Safety Program.

The regulatory requirements request the fundamental safety functions such as prevention of criticality, shielding, confinement, and heat removal for the design of spent fuel interim storage facilities, and require radiation monitoring for radiation control, measures for aging, and measures for natural phenomenon as other safety measures. Existing nuclear facilities are required to comply with them. In the review of the application on the amendment of operating license, the NRA reviews that the location, structure and equipment of spent fuel storage interim facilities and technical competence of licensees are conforming to the Licensing Standards.

The NRA reviews that the Design and Construction Plan of spent fuel interim storage facilities are complying with Permit of Business and the Technical Standards. .

In the review of Operational Safety Program, the NRA reviews that licensees take measures to comply with Permit of Business and to prevent disasters that might be caused by spent fuel or the material which contaminated by the spent fuel, for the safety operation of spent fuel interim storage facility.

For spent fuel interim storage facilities which license is permitted, and Design and Construction Plan, and Operational Safety Program are approved through conformity review, the NRA confirms by Nuclear Regulatory Inspection that Licensee's Pre-service Inspection if facility is conformed to the approved Design and Construction Plan as well as Technical Standards.

Licensees are required to conduct Licensee's Periodic Assessment in compliance with regulations of the Reactor Regulation Act. In a periodical evaluation, licensees are required to evaluate the status of incorporation of the latest technical knowledge into the operational safety activity, and to evaluate the status of the execution of the operational safety activity for every spent fuel interim storage facility for period that doesn't exceed 10 years.

G-2-1-2 Reprocessing Facilities

The conformity review for reprocessing facilities is composed of the review of

amendment of existing Business Permit, the review of Design and Construction Plan, and the review of Operational Safety Program.

In the up-to-dated regulatory requirements for reprocessing facilities, licensees are required to conform to enforced design criteria and take measures for severe accidents, and thus existing facilities need to back-fit to those latest regulatory requirements. In the review of amendment of business license, the NRA reviews location, structure and equipment of the reprocessing facilities, and the technical competence of licensees of reprocessing facilities are compliant with the licensing standards.

In the review of Design and Construction Plan, the NRA reviews that the Design and Construction Plan is compliant to Permit of Business, and to the Technical Standards.

In the review of Operational Safety Program, the NRA reviews that licensees take measures to comply with Permit of Business and to prevent disasters that might be caused by spent fuel, material separated from spent fuel or material contaminated with any of the foregoing, for the safety operation of reprocessing facilities.

For reprocessing facilities which business license, Design and Construction Plan, Operational Safety Program are authorized through conformity review, the NRA confirms by Nuclear Regulatory Inspection that Licensee's Pre-service Inspection if facility is conformed to the Approved Design and Construction Plan as well as the Technical Standards.

G-2-2 Evaluation of Nuclear Facilities that Have Ensured Compliance with the New Regulatory Requirements

When the NRA revises regulatory requirements, by reflecting domestic and/or international state-of-the-art knowledge, study results, etc., licensees are obligated to conform to the revised regulatory requirements even after the conformity review and the inspections, etc. are completed and it resumes operations (Back-fitting system).

In the 2012 amendment of the Reactor Regulation Act, new requirements of Periodic Safety Assessment of Continuous Improvement were newly introduced. In this system, licensees are required to evaluate safety of its facility by itself every time within 6 months after the completion of its periodic inspection, and required to submit the report to the NRA and make the result open to the public. This system is obligated to the nuclear power reactor, the nuclear fuel processing facility for uranium enrichment

or fuel fabrication, and the reprocessing facility.

For the other nuclear fuel facilities, licensees are required to evaluate safety of its facility periodically in accordance with the regulation for each activity. For instance, licensees of spent fuel interim storage business are required to evaluate status of operational safety activity, evaluate the status of reflecting state of the art technology for the operational safety activity, conduct technical evaluation related to aging in every 10 years in accordance with the NRA Ordinance on Business of Spent Fuel Storage.

For the Periodic Assessment of Safety Improvement, and the periodical evaluation, the NRA has developed various guidelines for licensees to be able to conduct necessary evaluation.

G-3 Permit of Business

Article 6

1. Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed spent fuel management facility:
   (i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime;
   (ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment;
   (iii) to make information on the safety of such a facility available to members of the public;
   (iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.
2. In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 4.

G-3-1 Spent Fuel Interim Storage Facilities

Any person who intends to conduct a business for interim storage of spent fuel shall obtain Permit of the NRA pursuant to the Reactor Regulation Act. Any person who intends to obtain the Permit shall submit an application document containing the type of spent fuel to be stored, the storage capacity, location, structure and equipment of spent fuel interim storage facility and the storage method, to the NRA. Documents concerning the conditions of weather, ground, hydrologic, seismic and the social conditions at the site of spent fuel interim storage facility is requested to be submitted as a part of the attachment of the application.

The NRA shall not grant Permit unless it confirms that the location, structure and equipment of the facility conform to the Licensing Standards.

The applicable scope of this requirements is spent fuel interim storage facility adopting metallic cask. A metallic cask here is a metallic dry cask in order to transport and store the spent nuclear fuel.

In the Licensing Standards, regulatory requirements such as prevention of criticality,

shielding, confinement, heat removal and prevention of damage due to fire, natural phenomenon, ground displacement, earthquake, tsunami and human-induced external impact are stipulated. Moreover, the Standards requires that spent fuel interim storage facility must not cause public exposure to radiation in the vicinity of the place in the Maximum Design Basis Accident (an accident which is expected to cause maximum public exposure within the accidents taken into account in plant design).

The NRA discloses conformity review on permit of spent fuel interim storage business, e.g. accept audience to a meeting, live streaming on You Tube, etc., and documents related to the licensing are publicly available.

G-3-2 Reprocessing Facilities

Any person who intends to carry out reprocessing business shall obtain Permit of Business pursuant to the Reactor Regulation Act. Any person who intends to obtain Permit shall submit an application documents containing the type of spent fuel to be reprocessed, the reprocessing capacity, location, structure and equipment of reprocessing facilities and the reprocessing method, to the NRA. Documents concerning the conditions of weather, bedrock, hydrologic, seismic and the social circumstances at the site of reprocessing facilities are requested to be submitted as a part of the attachment of the application.

The NRA shall not grant permit unless it confirms that the location, structure and equipment of facility conform to the Licensing Standards.

The Licensing Standards require prevention of criticality of nuclear materials, shielding, confinement, prevention of damage due to fire, prevention of damage of equipment with safety function due to ground displacement, earthquake, tsunami, natural phenomenon and human-induced external impact, flooding, leak of chemicals etc. Reprocessing facilities are required to be able to control the parameters within acceptable design safety level on abnormal transient in operation; and to be able to prevent radiation hazards to the public on the design basis accident. In addition to these requirements for design basis accidents, the Standards requires installing the facility for measures to manage severe accidents.

The NRA discloses conformity review of a reprocessing business, e.g. accept audience to a meeting, live streaming on You Tube, etc., and documents related to the business licensing are publicly available.

G-3-3 Consideration of Influence on Other Contracting States

Japan is an islands nation surrounded by ocean and with no land links with neighboring countries. Moreover, the spent fuel management facilities in Japan are located in a place with sufficient distance from the land of neighboring country. Therefore, the possibility of significant radiological impact on other Contracting Parties is extremely low. Thus, no framework for international discussion on siting of a spent fuel management facility is established.

G-4 Design and Construction of Facilities

Article 7

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the design and construction of a spent fuel management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;

(ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a spent fuel management facility are taken into account;

(iii) the technologies incorporated in the design and construction of a spent fuel management facility are supported by experience, testing or analysis.

G-4-1 Approval of Design and Construction Plan

G-4-1-1 Spent Fuel Interim Storage Facilities

Licensees who have obtained Permit of Business on spent fuel storage business are required to obtain Approval of Design and Construction Plan before the start of construction in accordance with the Reactor Regulation Act. The NRA reviews and confirms that the Design and Construction Plan is consistent with the permitted business license and the Technical Standards and gives Approval.

In relation to the limitation of radiation impact that might have influence to individuals, society and the environment, the Technical Standards require that metallic cask shall have a structure that does not leak spent fuel material, and that spent fuel interim storage facility must be installed to sufficiently suppress radiation dose defined by the NRA in the vicinity of the place of business due to direct ray and sky-shine ray from the spent fuel interim storage facility concerned. In addition, disposal facility for radioactive waste which is installed in the spent fuel interim storage facility is required to be capable of keeping the concentration of radioactive substance in the air outside of the surrounding monitored area and in the water at the boundary of the Surrounding Monitored Area be equal or below the value defined by the NRA.

The technology used for design and construction of spent fuel interim storage facilities is evaluated in the process of the review of Design and Construction Plan. It is an obligation of licensees to prove that the design of the facility comply with the Technical

Standards, and this ensures the appropriate technology is used for design and construction. In addition, based on the quality management policy reviewed upon licensing, licensees are required to develop a design and development plan and to implement investigation, verification and validation. These quality management activities ensure that spent fuel interim storage facility complies with the requirements for performance, the purpose of usage, intended usage method.

G-4-1-2 Reprocessing Facilities

Licensees who have obtained Permit of reprocessing business are required to obtain Approval of Design and Construction Plan before the start of construction in accordance with the Reactor Regulation Act. The NRA reviews and confirms that the Design and Construction Plan is consistent with permitted business license and the Technical Standards, and gives approval.

In relation to the limitation of radiation impact that might have influence to individuals, society and the environment, the Technical Standards require that equipment with safety function shall have a structure to maintain confinement, and that reprocessing facilities must be installed so as to sufficiently suppress radiation dose defined by the NRA in the vicinity of the place of business due to direct ray and sky-shine ray from the reprocessing facilities concerned during operation and outage, and that the equipment shall be capable to dispose the radioactive waste so as to keep the concentration of radioactive substance in the air outside of the surrounding monitored area and the dose rate of liquid radioactive substance to be discharged to the ocean shall be equal or below the value defined by the NRA. In addition, installation of equipment necessary to control the release of radioactive substance and radiation to the outside of reprocessing facilities in case of a severe accident.

The technology used for design and construction of reprocessing facilities is evaluated in the process of the review of Design and Construction Plan. It is an obligation of licensees of reprocessing business to prove that the design of the facility comply with the Technical Standards, and this ensures the appropriate technology is used for the Design and Construction. In addition, based on the quality management policy reviewed upon licensing, licensees are required to develop a design and development plan, and to implement investigation, verification and validation. These quality control activities ensure that reprocessing facilities comply with the requirements for the required performance, purpose of usage, intended usage method.

G-4-2 Consideration on Decommissioning at the Design Stage

As mentioned in Section E2-2, due to the revision of the Reactor Regulation Act in 2017, licensees of spent fuel interim storage facility and reprocessing facility must establish and publicly disclose a Decommissioning Policy immediately after licensing. In the Decommissioning Policy, method of dismantlement of the facility, decontamination, plan and timeline of decommissioning are described, and more practical description will be added in due course based on the operation status of the facility.

When decommissioning the facility, licensees shall obtain Approval of Decommissioning Plan in accordance with the Reactor Regulation Act.

G-5 Assessment of Safety of Facilities

Article 8

Each Contracting Party shall take the appropriate steps to ensure that:

(i) before construction of a spent fuel management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;

(ii) before the operation of a spent fuel management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

G-5-1 Spent Fuel Interim Storage Facilities

The procedures on the licensing and design/construction phase for spent fuel interim storage facilities are described in Section G3 and Section G4 and through these process the safety assessment is carried out. Licensees conduct Licensee's Pre-service Inspection and the NRA confirms it before commencement of use as reported in Section G6-1. This confirms the fulfillment of the performance based on safety assessment carried out before construction.

Concretely, the person who intends to obtain Permit of Business of the spent fuel interim storage should submit "Document concerning safety design of spent fuel interim storage facility," "Document concerning exposure control of radiation dose from the spent fuel, etc. and the disposal of radioactive wastes" and "Document concerning type, level, and influence, etc. of accident at spent fuel interim storage facility, those assumed to be caused in case of mis-operation, failure of machine or equipment, flooding, earthquake, fire, explosion, etc.," when applying process of permit, and explain the result of the safety evaluation to the NRA. When the NRA permits the application, these documents are also reviewed. In the Licensing Standards, the facility should have the performance such as prevention of criticality, shielding, confinement, heat removal, prevention of damage by fire, earthquake, tsunami, and external impact and prevention of radiation hazards at the maximum design-base accident and the performances is required for each equipment are described. And a systematic evaluation concerning safety is performed in accordance with the regulatory requirements.

After obtaining the Permit of Business, licensees are required to obtain Approval of Design and Construction Plan for the facility before construction starts. Licensees are required to submit the document that explains that Design and Construction Plan are compliant with the Technical Standards. When the NRA permits the application, these documents are also reviewed. In the Technical Standards, performance needed for the facility are described, such as prevention of criticality, shielding, confinement, heat removal, prevention of damage by fire, earthquake, tsunami, and external impact and the performances required for each equipment. And a systematic evaluation concerning safety is performed in accordance with the Technical Standards. The evaluation at this stage is more detailed than that of the Permit of Business, because it is based on the concrete facility design.

G-5-2 Reprocessing Facilities

The procedures on the licensing and design/construction phase for reprocessing facilities are described in Section G3 and Section G4 and through these process the safety assessment is carried out. Licensees conduct Licensee's Pre-service Inspection and the NRA confirms it before commencement of use as reported in Section G6-2. This confirms the fulfillment of the performance based on safety assessment carried out before construction.

Concretely, the person who intends to obtain the Permit of the business in the process of the licensing of reprocessing business should describe the following in the application documentation:

- Necessary facilities as countermeasure for abnormal transients during operation and design basis accidents, impact of the assumed accidents, condition to evaluate the impacts and a result of the evaluation; and
- Necessary facilities as countermeasure and organization for severe accident and for accident to potentially become a severe accident, impact of the assumed accidents, condition to evaluate the impacts and a result of the evaluation.

In addition, the person who intends to obtain the Permit of the Business is required to submit "Document concerning the safety design of the reprocessing facilities" and "Document concerning the maintenance of necessary facilities and system for an accident concerned when the accident occurs in the reprocessing facilities," etc., and to explain the result of the safety assessment. Documents are also reviewed in licensing

process. The Licensing Standards stipulates requirements on performance that reprocessing plant should have, such as prevention of criticality, shielding, confinement, prevention of damage by fire, earthquake, tsunami, external impact, leakage of chemicals, prevention of expansion of design basis accident, or performance necessary for other components. In addition, as the requirement for severe accident management facility, prevention of expansion of severe accident, prevention of damage by fire, earthquake, tsunami, and performance of severe accident management facility. To grant Permit, systematic evaluation of application is performed in line with these requirements.

After obtaining Permit of Business, licensees of reprocessing facilities are required to obtain Approval for Design and Construction Plan of the facility before the start of construction. Licensees of the reprocessing facilities are required to submit the application documents explaining that Design and Construction Plan is consistent with requirements of the Technical Standards in the process of the approval. When the NRA approves the application, these documents are also reviewed. In the Technical Standards, the performance that the reprocessing facilities should have, such as prevention of criticality, shielding, heat removal, prevention of damage by fire, earthquake, tsunami, flooding, external impact and leakage of chemicals, and the performances required for each equipment are described. A systematic evaluation concerning safety is performed in accordance with the regulatory requirements. At this phase, evaluation is performed based on the specific design for the concrete equipment, so is more detail than that of licensing phase.

G-6 Operation of Facilities

Article 9

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the licence to operate a spent fuel management facility is based upon appropriate assessments as specified in Article 8 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;

(ii) operational limits and conditions derived from tests, operational experience and the assessments, as specified in Article 8, are defined and revised as necessary;

(iii) operation, maintenance, monitoring, inspection and testing of a spent fuel management facility are conducted in accordance with established procedures;

(iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a spent fuel management facility;

(v) incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body;

(vi) programmes to collect and analyze relevant operating experience are established and that the results are acted upon, where appropriate;

(vii) decommissioning plans for a spent fuel management facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body.

G-6-1 Spent Fuel Interim Storage Facilities

In accordance with the Reactor Regulation Act, licensees cannot start operation without conducting Licensee's Pre-service Inspection and receiving its confirmation of NRA. Licensee's Pre-service Inspection checks whether construction and functions are complied with Design and Construction Plan approved by the NRA and the Technical Standards.

Licensees should obtain Approval of Operational Safety Program from the NRA before starting constructions. The implementation of the Operational Safety Program is required by the law, in the case of violation, the NRA could impose penalties such as revocation of permits or suspension of the operation of facilities within 1 year. The main items to be indicated in Operational Safety Program are system for operational

safety, quality management system, education on operational safety, access control, oversight and management of facilities, which are detailed in Table G-1.

Based on the Reactor Regulation Act, licensees shall conduct Licensee's Periodic Inspection to check whether facilities are maintained to comply with the regulatory requirements, and shall report the plan and result to the NRA. The NRA confirms through Nuclear Regulatory Inspection licensees' safety activities including its implementation and conformity to Operational Safety Program.

Licensees have to report to the NRA based on the Reactor Regulation Act when an event stipulated by the NRA Ordinance occurs, such as: spent fuel is stolen or missing; loss of confinement function, shielding, decay heat removal function or function for prevention of fire or explosion, or possibility of losing these functions due to failure of spent fuel interim storage facility.

In the case of decommissioning of spent fuel interim storage facilities, licensees shall obtain Approval of Decommissioning Plan in accordance with the Reactor Regulation Act. The following explanatory documents should be attached to the application of Decommissioning Plan:

- Management of radiation exposure during decommissioning;
- Assumed incident, damage and effect in case of error, fault of machine and equipment, flooding, earthquake, fire;
- Distribution of contamination by spent fuel and assessment method for that;
- Maintaining functions of spent fuel interim storage facilities during decommissioning;
- period of maintaining above functions.

Acceptance criteria on Approval of Decommissioning Plan is that spent fuel has been already removed from spent fuel interim storage facility, management of material contaminated by spent fuel is appropriate, implementation of decommissioning is appropriate in terms of prevention of disaster caused by material contaminated by spent fuel.

G-6-2 Reprocessing Facilities

In accordance with the Reactor Regulation Act, licensees of reprocessing facilities cannot start operation without conducting Licensee's Pre-service Inspection and receiving its confirmation of the NRA. Licensee's Pre-service Inspection checks whether construction and functions are complied with Design and Construction Plan

approved by the NRA and the Technical Standards.

Licensees of reprocessing facilities should obtain Approval of Operational Safety Program from the NRA before starting construction. The implementation of Operational Safety Program is required by the law, in the case of violation, the NRA could impose penalties such as revoke permits or suspend the operation of facilities within 1 year. The main items to be indicated in Operational Safety Program are system for operational safety, quality management system, education on operational safety, access control, oversight and management of facilities, which are detailed in Table G-2.

Based on the Reactor Regulation Act, licensees of reprocessing facilities shall conduct Licensee's Periodic Inspection whether facilities are maintained to comply with the NRA's regulatory requirements, and shall report the plan and result to the NRA. And the NRA confirms through Nuclear Regulatory Inspection the licensee's safety activities including its implementation and conformity to Safety Operational Program.

Licensees have to report to the NRA based on the provision of the Reactor Regulation Act when events stipulated by the NRA occurs in the same manner as spent fuel interim storage facility explained in Section G6-1.

In the case of decommissioning reprocessing facilities, licensees of reprocessing facilities shall obtain Approval of Decommissioning Plan in accordance with the Reactor Regulation Act. The following documents should be attached to the application of Decommissioning Plan in the same manner as spent fuel interim storage facility explained in Section G6-1. Acceptance criteria on Approval of Decommissioning Plan are that nuclear fuel material is removed from main process of reprocessing plant, management and transfer of spent fuel, material separated from nuclear fuel material or spent fuel are appropriate, management of spent fuel, nuclear fuel material or material separated from nuclear fuel is appropriate, implementation of decommissioning is appropriate in terms of prevention of disaster caused by material contaminated by spent fuel, nuclear fuel material or material separated from nuclear fuel material or spent fuel.

G-6-3 Making Effective Use of Operational Experiences

In accordance with the Reactor Regulation Act, spent fuel interim storage facilities are required to implement periodic assessment and reprocessing facilities are required to

implement Periodic Safety Assessment of Continuous Improvement. Those are prescribed in Section G2.

If a safety significant event occurs, licensees are required to report this to the NRA without delay, in accordance with the provisions of the Reactor Regulation Act. After examining the cause and developing counter measures to the event, licensees shall report to the NRA and publish those contents. Once in receipt of the report concerning the event, the Secretariat of the NRA immediately publishes the details and checks the response of licensees to the event. Moreover, after report of the cause and the developed measures on the event from licensees, licensees confirm the validity of the contents and report again to the NRA.

As reported in Section F3-1, licensees are required to establish quality management system in the Operational Safety Program according to quality management standards. Corrective actions and preventive actions are taken into the quality management system. Operational experiences obtained not only from own facility but also from domestic/foreign facilities are utilized. The NRA ensures licensees' those activities through Nuclear Regulation Inspection.

The NRA examines information on these accidents and failures one by one, strives to extract lessons learned for enhancing safety. As necessary, the NRA requests licensees to reflect the lessons learned in operational safety and reflects them in regulatory activities.

In the information collection and analysis process in the Secretariat of the NRA, through the first step of screening process, information possibly related to regulation of Japan is chosen from collected information, and through the second step of screening process, "technical information which needs measure to be taken" is selected. The Secretariat of the NRA studies about the "technical information which needs measure to be taken" and develop the measure in the Technical Information Study Committee periodically held, report to the Reactor Safety Examination Committee and the Nuclear Fuel Safety Examination Committee periodically, get the advice and report to the NRA Committee periodically. Through such process, a variety of domestic and foreign experiences and knowledge are collected, analyzed and reflected to the regulation in Japan.

Licensees manage the Nuclear Information Archives, database for nuclear facilities' information which is disclosed to the public, cooperating with Japan Nuclear Safety

Institute (JANSI). Database of the Nuclear Information Archives contains operating information from the first nuclear power reactor in 1966 to the current reactors or reprocessing plant, and is shared not only by licensees but also the public for the transparency.

In addition to that, as for the collection, analysis, assessment and utilization of operating information among licensees, JANSI, as a third party which is independent from atomic energy activity operators, collect domestic and abroad information such as event at nuclear facility, analyze, assess and provide the result to the domestic operators.

Table G1 Required Items to be Described in Operational Safety Program of Spent Fuel Interim Storage Facility

- The system for implementing relative laws and Operational Safety Program
- Quality Management System for spent fuel interim storage facility
- Duties and organization of personnel who manage and operate spent fuel interim storage facilities
- The job description and extent of duty of Chief Engineer of Nuclear Fuel and the positioning in organization and necessary authority for supervising of operational safety
- Education on operational safety for operator and management staff in spent fuel interim storage facility
- Operation of spent fuel interim storage facility
- Establishing Radiation Controlled Area, Surrounding Monitored Area and access control for those areas
- Exhaust gas and effluent monitoring equipment
- Dose, equivalent dose, concentration of radioactive substance, monitoring density of surface contaminated by radioactive material and removal of contamination
- Management of dose meter and methods of dose monitoring
- Waste receipts and payments, transportation and other handling for spent fuel
- Disposal of radioactive waste
- Measures for emergency
- Measures for operational safety of interim storage facilities against postulated events for the design
- Appropriate report and record of operational safety for spent fuel interim storage facilities
- Facility management for spent fuel interim storage facility
- Periodic assessment for spent fuel interim storage facilities
- Distributing and sharing technical information obtained from maintenance to other spent fuel interim storage operators
- Disclosing information on non-compliance in case of occurrence on non-compliance
- Other necessary items of safety operation for spent fuel interim storage facilities

Table G2 Required Items to be described in Operational Safety Program of Reprocessing Facility

- The system for implementing relative laws and Operational Safety Program
- Quality Management System for reprocessing facilities
- Duties and organization of personnel who manage and operate reprocessing facilities
- The job description and extent of duty of Chief Engineer of Nuclear Fuel and the positioning in organization and necessary authority for supervising of operational safety
- Education on operational safety for operator and management staff in the reprocessing facilities
- Operation of reprocessing facilities
- Establishing Radiation Controlled Area, Preservation Area and Surrounding Monitored Area and access control for those areas
- Exhaust gas and effluent monitoring equipment
- Dose, equivalent dose, concentration of radioactive substance, monitoring density of surface contaminated by radioactive material and removal of contamination
- Management of dose meter and methods of dose monitoring
- Waste receipts and payments, transportation, storage and other handling of nuclear fuel material
- Disposal of radioactive waste
- Radiation control around liquid waste discharge equipment
- Measures for emergency
- Measures for operational safety of reprocessing facilities against postulated events for the design including natural phenomena and human errors which might cause damage on safety, severe accidents or large-scale damage
- Appropriate report and record of operational safety for reprocessing facilities
- Facility management for reprocessing facilities
- Distributing and sharing technical information obtained from maintenance to other reprocessing facilities operators
- Disclosing information on non-compliance in case of occurrence on non-compliance
- Other necessary items of safety operation for reprocessing facilities

G-7 Disposal of Spent Fuel

Article 10 If, pursuant to its own legislative and regulatory framework, a Contracting Party has designated spent fuel for disposal, the disposal of such spent fuel shall be in accordance with the obligations of Section 3 relating to the disposal of radioactive waste.

According to Final Disposal Act, radioactive waste have to be disposed after reprocessing spent fuel, it means spent fuel is not stipulated as disposal in Japan.

Section H Safety of Radioactive Waste Management

This Section reports on the radioactive waste management business regulated by the Rector Regulation Act and the similar business regulated by the RI Regulation Act, which main purpose is safety of radioactive waste management. The radioactive waste management business regulated by the Reactor Regulation Act is reported in Section H1 to H7. In addition, radioactive waste management business regulated by the RI Regulation Act is summarized at the end of this item.

The Reactor Regulation Act stipulates requirements, for waste management business of nuclear fuel material or waste contaminated by nuclear fuel material, of Permit of Business for its start, Approval of Design and Construction Plan prior to construction work, licensees' obligation on conducting Licensee's Pre-service Inspection and Licensee's Periodic Inspection, Approval of Operational Safety Program and Nuclear Regulatory Inspection by the NRA. Under the Act, regulatory requirements are established as the NRA Ordinance: Licensing Standards for the stage of Permit of Business, and Technical Standards for the stage of Approval of Design and Construction Plan.

In this report, Section H3 describes regulation on Permit of Business; Section H4 mainly on Approval of Design and Construction Plan; Section H5 on safety assessment both in the process of Permit of Business and Approval of Design and Construction Plan; and Section H6 on Licensee's Pre-service Inspection and Licensee's Periodic Inspection, Approval of Operational Safety Program and Nuclear Regulatory Inspection by the NRA.

As reported in Section E2-2, the radioactive waste management business regulated under the Reactor Regulation Act are divided into waste interim storage business, category-1 waste disposal business (geological disposal) and category-2 waste disposal business (intermediate depth disposal, pit disposal, trench disposal).

Among them, in waste interim storage business, facility which handles over 3.7 TBq nuclear fuel material or material contaminated with nuclear fuel material is defined as specified waste storage facility, and currently licensed 2 waste storage facilities are both in this definition. Specified waste interim storage facility is required to obtain Approval of Design and Construction Plan before commencing construction work, and the above-mentioned Technical Standards have been established for specified waste storage

facilities. As such, this section reports mainly on specified waste storage facility. 2 licensed facilities: Waste Storage Facility of JNFL, Waste Storage Facility of JAEA Oarai Research & Development Institute, submitted applications on compliance to the new regulatory requirements; the former facility obtained Permit in August 2020 and the latter obtained Permit in August 2018. The former stores vitrified waste canisters generated from reprocessing in the UK or France, which was reported in Section B4-1.

Cat-1 waste disposal facility includes ground facility such as reception facility for radioactive waste, which is defined as specified cat-1 waste disposal facility. Specified cat-1 waste disposal facility is required to obtain Approval of Design and Construction Plan before commencing construction work, and the above-mentioned Technical Standards have been established for specified cat-1 waste disposal facilities.

Out of cat-1 and cat-2 waste disposal facilities, underground facility, which does not fall under specified cat-1 waste disposal facility mentioned above such as waste disposal site and tunnel, are not required to obtain Approval of Design and Construction Plan, but required to obtain safety confirmation of the NRA (Confirmation of Facility). In addition, waste to be disposed of is required to obtain confirmation of the NRA before disposal (Confirmation of Waste). As Confirmation of Facility and Confirmation of Waste are conducted during the operation of facilities as needed, these are reported in Section H4 and Section H6.

There are 3 licensed cat-2 waste disposal facilities: Waste Disposal Facility Unit 1 and 2 of the JNFL, Waste Disposal Facility of the JAEA Nuclear Science Research Institute. Currently reviews for Permit of Business or its amendment are underway for additional installation of Unit 3 of JNFL and design change of Unit 1 and 2 of JNFL, and for Tokai Low Level Radioactive Disposal Facility of the Japan Atomic Power Co. (JAPC).

As reported in Section D3, there are also radioactive wastes stored in nuclear facilities where they had been generated. As for the radioactive waste management in the JAEA facilities, the NRA set up an oversight team in April 2019 to deal with the comprehensive issues related to back-end measures of the whole JAEA such as decommissioning and radioactive waste management of aged facilities, and continues oversight hearing measures from licensees in the team meeting.

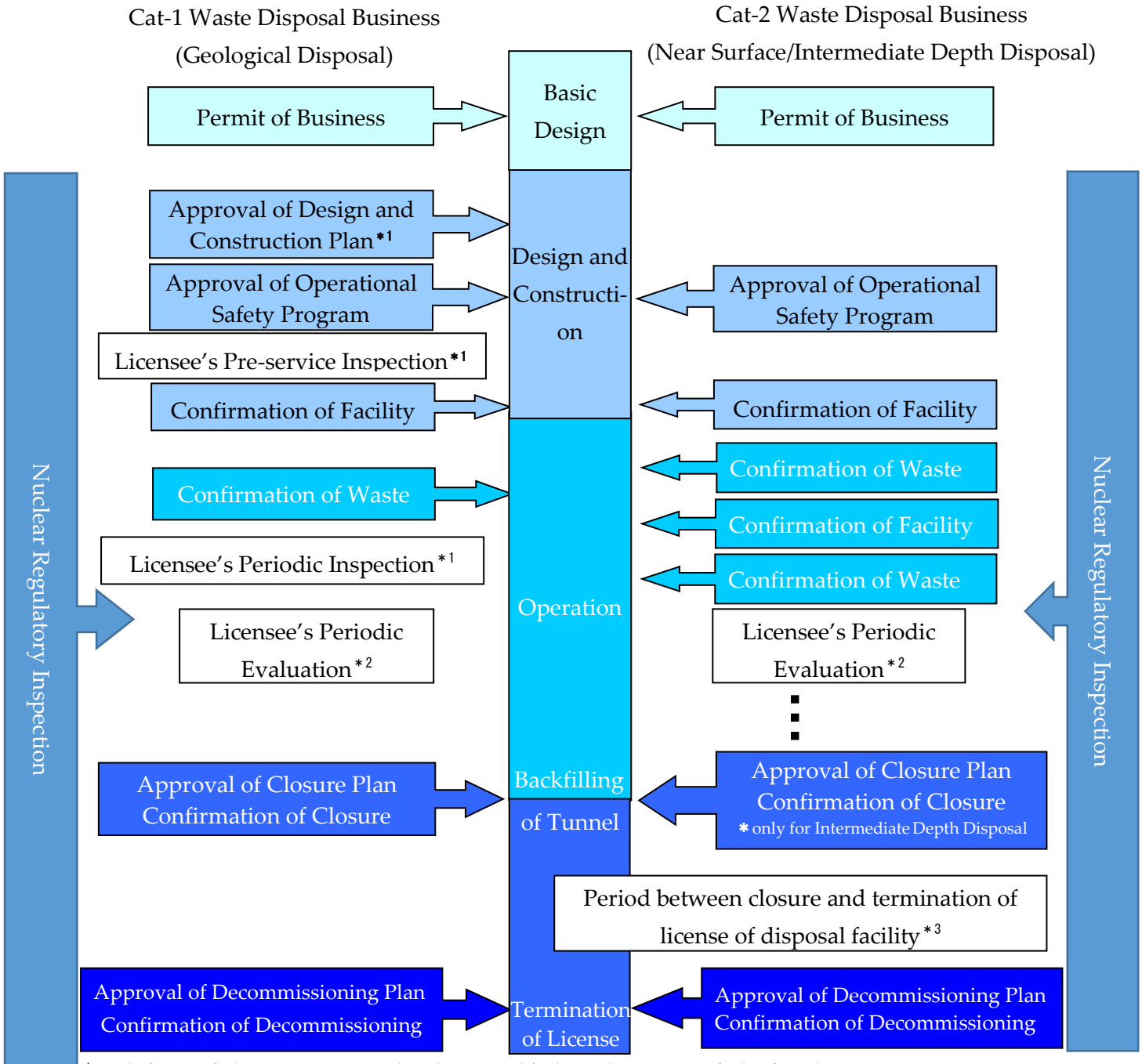
Radioactive wastes regulated under the RI Regulation Act are stored by licensees and registrants, and most of them are collected, treated and stored by permitted waste management licensees. Waste management licensees commence business following

obtaining permission and receiving facility inspection in accordance with the RI Regulation Act, and conduct business according to the Radiation Hazards Prevention Program as well as undergo periodic inspection confirmation. Any person who intends to conduct waste management business on radioisotopes shall obtain permission from the NRA in accordance with the RI Regulation Act. Upon submission of an application, documents shall be submitted describing the methods of waste management, the location, structure and equipment of waste repacking facility, waste storage facility and disposal facility (waste facilities). Upon granting permission, the NRA reviews as to whether waste facilities comply with the Technical Standards required by the NRA Ordinance. As for location, structure and equipment of each facility, shield wall and other shielding structure, ventilation equipment and drainage equipment are required to comply with the regulatory requirements stipulated by the law and ordinance to reduce the impact resulting from radiation. For siting, such facility shall be installed at a location where landslide and flooding are not likely to occur, and major structure of a facility shall be fire-resistant or made from non-combustible materials, etc.

In addition, any person who has been granted permission of waste management business shall undergo and pass facility inspection before use in order to be checked whether waste facility complies with the Technical Standards. Waste management licensees shall prepare the Radiation Hazards Prevention Program including the organization for operational safety, maintenance of the facility, measurement of radiation dose and contamination, education and training, records, etc. before commencement of business, and comply with it (for details, refer to Table H4 in Section H6). Furthermore, after starting use of the facility, licensees shall undergo periodic inspection to be checked whether its facility complies with the Technical Standards, and undergo periodic confirmation as to contamination measurement and recording, description and preservation of records and so on.

As for disposal, the special cases of waste management added to the RI Regulation Act in 2017 and the Ordinance (refer to Section E2-4) has enabled disposal of radioisotopes and radioactive contaminants by disposal licensees under the Reactor Regulation Act integrally and reasonably (refer to Section E2-3-2).

Figure H-1 Safety Regulation Flow of Cat-1 Waste Disposal Business and Cat-2 Waste Disposal Business



＊1：only for Specified Cat-1 Waste Disposal Facility (ground facility such as reception facility for radioactive waste)

＊2：Cat-1 Waste Disposal Business

Periodically not exceeding 20 years after the approval, or at the time of formulation of Closure Plan and Decommissioning Plan

Cat-2 Waste Disposal Business

Evaluation of radiation exposure management due to nuclear fuel materials based on the latest technical knowledge and measures necessary for maintenance of waste disposal facility based on the evaluation result / periodically not exceeding 10 years after the start date of activity, at the time to change measures to be taken for operational safety in accordance with decay of radioactivity or to formulate Decommissioning Plan

＊3：About 50 years after covering trench disposal site, 300-400 years after covering pit disposal site, 300-400 years for intermediate depth disposal after closure of tunnel (now under consideration)

H-1 General Safety Requirements

Article 11

Each Contracting Party shall take the appropriate steps to ensure that at all stages of radioactive waste management individuals, society and the environment are adequately protected against radiological and other hazards.

In so doing, each Contracting Party shall take the appropriate steps to:

(i) ensure that criticality and removal of residual heat generated during radioactive waste management are adequately addressed;

(ii) ensure that the generation of radioactive waste is kept to the minimum practicable;

(iii) take into account interdependencies among the different steps in radioactive waste management;

(iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;

(v) take into account the biological, chemical and other hazards that may be associated with radioactive waste management;

(vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;

(vii) aim to avoid imposing undue burdens on future generations.

H-1-1 Criticality and Residual Heat Removal

In the radioactive waste management business in Japan, as for the radioactive waste interim storage facility, the regulatory requirements stipulated by the NRA require licensees to take necessary measures for cooling when the radioactive waste is likely to be overheated by decay heat. As for interim storage facility which store the radioactive waste which contain more than certain amount of radioactivity, the NRA regulatory requirements require that the necessary measures shall be taken to prevent criticality if there is a possibility of nuclear fuel material reaching criticality.

H-1-2 Minimizing the Generation of Radioactive Waste

As stated in Section G2-1.

H-1-3 Interdependence of Different Stages in Radioactive Waste Management

For example, the NRA Ordinance on Commercial Power Reactors requires the radioactive waste in the liquid state to be enclosed in a containment, or solidified integrally with a containment and stored in the storage facility, as the regulatory requirements. On the other hand, the NRA Ordinances on Waste Disposal Business require the radioactive waste to be enclosed in a containment or solidified integrally with a containment, as the regulatory requirements. Therefore, the requirements for the generating stage of radioactive waste, include the requirements which disposal stage are taken into account.

Besides, for relatively high-level radioactive waste such as reactor internals, as natural barrier surrounding a disposal facility, the regulatory requirements for permission of intermediate depth disposal (waste disposal in the depth which is considered to be effective for isolation between the public and radioactive waste) stipulate that back-filling not to create path that radioactive material can easily transit between ground-level and disposal facility shall be expected to be feasible. Therefore, regulatory requirements applied for certain stage contain the requirements which consider safety of following stage.

As stated above, the regulatory system is taken the interdependence of different stages into account.

H-1-4 Effective Protection of Individuals, Society and the Environment

The Atomic Energy Basic Act aims to contribute to protecting people's lives, health, and property, and preserving the environment through ensuring safety based on the established international standards.

The Reactor Regulation Act aims to protect people’s lives, health and property and preserve the environment through necessary regulation in accordance with the spirit of the Atomic Energy Basic Act. Its objective include ensuring public safety by preventing hazards resulting from nuclear source material, nuclear fuel material and nuclear reactors. Thus the Reactor Regulation Act stipulates necessary requirements so that individuals, society and the environment can be protected appropriately by implementing them.

H-1-5 Consideration for Biological, Chemical and Other Risks Associated with Radioactive Waste Management

In the regulatory requirements for radioactive waste interim storage facility and radioactive waste disposal facility, considerations are given to the prevention of damage caused by external impact such as natural hazards, and it is required for cat-2 waste disposal facility that the safety function shall not be damaged from chemical substances.

H-1-6 Avoidance of Impacts on Future Generations

Regulatory requirements for the prevention of radiation hazard after the termination of license of waste disposal facility demand that the site is supposed to shift into the state which does not need institutional controls by the termination of license. Specifically, the regulation requires that the doses to the general public in future generations shall not exceed the criteria shown in the table below. These criteria are applied to the doses assessed for natural event scenario and human intrusion scenario which are considered scientifically reasonable.

		Trench disposal	Pit disposal	Intermediate depth disposal
Natural event scenario	With the most likely parameters scientifically reasonable	10 μSv/y	10 μSv/y	100 μSv/y (under discussion)
	With the most conservative parameters scientifically reasonable	300 μSv/y	300 μSv/y	300 μSv/y (under discussion)
Human intrusion scenario		300 μSv/y	1 mSv/y	20 mSv/y (under discussion)

It also requires that the doses to the general public in future generations be evaluated for scenarios including the most conservative case and not exceed the does constraint for each scenario.

H-1-7 Avoidance of Undue Burdens on Future Generations.

The Final Disposal Act contributes to the proper use of nuclear energy for power generation, by taking necessary measures to systematically and reliably implement the final disposal of specified radioactive waste which is generated after the reprocessing of spent fuel generated by the operation of the nuclear power reactor, of which the purpose is to improve the environment related to nuclear energy related to power generation, thereby contributing to the sound development of the national economy and the stability of people's lives, thus consideration is given to avoiding an unreasonable burden on future generations.

H-2 Existing Facilities and Past Practices

Article 12

Each Contracting Party shall in due course take the appropriate steps to review:

(i) the safety of any radioactive waste management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility;

(ii) the results of past practices in order to determine whether any intervention is needed for reasons of radiation protection bearing in mind that the reduction in detriment resulting from the reduction in dose should be sufficient to justify the harm and the costs, including the social costs, of the intervention.

This Convention came into effect in Japan on November 24, 2003. At that moment, the radioactive waste management facilities that had already obtained Permit of Business included waste interim storage facility and waste disposal facility (near surface disposal). On acceding to this Convention, Japan ensured that the regulation by the domestic law fulfilled the obligations provided in the Convention. Furthermore, it has been taking actions for improving safety, examples are reported as below.

H-2-1 Periodic Evaluation of Safety for Existing Facilities

H-2-1-1 Application of Back-Fitting for Specified Cat-1 Radioactive Waste Disposal Facilities and Specified Radioactive Waste Storage Facilities

Cat-1 waste disposal (geological disposal) is to dispose of the waste which has especially high level of radioactivity such as HLW and cladding of spent fuel. Since this kinds of waste contain very high concentration of the radioactive materials, these would be risks to seriously impact the health of humans in case of the failure in maintaining adequate function of the relevant facilities above the ground, resulting in radioactive materials release in a living environment.

Among the relevant facilities for cat-1 waste disposal, specified cat-1 radioactive waste disposal facilities, i.e. surface facility such as reception facility for radioactive waste are required to obtain the Approval of Design and Construction Plan and conduct Licensee's Periodic Inspections.

The NRA may order the necessary measures to be taken – back-fitting system – in regard to specified cat-1 waste disposal facility, when the location, structure and equipment of the facility does not meet the standards stipulated by the NRA Ordinance, or the performance of the facility is not enough comparing to the Technical Standards. Back-fitting system which requires existing nuclear facilities to comply with the new regulatory standards is reported in Section G2-1.

The same stipulations are also provided for radioactive waste interim storage facilities which handle nuclear material or material contaminated with nuclear fuel material over 3.7 TBq (specified waste storage facility), so back-fitting system is applied. Regardless of the date which the Convention took into force in Japan, these stipulations are applied to existing facilities to "back-fit" to the latest requirements.

On the other hand, the back-fitting system is not applied to the cat-2 waste disposal facilities and cat-1 waste disposal facilities which do not fall into specified cat-1 waste disposal facilities.

H-2-1-2 Periodic Evaluations of Waste Disposal Facilities and Waste Storage Facilities

As for cat-2 waste disposal (intermediate depth disposal and near surface disposal), the NRA Ordinance requires licensees to:

- Conduct periodic evaluations with the latest technical knowledge taken into account after the start of its business until the termination of license,
  - with the regular period not exceeding 10 years;
  - prior to the transition of stages (such as operation stage, preservation stage);
  - prior to the backfill of tunnel (applicable for intermediate depth disposal only).
- Take necessary measures for maintenance of waste disposal facilities based on the result of the periodic evaluations stated above.

As for cat-1 waste disposal (geological disposal), the NRA Ordinance requires the licensees to:

- Conduct periodic evaluations with the latest technical knowledge taken into account until the termination of license with the regular period not exceeding 20 years and prior to the backfill of the tunnel;
- Take necessary measures for maintenance of disposal facilities based on the result of periodic evaluations stated above.

As for waste interim storage facilities, the NRA Ordinance requires the licensees to:

- Conduct evaluations with the latest technical knowledge taken into account until the commencement of decommission with the regular period not exceeding 10 years;
- Take necessary measures for maintenance of facilities based on the result of periodic evaluation stated above.

H-2-2 Past Activities

In Japan, all radioactive waste including those generated from the activities conducted before the date which the Convention came into effect in Japan have been managed and disposed of under the Reactor Regulation Act and the RI Regulation Act. Also, there is no radioactive waste or facilities which need intervention for reasons of radiation protection as the results of past practices.

H-3 Permit of Business

Article 13

1. Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed radioactive waste management facility:

(i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime as well as that of a disposal facility after closure;

(ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment, taking into account possible evolution of the site conditions of disposal facilities after closure;

(iii) to make information on the safety of such a facility available to the general public;

(iv) consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.

2. In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 11.

H-3-1 Permit of Waste Management Business

Any person who intends to carry out business of radioactive waste disposal or storage shall, for each category of business (cat-1 radioactive waste disposal, cat-2 radioactive waste disposal, radioactive waste interim storage), obtain Permit of the NRA pursuant to the provisions of the Reactor Regulation Act. The applicant shall submit application documents which describe required items such as:

- the property and quantity of nuclear fuel material or material contaminated with nuclear fuel material that are to be disposed of;
- the location, structure and equipment of the radioactive waste disposal facility or the radioactive waste storage facility, and the methods of disposal or storage;
- the timing for amendment of the measures taken for the operational safety of cat-2 waste disposal in accordance with the decay of radioactivity;
- construction plan for radioactive waste disposal facility or radioactive waste storage;

- matters regarding quality management system necessary for operational safety for the radioactive waste disposal facility or the radioactive waste storage facility.

It is required to attach a document as an appendix which explains a state of weather, ground, hydrology, earthquake and social environment of the location.

When giving a Permit for the relevant business, the NRA shall not issue a Permit unless it conforms to the Licensing Standards as:

- the location, structure and equipment of the radioactive waste disposal facility or the radioactive waste storage facility are such that they will not hinder the prevention of disasters resulting from nuclear fuel material or material contaminated with nuclear fuel material in accordance with the Licensing Standards.

With regard to the design of waste disposal facility to reduce the risk associated with the events assumed not only during under the regulation but also after the period of regulation, the applicant is requested to explain measures to ensure isolation, including the selection of an appropriate location (in case of intermediate and geological disposal), and measures for confinement and shielding at the review stage of business application. The NRA confirms the validity, and if it complies with the requirements including dose limit for the public, the NRA permits the business.

For intermediate depth disposal, it is under consideration to provide the guideline for the Licensing Standards, that against the natural barrier where access tunnel is set up, back-filling not to create path that radioactive material can easily transit between ground-level and disposal facility shall be expected to be feasible, taking into account drilling and backfilling technology reasonably available at the design stage.

In addition, it is under consideration to require in the guideline for the Licensing Standards of intermediate depth disposal that the waste disposal site can be technically constructible in the site environment; that after comparison and consideration of construction and installation technologies, and the designs utilizing those technologies, licensees shall select structure and specification by the best available techniques; and that licensees shall explain the scientific and technical basis of the design and technology.

The Licensing Standards for cat-2 waste disposal facilities require that the location of the facility should not be in the areas where natural phenomena such as volcanic

activity or fault activity may have a significant public impact on facilities. Furthermore, it also requires that the exposed dose of the public will not exceed the dose constraint through the evaluation of scenarios in consideration of natural phenomena reasonably assumed including even after the termination of license.

The review meetings of the NRA with regard to the procedure related to the permission for waste management business, are open to the public, e.g. accept audience to a meeting, live streaming on YouTube, etc., therefore, the information on the review process and result are available to members of the public.

H-3-2 Consideration of the Effects on Other Contracting Parties

Japan is an islands nation surrounded by ocean and with no land links with neighboring countries. Moreover, the radioactive waste management facilities in Japan are located in a place with sufficient distance from the land of neighboring country. Therefore, the possibility of significant radiological impact on other Contracting Parties is extremely low. Thus, no framework for international discussion on siting of a radioactive waste management facility is established.

H-4 Design and Construction of Facilities

Article 14

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the design and construction of a radioactive waste management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;

(ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a radioactive waste management facility other than a disposal facility are taken into account;

(iii) at the design stage, technical provisions for the closure of a disposal facility are prepared;

(iv) the technologies incorporated in the design and construction of a radioactive waste management facility are supported by experience, testing or analysis.

H-4-1 Approval of Design and Construction Plan

H-4-1-1 Radioactive Waste Storage Facilities

Licensees who have obtained Permit of Business of specific radioactive waste storage facility (a facility to handle nuclear fuel material or material contaminated with nuclear fuel material over 3.7 TBq, refer to the beginning of Section H.) should obtain Approval of Design and Construction Plan based on the Reactor Regulation Act before starting construction. The NRA approves the licensee's Design and Construction Plan are consistent with the contents of obtained Permit of Business and the Technical Standards.

With regard to the limit of radiation effect which might threat an individual, society and the environment, licensees are required by the Technical Standards to design the facility so as not to cause radiation hazards to the public by the damage from estimated seismic force taking into account the estimated level of radiological impact to the public at the loss of safety function, and take appropriate measures in the design so that doses in the vicinity of the facility caused by direct radiation and sky shine radiation shall fall below enough the dose limit defined by the NRA.

Licensees are required to append the document that explains Design and Construction

Plan of the equipment in radioactive waste storage facility which is installed for process or storage of radioactive waste generated in the facility, and explains that it complies with the Technical Standards.

The technology used for the design and construction of a specified waste storage facility is evaluated in the process of the review of Design and Construction Plan. It is an obligation of licensees to prove that the facility is designed to achieve performance which satisfies the Technical Standards, which ensures that the appropriate technology is applied to the design and construction. In addition, licensees are required to prepare a design and development plan, and to check, verify and validate it in the quality management system, and thus ensures that the facility complies to the Technical Standards in terms of the required performance, purpose of usage, or the requirements concerning to the method of usage.

H-4-1-2 Waste Disposal Facilities

As reported at the beginning of Section H, surface facility such as reception facility for radioactive waste out of cat-1 waste disposal facility is defined as specified cat-1 waste disposal facility, and required to obtain Approval for Design and Construction Plan before commencing construction work in the same manner as specified waste storage facility mentioned in Section H4-1-1.

Out of cat-1 waste disposal facility and cat-2 waste disposal facility, underground facilities (waste disposal site and tunnel) which do not fall under specified cat-1 waste disposal facility mentioned above are not required to obtain Approval for Design and Construction Plan, but required to obtain confirmation of the NRA (Confirmation of Facility). At the construction stage after Permit of Business, licensees submit application to the NRA for confirmation as to whether waste disposal facility is being constructed in accordance with the design. The NRA Ordinance on Business requires, in applying for confirmation, submission of documents explaining that the facility under construction complies with the approved design in addition to the building method of the facility and the times when the structures of its major portions are ready for confirmation. The NRA confirms that the waste disposal facility and measures for operational safety comply with the Technical Standards (stipulated in the NRA Ordinance on Business). The NRA Ordinance on Business mainly stipulates the following criteria as the Technical Standards.

- to be equipped with structures and equipment as permitted;
- not to exceed the amounts of radioactivity for each type of radioactive material as permitted;
- not to bury explosive materials, materials which corrode other materials seriously or other dangerous materials;
- to backfill the waste disposal site which has completed burial work.

Technical consideration for closure of the disposal facilities is taken into account from the stage of Permit of Business as reported in Section H3-1.

H-4-2 Consideration on Decommissioning at the Design Stage

As mentioned in Section E2-2, due to the revision of the Reactor Regulation Act in 2017, licensees of radioactive waste management business must establish and publish a Decommissioning Policy immediately after licensing. In the Decommissioning Policy, method of dismantlement of the facility, decontamination, plan and timeline of decommissioning are described, and more practical description will be added in due course based on the operation status of the facility.

When decommissioning the facility, licensees shall obtain Approval of Decommissioning Plan in accordance with Reactor Regulation Act.

H-5 Assessment of Safety of Facilities

Article 15

Each Contracting Party shall take the appropriate steps to ensure that:

(i) before construction of a radioactive waste management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;

(ii) in addition, before construction of a disposal facility, a systematic safety assessment and an environmental assessment for the period following closure shall be carried out and the results evaluated against the criteria established by the regulatory body;

(iii) before the operation of a radioactive waste management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

H-5-1 Radioactive Waste Storage Facilities

The procedure before the construction of radioactive waste storage facilities are as reported in Sections H3 and H4, and through these process the NRA assesses the safety. Regarding specified waste storage facility, licensees conduct Licensee's Pre-service Inspection and the NRA confirms it before commencement of use as reported in Section H6-1. This confirms the fulfillment of the performance based on safety assessment carried out before construction.

Concretely, the person who intends to obtain the Permit of Business in the process of the licensing of the waste interim storage business is required to submit "Document concerning safety design of radioactive waste storage facilities," "Document concerning the exposure management to the nuclear fuel material etc. and the disposal of radioactive waste" and "Document concerning the kind, level and impact of accidents assumed to be caused when human operational error, failure of the machine or the device, flooding, earthquake, fire, and explosion occur in the radioactive waste storage facility, etc." and to explain the result of the safety assessment. In the course of the NRA's permission, review of these documents is also included. In the Licensing Standards, required performance which waste interim storage facility should have are provided, such as prevention of criticality, shielding, confinement, heat removal and

prevention of damage from fire, earthquake, tsunami, and external impact, and prevention of radiation hazards at the maximum design-base accident and the performance of each equipment. A systematic evaluation concerning safety is performed in accordance with this standards.

Licensees are required to obtain the NRA's Approval of Design and Construction Plan before starting construction of specified waste storage facility after obtaining Permit of Business. In this process of approval, licensees are required to submit document explaining that, based on the detailed design, the Design and Construction Plan complies with the Technical Standards. The review of these documents by the NRA is included in the process of approval. In the Technical Standards, performance needed for the facility and performance of each equipment are described, such as prevention of criticality, shielding, confinement, heat removal, prevention of damage from fire, earthquake, tsunami and external impact. And a systematic evaluation concerning safety is performed in accordance with this standards. In this phase, the evaluation is based on the concrete facility design, so is more detailed than that of the licensing.

H-5-2 Waste Disposal Facilities

The procedure for the evaluation concerning safety of the waste disposal facility is reported in Section H3 and H4. Regarding specified waste disposal facility (surface facility such as reception facility for radioactive waste), licensees conduct Licensee’s Pre-service Inspection and the NRA confirms it before commencement of use as reported in Section H6-2. This confirms the fulfillment of the performance based on safety assessment carried out before construction.

H-6 Operation of Facilities

Artic

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Each Contracting Party shall take the appropriate steps to ensure that:

(i) the licence to operate a radioactive waste management facility is based upon appropriate assessments as specified in Article 15 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;

(ii) operational limits and conditions derived from tests, operational experience and the assessments as specified in Article 15 are defined and revised as necessary;

(iii) operation, maintenance, monitoring, inspection and testing of a radioactive waste management facility are conducted in accordance with established procedures. For a disposal facility the results thus obtained shall be used to verify and to review the validity of assumptions made and to update the assessments as specified in Article 15 for the period after closure;

(iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a radioactive waste management facility;

(v) procedures for characterization and segregation of radioactive waste are applied;

(vi) incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body;

(vii) programmes to collect and analyse relevant operating experience are established and that the results are acted upon, where appropriate;

(viii) decommissioning plans for a radioactive waste management facility other than a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body.

(ix) plans for the closure of a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility and are reviewed by the regulatory body.

H-6-1 Radioactive Waste Storage Facilities

The licensees of specified waste storage facility which have obtained Approval of Design and Construction Plan of the NRA cannot start operation without conducting Licensee's Pre-service Inspection and receiving its confirmation of the NRA. Licensee's

Pre-service Inspection checks whether construction and functions are complied with Design and Construction Plan approved by the NRA and the Technical Standards. In the Technical Standards, the required function of confinement, shielding, heat removal, the prevention of damage from fire, earthquake, tsunami, and external impacts are described, and those are confirmed by Licensee's Pre-service Inspections.

Licensees should obtain Approval of Operational Safety Program from the NRA before starting construction. The implementation of Operational Safety Programs is required by the law, in the case of violation, the NRA may impose penalties such as revocation of permits or suspension of the operation of facilities. The main items to be indicated in Operational Safety Program are system for operational safety, quality management system, education on operational safety, access control, oversight and management of facilities, which are detailed in Table H-1.

Licensees shall conduct Licensee's Periodic Inspection to check whether facilities are maintained to comply with the regulatory requirements, and shall report the plan and result to the NRA. The NRA confirms through Nuclear Regulatory Inspections licensees' safety activities including its implementation and conformity to Operational Safety Program.

Licensees have to report to the NRA based on the Reactor Regulation Act when events designated by the NRA Ordinance occur such as: nuclear fuel material is stolen or missing; loss of confinement function, shielding, decay heat removal function or function for prevention of fire or explosion, or possibility of losing these functions due to failure of radioactive waste interim storage facility.

In the case of decommissioning of the radioactive waste interim storage facility, licensees shall obtain Approval of Decommissioning Plan in accordance with the Reactor Regulations Act. As for decommissioning measures, licensees are required to dismantle the waste storage facility, decontaminate, dispose of the nuclear fuel material, etc., transmit radiation control records to the organization designated by the NRA. The following instruction should be attached to the application of Decommissioning Plan:

- Management of radiation exposure during decommissioning;
- Possible kind, damage and effect of incident in case of error, fault of machine and equipment, flooding, earthquake, fire;
- Distribution of contamination by nuclear fuel material and its assessment method;
- Maintaining functions and performance of waste storage facility during

decommissioning; and period of maintaining above functions.

Acceptance criteria on Approval of Decommissioning Plan is that nuclear fuel materials are removed from waste storage facility, the liquid or solid nuclear fuel materials are removed, management, processing and disposal of nuclear fuel materials is appropriate, implementation of decommissioning is appropriate in terms of prevention of disaster caused by nuclear fuel materials.

H-6-2 Cat-1 Waste Disposal Facilities

Licensees of specified cat-1 waste disposal facility (a facility to receive waste disposal on the ground) which have obtained Approval of Design and Construction Plan by the NRA cannot start operation without conducting Licensee's Pre-service Inspection and receiving its confirmation of the NRA. Licensee's Pre-service Inspection checks whether construction and functions are complied with Design and Construction Plan approved by the NRA and the Technical Standards. In the Technical Standards, the required function of confinement, shielding, heat removal, the prevention of damage from fire, earthquake, tsunami, and external impacts are described, and those are confirmed by Licensee's Pre-service Inspection.

As reported in Section H4-1-2, underground facilities (waste disposal site and tunnel) which do not fall under specified waste disposal facility are not required to obtain Approval for Design and Construction Plan, however, it is required to obtain confirmation of the NRA during operation of the facilities as needed that the facilities and related measures for operational safety comply with the Technical Standards stipulated in the NRA Ordinance (Confirmation of Facility).

In addition, wastes to be disposed of are required to obtain confirmation of the NRA before disposal as to whether they comply with the Technical Standards stipulated in the NRA Ordinance on Cat-1 Waste Disposal Business (Confirmation of Waste). The NRA Ordinance on business stipulates mainly following criteria as Technical Standards.

- Radioactive waste to be encapsulated in containers or solidified in containers;
- Not to exceed maximum radioactivity concentration as permitted;
- Not to contain materials with the risk of damaging integrity of waste package;
- To have adequate strength to bear possible load under the condition of disposal;
- To have no marked failure; and
- To indicate serial number.

Licensees should obtain Approval of Operational Safety Program from the NRA before starting construction. The implementation of Operational Safety Program is required by the law, in the case of violation, the NRA can impose penalties such as revocation of permits or suspension of the operation of facilities within 1 year. The main items to be indicated in Operational Safety Program are system for operational safety, quality management system, education on operational safety, access control, oversight and management systems which are detailed in Table H-2.

Based on the Reactor Regulation Act, licensees shall conduct Licensee's Periodic Inspection to check whether facilities are maintained to comply with the regulatory requirements, and shall report the plan and result to the NRA. The NRA confirms through Nuclear Regulatory Inspections the licensee's safety activities including its implementation and conformity to Operational Safety Program. .

Licensees have to report to the NRA based on the Reactor Regulation Act in the same manner as waste storage facility reported in Section H6-1 when events designated by the NRA occur.

Licensees of cat-1 waste disposal business is required to develop Closure Plan and obtain the NRA's approval when the tunnel of the facility is closed. Licensees are required to describe the plan concerning back-filling the tunnel, blockage of the pithead, and other measures in Closure Plan, and to attach document concerning management of radiation exposure during closure; possible kind of incident, damage and effect in case of error, fault of machine or equipment, flooding, earthquake, or fire, etc.; maintaining functions and performance during closure and period of maintaining above functions. Approval criteria for Closure Plan is that closing measures are consistent with contents described in the approved license application documents, and that the closing measures are appropriate for prevention of disaster by the nuclear fuel materials.

Upon closure, licensees of cat-1 waste disposal business are required to obtain the confirmation of the NRA for each step of the tunnel closure which the NRA decides that the closing measures are conducted in accordance with Closure Plan.

Licensees of waste disposal business is required to obtain Approval of Decommissioning Plan of the NRA based on the Reactor Regulation Act when the disposal business is terminated. As for termination of license, licensees are required to dismantle auxiliary facility at the site of waste disposal facility, decontaminate, dispose

of nuclear fuel material, and transmit radiation control records to the organization designated by the NRA. Licensees are required to append documents to the application of Decommissioning Plan in the same manner as radioactive waste storage facilities reported in Section H6-1. Approval criteria of Decommissioning Plan is that backfilling of all the tunnels are completed, and that management, processing and disposal of nuclear fuel material are appropriate, implementation of decommissioning is appropriate in terms of prevention of disaster caused by nuclear fuel materials.

H-6-3 Cat-2 Waste Disposal Facilities

As reported in Section H4-1-2, cat-2 waste disposal facilities are not required to obtain Approval for Design and Construction plan, however, it is required to obtain confirmation of the NRA during operation of the facilities as needed that the facilities and related measures for operational safety comply with the Technical Standards stipulated in the NRA Ordinance (Confirmation of Facility).

In addition, wastes to be disposed of are required to obtain confirmation of the NRA before disposal as to whether they comply with the Technical Standards stipulated in the NRA Ordinance on Cat-2 Waste Disposal Business (Confirmation of Waste). The NRA Ordinance on business stipulates mainly following criteria as Technical Standards:

- Radioactive waste to be encapsulated in containers or solidified in containers;
- Not to exceed maximum radioactivity concentration as permitted;
- Not to contain materials with the risk of damaging integrity of waste package;
- To have adequate strength to bear possible load expected until termination of the disposal;
- To minimize the amount of scattering or leaking radioactive materials due to dropping impact from the postulated maximum height; and
- To indicate serial number.

Licensees who obtains the permission of the activity of the cat-2 waste disposal facilities are required to get the confirmation of the NRA that the facility and its Operational Safety Program complies to regulatory requirements of the NRA Ordinance. Licensees should obtain Approval of Operational Safety Program from the NRA before starting construction. The implementation of Operational Safety Program is required by the law, in case of violation, the NRA can impose penalties such as revocation of permits and suspension of the operation of facilities. The main items indicated in Operational Safety

Program are system for operational safety, quality management system, education on operational safety, access control, oversight, management of facilities and Reception Criteria for Waste, which are detailed in Table H-3. It shall be demonstrated in the Operational Safety Program that "Waste Acceptance Criteria" developed by licensees comply with the Technical Standards stipulated in the NRA Ordinance on Business.

The NRA confirms through Nuclear Regulatory Inspections the licensees' safety activities including its implementation and conformity to Operational Safety Program.

Licensees have to report to the NRA in accordance with the Reactor Regulation Act in the same manner as waste storage facility reported in Section H6-1when events designated by the NRA occur.

Regarding intermediate depth disposal among cat-2 disposal, licensees are required to develop Closure Plan and obtain the approval of the NRA when the tunnel of the facility is closed in the same manner as cat-1 disposal facility reported in Section H6-2. Upon closure, licensees are required to obtain the confirmation by the NRA with each step of the tunnel closure which the NRA decides that the closing measures are conducted in accordance with the Closure Plan.

For near surface disposal among cat-2 disposal, licensees shall obtain the confirmation by the NRA upon covering disposal site with soil and sand so as to make sure that the measures comply with the Technical Standards.

Licensees of the waste disposal business are required to obtain Approval of Decommissioning Plan of the NRA based on the Reactor Regulation Act when the disposal business is terminated. As for termination of license for waste disposal business, licensees are required to dismantle auxiliary facility, decontaminate, dispose of the nuclear fuel material, etc., transmit radiation control records to the organization designated by the NRA and take measures to show the location of waste disposal facility.
Licensees are required to attach documents to the application of Decommissioning Plan in the same manner as waste storage facility reported in Section H6-1.
Approval criteria of Decommissioning Plan is:

- Passing the timing for amendment of the measures taken for the operational safety of cat-2 waste disposal in accordance with decay of radioactivity;
- There is no need to take measures for preservation of the waste disposal site;
- Management, processing and disposal of nuclear fuel material are appropriate;

- Termination of license is appropriate in terms of prevention of disaster caused by nuclear fuel materials.

H-6-4 Engineering and Technical Support

When engineering and technical support are needed for ensuring safety of waste storage facility and waste disposal facility, licensees that install those facilities can take flexible measures at their discretion.

When licensees subcontract technical support for the operation management of facilities to specialized contractors, since it is important that the contractors are equipped with competence and prerequisites necessary for ensuring safety of the facilities, licensees are required to appropriately audit and manage the contractors in accordance with its own quality management system in its Operational Safety Program, and the NRA confirms this by Nuclear Regulatory Inspection, etc.

H-6-5 Characterization and Classification of Radioactive Waste

Radioactive wastes are disposed of appropriately after understanding their characteristics so that they may not have serious impact on human health.

As for the classification bearing the disposal methods of radioactive waste in mind, classification standards based on the kind and quantity of each radioactive substance included in radioactive waste are described in the Cabinet Order for Enforcement of the Reactor Regulation Act. Concretely speaking, the waste which radioactivity concentration exceeds the following limits shall be disposed of as cat-1 waste:

- Carbon-14 10 PBq/ton
- Chlorine-36 10 TBq/ton
- Technetium-99 100 TBq/ton
- Iodine-129 1 TBq/ton
- Alfa-emitting radionuclides 100 GBq/ton

Other waste including radioactive substances are in the scope of cat-2 waste disposal. Regarding the cat-2 waste disposal, the concentration (upper) limit for each radionuclide are stipulated in the NRA Ordinance as listed in the following table, and based on these limitation radioactive waste is classified to either of intermediate depth disposal, pit disposal or trench disposal:

	Intermediate Depth Disposal	Pit Disposal	Trench Disposal
Carbon-14	10 PBq / ton	100 GBq / ton	
Chlorine-36	10 TBq / ton		
Cobalt-60		1 PBq / ton	10 GBq/ ton
Nickel-63		10 TBq/ ton	
Strontium-90		10 TBq/ ton	10 MBq/ ton
Technetium-99	100 TBq / ton	1 GBq/ ton	
Iodine-129	1 TBq / ton		
Cesium-137		100 TBq/ ton	100 MBq/ ton
Alfa-emitting Radionuclides	100 GBq/ ton	10 GBq/ ton	

The person who intends to conduct waste disposal business should obtain the Permit of Business according to the above-mentioned classification. However, it is not guaranteed to be granted license when the radioactivity is equal to or less than the above concentration limit. The license application shall indicate the upper limit of radionuclide concentrations and total activities based on the site specific characterization and the design of facility, which will be reviewed for its validity

H-6-6 Use of Operating Experience

Licensees are requested to evaluate the status of its operational safety activity, evaluate the status of reflecting state of the art technology to the operational safety activity, and conduct a technical evaluation concerning the aging in every 10 years in accordance with the NRA Ordinance on Business of waste management. Licensees are required to evaluate the implementation status of reflecting the lessons learned from incidents or troubles at the facility as part of the status of its operational safety activity, and evaluate the lesson learned from operational experiences of domestic and overseas facilities as a part of status of reflecting state of the art technology.

Reflection of operating experience into regulation and its handling by licensees are as reported in Section G6.

Table H1 Required Items to be Described in Operational Safety Program of Waste Storage Facility

- The system for implementing relative laws and Operational Safety Programs
- Quality Management System for waste disposal facilities
- Duties and organization of personnel who manage and operate waste storage facilities
- The job description and extent of duty of Chief Engineer of Radioactive Waste and the positioning in organization and necessary authority for supervising of operational safety
- Education on operational safety for operator and management staff n waste storage facilities
- Operating equipment which need special management for operational safety
- Establishing Radiation Controlled Area, Surrounding Monitored Area and access control for those areas
- Exhaust gas and effluent monitoring equipment
- Dose, dose equivalent, concentration of radioactive substance, monitoring density of surface contaminated by radioactive material and removal of contamination
- Management of dose meter and methods of dose monitoring
- Waste receipts, transportation and other handlings for radioactive waste
- Measures for emergency
- Measures for operational safety of waste storage facility against postulated events for the design
- Appropriate report and record of operational safety for waste storage facilities
- Facility management for waste storage facility
- Periodic assessment for waste storage facilities
- Distributing and sharing technical information obtained from maintenance inspection operators to other waste storage facilities operators
- Disclosing information of non-conformance in case of occurrence on non-conformance
- Other necessary items of safety operation for waste storage facilities

Table H2 Required Items to be Described in Operational Safety Program of Cat-1 Waste Disposal Facility

- The system for implementing relative laws and Operational Safety Program
- Quality Management System for waste disposal facilities
- Duties and organization of personnel who manage and operate waste disposal facilities
- The job description and extent of duty of Chief Engineer for Radioactive Waste Handling and the positioning in organization and necessary authority for supervising of operational safety
- Education on Operational Safety for operator and management staff in waste disposal facilities
- Operating equipment which need special management for operational safety
- Establishing Radiation Controlled Area, Surrounding Monitored Area and Preservation Area, and access control for those area
- Exhaust gas and effluent monitoring equipment
- Dose, equivalent dose, concentration of radioactive substance, monitoring density of surface contaminated by radiation substance and removal of contamination.
- Management of dose meter and methods of dose monitoring
- Waste receipts, transportation and other handling for spent radioactive waste
- Measures for emergency
- Measures for operational safety of waste disposal facility against postulated events for the design
- Appropriate report and record of operational safety for waste disposal facilities
- Facility management for cat-1 facility
- Periodic assessment for waste disposal facilities
- Distributing and sharing technical information obtained from maintenance inspection operators to other waste disposal facilities operators
- Disclosing information of non-conformance in case of occurrence on non-conformance
- Other necessary items of safety operation for waste disposal facilities

Table H3 Required Items to be Described in Operational Safety Program of Cat-2 Waste Disposal Facility

- The system for implementing relative laws and Operational Safety Program
- Quality Management System for cat-1 waste disposal facility
- Duties and organization of personnel who manage and operate waste disposal facilities
- The job description and extent of duty of Chief Engineer for Radioactive Waste and the positioning in organization and necessary authority for supervising of operational safety
- Education on operational safety for operator and management staff in waste disposal facilities
- Operational safety of cat-2 waste disposal facility in line with decay of radiation
- Establishing Radiation Controlled Area, Surrounding Monitored Area and Preserved Area and access control for those area
- Exhaust gas and effluent monitoring equipment
- Dose, equivalent dose, concentration of radioactive substance, monitoring density of surface contaminated by radiation substance and removal of contamination.
- Items concerning the observation of the site and the circumference to obtain the necessary information for the periodical evaluation of the waste disposal facility.
- Management of dose meter and methods of dose monitoring
- Waste Acceptance Criteria
- Waste receipts, transportation and other handling for waste disposal facilities
- Measures for emergency
- Measures for operational safety of waste disposal facility against postulated events for the design
- Appropriate report and record of operational safety for waste disposal facilities
- Facility management for waste disposal facilities
- Periodic assessment for waste disposal facilities
- Distributing and sharing technical information obtained from maintenance inspection operators to other cat-1 and cat-2 waste disposal facilities operators
- Disclosing information of non-conformance in case of occurrence on non-conformance
- Other necessary items of safety operation for waste disposal facilities

Table H4 Required Items to be Described in Radiation Hazards Prevention Program of RI Waste Management Facility

- Organization and duties engaging safety management
- Maintenance, management and inspection of facility
- Reception, carrying out , storage, transportation and disposal
- Measurement of amount of radiation and situation of contamination and actions for the result of measurement
- Education and training necessary for prevention of radiation hazards
- Medical examination
- Medical measures in need for persons who have suffered or may have suffered from radiation hazard
- Registration and preservation concerning radiation hazards
- Measures against earthquake, fire and other disasters
- Measures on hazards
- Informing when the radiation hazard occurred or may have occurred
- Improving services concerning prevention of radiation hazards
- Reporting situations of radiation control
- Other items for prevention of radiation hazard

H-7 Institutional Measures after Closure

Article 17

Each Contracting Party shall take the appropriate steps to ensure that after closure of a disposal facility:

(i) records of the location, design and inventory of that facility required by the regulatory body are preserved;

(ii) active or passive institutional controls such as monitoring or access restrictions are carried out, if required; and

(iii) if, during any period of active institutional control, an unplanned release of radioactive materials into the environment is detected, intervention measures are implemented, if necessary.

Regarding cat-1 waste disposal (geological disposal) and intermediate depth disposal within cat-2 waste disposal, the NRA shall designate a certain range of three-dimensional area including waste disposal facility site, surrounding area and underground of those area (designated waste disposal area) before starting operation. Within the designated waste disposal area, no person shall excavate site without a permit from the NRA. This provisions are stipulated in the amendment of the Reactor Regulation Act promulgated in April 2017.

In addition, according to this Act, the NRA shall give public notice of records for the designated waste disposal area and keep them permanently.

This institutional control is maintained after closure of the site and also even after the termination of the license.

Also, the NRA Ordinance based on the Act requires that, from the start of business, licensees for cat-2 waste disposal business shall monitor the leakage of radioactive material and shall take necessary measures to prevent abnormal leakage of radioactive material such as repair of the disposal facility in case of detecting abnormal leakage. This requirement is maintained after closure of the site till the termination of the license.

Section I Transboundary Movement

Article 27

1. Each Contracting Party involved in transboundary movement shall take the appropriate steps to ensure that such movement is undertaken in a manner consistent with the provisions of this Convention and relevant binding international instruments.

In so doing:

(i) a Contracting Party which is a State of origin shall take the appropriate steps to ensure that transboundary movement is authorized and takes place only with the prior notification and consent of the State of destination;

(ii) transboundary movement through States of transit shall be subject to those international obligations which are relevant to the particular modes of transport utilized;

(iii) a Contracting Party which is a State of destination shall consent to a transboundary movement only if it has the administrative and technical capacity, as well as the regulatory structure, needed to manage the spent fuel or the radioactive waste in a manner consistent with this Convention;

(iv) a Contracting Party which is a State of origin shall authorize a transboundary movement only if it can satisfy itself in accordance with the consent of the State of destination that the requirements of subparagraph (iii) are met prior to transboundary movement;

(v) a Contracting Party which is a State of origin shall take the appropriate steps to permit re-entry into its territory, if a transboundary movement is not or cannot be completed in conformity with this Article, unless an alternative safe arrangement can be made.

2. A Contracting Party shall not licence the shipment of its spent fuel or radioactive waste to a destination south of latitude 60 degrees south for storage or disposal.

3. Nothing in this Convention prejudices or affects:

(i) the exercise, by ships and aircraft of all States, of maritime, river and air navigation rights and freedoms, as provided for in international law;

(ii) rights of a Contracting Party to which radioactive waste is exported for processing to return, or provide for the return of, the radioactive waste and other products after treatment to the State of origin;

(iii) the right of a Contracting Party to export its spent fuel for reprocessing;

(iv) rights of a Contracting Party to which spent fuel is exported for reprocessing to return, or provide for the return of, radioactive waste and other products resulting from reprocessing operations to the State of origin.

The electric power utilities in Japan have concluded reprocessing contracts with the United Kingdom and French companies and exported 7,100MTU of spent fuel between 1969 and 2001. They, in return, receive nuclear fuel material recovered from the spent fuel and vitrified waste generated in the reprocessing. 1,830 vitrified waste canisters were sent back to Japan between 1995 and March 2020and the remaining packages will be returned in the next approximately three years. As they are constructing a reprocessing plant at Rokkasho Village in Aomori Prefecture since 1993, there has not been any contract of spent fuel with the United Kingdom and French companies after 2002.

I-1 Transboundary Movement

I-1-1 Steps to Ensure Prior Notification and Consent of the State of Destination

For the export of the spent fuel or the radioactive waste, the Foreign Exchange and Foreign Trade Control Law provides that an applicant should apply for and obtain the Export Permit from the Minister of METI. This Export Permit should be applied once it is confirmed that the authorities of the State of destination recognized the administrative and technical capacity of the importer.

I-1-2 Steps to Ensure Transboundary Movement Subject to International Obligations

Japanese domestic laws, such as the Ship Safety Law, etc., have incorporated obligations under the IAEA Regulations for the Safe Transport of Radioactive Materials and relevant international conventions on each mode of transport, such as International Convention for the Safety of Life at Sea (SOLAS), etc.

I-1-3 Consent as a State of Destination

As stated in Section B, G, H and I, Japan has the administrative and technical capacity, as well as the regulatory structure, needed to manage the spent fuel or the radioactive waste. That means measures for article 27 (iii) of JC convention are to be taken.

I-1-4 Confirmation of the Capacity of a State of Destination

The Foreign Exchange and Foreign Trade Control Law provides that an exporter should apply for and obtain the Export Permit from the Minister of METI for the export of the spent fuel or the radioactive waste. The Minister of METI judges the grant of the Export Permit after confirming the general conditions of safety of the country of destination such as its regulatory structure, the membership in relevant international agreements, and the administrative and technical capacity of the importing body.

I-1-5 Steps to Permit Re-entry in case of Uncompleted Transboundary Movement

The Import Trade Control Order allows, as special exemption, re-entry of exported goods, in case of uncompleted transboundary movement so long as original characteristics and configuration of exported goods are preserved, and the other case of the exemption is a transport accident. Re-entry of exported spent fuel and radioactive waste is allowed by that provision.

I-2 Prohibition of Shipment to a Destination South of Latitude 60 Degrees South

The Foreign Exchange and Foreign Trade Control Law provides that an applicant should apply for and obtain the Export Permit from the Minister of Ministry of Economy, Trade and Industry for the export of the spent fuel or the radioactive waste. The Export Permit is judged by considering implementation of international convention for the export of spent fuel or radioactive waste to a destination south of latitude 60 degrees south for storage or disposal.

Section J Disused Sealed Sources

Article 28

1. Each Contracting Party shall, in the framework of its national law, take the appropriate steps to ensure that the possession, remanufacturing or disposal of disused sealed sources takes place in a safe manner.

2. A Contracting Party shall allow for reentry into its territory of disused sealed sources if, in the framework of its national law, it has accepted that they be returned to a manufacturer qualified to receive and possess the disused sealed sources.

J-1 Regulatory Framework for Sealed Sources

As stated in Section E2-4, the use and disposal of radioisotopes and the use of radiation generation equipment is regulated by the RI Regulation Act as mentioned in Section E2-1. Sealed sources are also regulated by this Act. Licensees and registrants are responsible for safety and ensuring that radioisotopes are properly controlled.

The NRA, as the competent regulatory authority, conducts safety reviews and on-site inspections in accordance with this Act.

J-2 Management of Radioactive Sources

Legal restrictions are imposed to ensure that the possession of radioactive sources is not allowed other than authorized licensees or registrants. There is a well-established mechanism for the handover of disused radioactive sources to licensees or registrants with the requisite license or registrants. Licensees and registrants are obliged to submit notification of a decommissioning plan to the NRA when they terminate and abolish the use of all the sources, and to report the result of the handover.

Licensees of use of radioactive sources shall conduct an annual inventory check of both sealed and unsealed radioactive sources in their possession and report the results to the NRA, to prevent the loss of radioactive sources. The NRA carries out on-site inspections, if needed, and checks that the inventory of radioactive sources corresponds to the content permitted to the licensees. The RI Regulation Act prescribes penalties and underlines that responsibility for managing the safety of radioactive sources lies with licensees.

In accordance with the IAEA "Code of Conduct on the Safety and Security of Radioactive Sources," licensees must report to the NRA details of the specification, receipt and transfer of any sealed radioisotopes above a specified amount which have potential significant risks to human health. In addition, they must provide the NRA with a report on any such sources in their possession at the end of each fiscal year.

Most sources in Japan are imported from overseas; sealed sources with a long half-life and high activity are returned to the original foreign manufacturers. Regarding the distribution of radioisotopes and sealed sources in Japan, a single supplier (the Japan Radioisotope Association) organizes the entire process, from distribution and delivery of almost all radioactive sources to the collection of disused radioactive sources.

As a result, there have been no serious radiation hazard incidents involving radioactive sources or orphan sources to date.

J-2-1 Criteria for the Storage of Disused Sealed Sources

The RI Regulation Act prescribes the following regulatory requirements relating to the storage of sealed sources.

- Sealed sources shall be put in containers and stored in storage or bins;
- Sealed sources shall not be stored in quantities exceeding storage capacity;
- Appropriate measures shall be taken to prevent radiation workers being exposed to levels exceeding the effective dose limit; such as
  - installing shields;
  - distancing personnel from sealed sources; and
  - shortening the time during which personnel may be exposed to radiation;
- Appropriate measures, such as immobilizing storage bins, shall be taken to prevent containers storing sealed sources from being transferred from one place to another without permission;
- A notice showing the precautions necessary to prevent radiation hazards shall be posted at an appropriate location within storage facilities; and
- Appropriate measures shall be taken to prevent unauthorized persons entering a controlled area.

J-2-2 Response to Missing Radioactive Sources

In accordance with the regulation, in case of loss of any radioactive sources, licensees shall immediately report the matter to the police and the NRA. The NRA will order

licensees to conduct an immediate search for the lost source, while the police will carry out a criminal investigation if the loss is associated with a criminal act.

The NRA will also conduct an International Nuclear and Radiological Event Scale (INES) rating of the loss, in accordance with the additional guidance for rating events related to radiation sources, and will report the resultant rating to the IAEA.

J-2-3 Response to Orphan Sources

If an orphan source is found, the NRA requests and instructs the manager of the site or facility to place the source in a safe condition. The NRA or cooperation organization might dispatch personnel to the site or facility. Basically the orphan source will be managed by the owner of the site or facility in compliance with the law, but in most cases, through the NRA's mediation and request by the owner, the Japan Radioisotope Association collects and properly manages orphan sources.

J-2-4 Response to Accidents Involving Radioactive Sources

In the event of an accident involving a radioactive source, the RI Regulation Act mandates licensees or registrants to take emergency measures as necessary, such as fire extinguishing or prevention of fire spreading in case of fire, evacuation warning, rescue and evacuation, prevention of contamination spreading and decontamination, transfer of radioisotopes to safe place and lockdown measure except persons concerned.

The NRA, the police and fire service will carry out immediate initial measures depending on the notification. Meanwhile, the NRA will dispatch personnel to instruct licensees on the proper measures to be implemented.

J-2-5 Long-Term Management of Sealed Sources Unreturnable to the Manufacturers

As previously described, most sealed sources used in Japan are manufactured abroad, imported and then returned to foreign manufacturers after use. Therefore, Japan has few sealed sources that are unreturnable to the manufacturers. The storage and management of some unreturnable sealed sources are carried out pursuant to the RI Regulation Act. Accordingly, there is no specific issue at present concerning unreturnable sealed sources.

J-3 Reentry of Returning Sealed Sources

The reentry of approved sealed sources which have been returned from abroad by a manufacturer licensed under the RI Regulation Act is allowed within the scope of the storage capacity stipulated in the license. In this situation, licensees, when importing such sources, shall comply with regulation or procedures concerning import-export management consistent with the IAEA's Guidance on the Import and Export of Radioactive Sources. A manufacturer intending to possess or renew returned sealed sources is required to store them in accordance with the storage criteria prescribed in the RI Regulation Act.

Section K Planned Activities to Improve Safety

K-1 General Efforts to Improve Safety during Reporting Period

K-1-1 Conformity Review for Spent Fuel/Radioactive Waste Management Facilities

In accordance with the Reactor Regulation Act amended in 2012, licensees are obliged to conform to the latest regulatory requirements, i.e. Licensing Standards and Technical Standards, for their facilities which have already obtained Permit of Business. Nuclear fuel cycle facilities shall obtain permit and approval through conformity review to the new regulatory requirements enforced in December 2013, which embodies the back-fitting system pursuant to the Reactor Regulation Act with exemption for operating waste disposal facility. Conformity reviews are carried out both for existing facilities to the new regulatory standards as back-fitting and for existing facilities with changes or new constructions.

The NRA is reviewing conformity for the following facilities which correspond to the relevant definition of this Convention, as of March 2020.
Spent fuel management facilities:

- Reprocessing facility of JNFL; and
- Spent fuel interim storage facility of Recyclable-Fuel Storage Co. (RFS).

Radioactive waste management facilities:

- Waste storage facility and cat-2 disposal facility (expansion of the facility) of JNFL; and
- Cat-2 disposal facility (new build) of JAPC;
- Waste storage facility of JAEA

For example, regarding reprocessing facilities, in accordance with the Reactor Regulation Act, the NRA may order suspension of operation, modification, repair or transfer of the facility, specification of operating method or other actions required to ensure operational safety, if the location, structure, or equipment of the facility does not conform to the Licensing Standards. If licensees do not comply with the order, the

NRA may revoke the Permit of Business, or may order suspension of the business for a period not exceeding 1 year. The Act stipulates the similar provisions for spent fuel interim storage and radioactive waste interim storage and disposal, and thus conformity to the new regulatory requirements has become legal obligations.

The JNFL, for reprocessing facility and radioactive waste interim storage facility, applied for the conformity review for amendment of Permit of Business in January 2014 and the NRA issued the said Permit of Business in July 2020 and August 2020, respectively. RFS, for spent fuel interim storage facility, submitted the application for the conformity review to the NRA in January 2014; the JNFL applied for the cat-2 waste disposal facility in August 2018; and the JAPC applied for the cat-2 waste disposal facility in July 2015. In regard to the waste storage facility of JAEA, JAEA submitted the application in February 2014 and revised the application documents 4 times. The NRA issued the said Permit of Business in August 2018.

To ensure transparency and openness of decision-making process for regulation, the NRA has a policy that meetings such as conformity review meetings are generally open to the public. Therefore, the public are able to listen to meetings as audience, through webcasting on YouTube and recorded video afterwards. In addition, materials distributed at conformity review meetings are made available beforehand at the NRA website and the minutes are disclosed afterwards. When a meeting deals with confidential information such as nuclear security matters, it is not open to the public and thus the materials and minutes are also not open.

K-1-2 Communication with Stakeholders

The NRA holds "Exchange of opinions with CEOs of major nuclear utilities" since 2014, open to the public, to promote efforts fostering safety culture and enhancing safety, and to hear licensees' basic policy for safety improvement activities and perspectives on current regulatory system. Also, the NRA holds "Exchange of opinions with chief nuclear officers (CNOs) of major nuclear utilities" since 2016, open to the public, to contribute to smooth introduction of new regulation, regulatory requirements to enhance predictability, and improvement and clarification of safety reviews.

The NRA has discussed with licensees or potential licensees on the regulatory framework for intermediate depth disposal described in K-2-2, and the clearance regulation described in E-2-3-3 and F-4-5. In the discussion of intermediate depth disposal, the potential licensees introduced the temporally designed waste package,

assumed design of the disposal facility. The NRA and potential licensees continue to discuss the technical issues for establishing the regulatory framework for intermediate depth disposal. In the discussion of the clearance, the licensees described the details of approaches to treat the uncertainties in the measurement and evaluation for the clearance.

The NRA has disclosed the "Explanation for the People on New Regulatory Requirements for Commercial Power Reactors" prepared in a plain but precise manner on the website for the people who are interested in the said requirements. The NRA participates in public meetings for local residents to make efforts to obtain understanding to the nuclear regulatory activities. The NRA started "Visits of nuclear facilities by NRA Commissioners and exchange of opinions with local parties" based on the decision in the NRA Commission Meeting in November 2017.

Furthermore, in addition to collecting public comments according to the Administrative Procedure Act, the NRA collects voluntarily public comments and responds to them one by one.

K-1-3 Efforts Toward Risk Reduction through Transfer to DPC of Spent Fuel

The NRA has recommended the transfer of spent fuel to dry storage at NPP sites based on the idea that, for safety risk reduction, dry storage using metal cask which continuously cools spent fuel by natural convection of air is more desirable than storage in spent fuel pool which needs circulation of cooling water and heat exchange when spent fuel has been cooled for a certain period and its decay heat has been decreased. For this purpose, the NRA has encouraged the transfer to dry storage in the dialogue with licensees mentioned in K1-2 and also has worked on improving regulatory system. Efforts to improve the regulatory system and the status of application related to the transfer are reported below.

Improvement of the regulatory system has progressed as follows. Metal cask is used for transportation, and thus has a robust design that can withstand a drop during transportation. In addition, more flexible operation is possible by using the transportation cask for storage due to operational merits such as no necessity of repacking. On the other hand, in the previous regulatory system, dry storage cask at NPP sites required applicants to set and evaluate design conditions against natural hazards for each site such as design basis ground motion by the same procedures as for spent fuel pool in order to conform to the new regulatory standards, which was an

obstacle to shift to dry storage. Therefore, the NRA had been considering a reasonable regulatory system since 2017. The NRA revised/established relevant ordinances and guides followed by promulgation and enforcement in April 2019. Specifically, the NRA has stipulated in the notification the design conditions for Dual Purpose Cask (DPC) such as the uniform seismic forces, tsunamis, and tornados that are applicable to any candidate site, which allows applicants to design a DPC using the uniform values specified in the notification. The NRA also added DPC into the system of Type Certification for Design and Type Designation when it is designed using the uniform values such as seismic forces. It allows the NRA to omit the relevant part from reviews on Installation Permit and Approval of Design and Construction Plan for each site, provided applicants have once obtained approval of Type Certification for Design and Type Designation for a certain DPC. However, site specific conditions such as site boundary radiation dose or separation distance from a fire source remain to be reviewed for each site.

In addition, application is needed both for transportation and on-site storage before using DPC on site. The items that are once reviewed for transportation will be omitted from the review for on-site storage. Along with the revision related to NPP, in order to rationalize review processes of DPC design approval and packaging approval for transportation, the NRA also revised the Notification on Technical Details for Off-Site Transportation of Nuclear Fuel Materials, etc. and established the guide for application procedures, and enforced them on April 1, 2020.

The status of application regarding transfer to dry storage is reported below. After revision of the regulatory system for NPP, the NRA received DPC applications for Type Certification for Design respectively from Mitsubishi Heavy Industries, Ltd. in January 2020, and from Hitachi-GE Nuclear Energy, Ltd. in March 2020. The NRA's review process is ongoing.

While dry storage of spent fuel had been applied at JAPC Tokai No.2 NPS and TEPCO Fukushima Daiichi NPS before the establishment of the NRA, after the confirmation of conformity to the new regulatory standards, the NRA received applications for amendment to Reactor Installation Permit for the purpose of the installation of spent fuel dry storage from Shikoku Electric Power Company (Ikata PS) and Kyushu Electric Power Company (Genkai NPS). Permit was given to Shikoku Electric Power Company (Ikata PS) in September 2020, and its application for Approval of Design and Construction Plan will be submitted in the future. The NRA also received application

for amendment to Reactor Installation Permit on compliance to the new regulatory standards including installation of spent fuel dry storage from Chubu Electric Power Company (Hamaoka NPS), and its conformity review is ongoing.

As for spent fuel interim storage facility which stores spent fuel transported from NPPs, the NRA received application for conformity review to the new regulatory standards from RFS, and its review is ongoing. As for Type Certification for Design of dry casks to be used in a spent fuel interim storage facility, 6 applications were submitted in total from Mitsubishi Heavy Industries, Ltd., Hitachi-GE Nuclear Energy, Ltd., Toshiba Energy Systems & Solutions Corporation, Hitachi Zosen Corporation and Transnuclear, Ltd. 3 Type Certifications for Design have been issued so far.

K-1-4 Implementation of New Inspection System at Spent Fuel Management Facilities and Radioactive Waste Management Facilities

The inspection for nuclear fuel-related facilities were previously carried out by the NRA for item by item and indicated its result one by one.

As reported in E-2-2, the new inspection system in full operation since April 2020 covers licensees' whole activities relevant to safety with a focus on safety issues and concerns, which makes inspection more flexible. Moreover it specifies obligation on licensees to carry out inspections by themselves and thus clearly defines that the prime responsibility for the safety rests with licensees. Oversight is more reinforced by the system that NRA inspectors can freely access to licensees' sites at any time.

The new inspection system introduces a graded approach for all facilities and activities, i.e. inspection items, the number of samples and the duration required for inspection are adjusted according to the type of facility business, the significance of impact to the people and environment by the scale of facility, different facility stage such as construction or decommissioning.

K-1-5 Study on Clearance and Disposal of Uranium Waste

The NRA started a study on regulation regarding clearance and disposal of uranium waste in 2018. Hereinafter "uranium waste" in Japan is defined as radioactive waste solely contaminated with uranium which is generated from facilities fabricating nuclear fuel or using nuclear fuel materials.

The NRA has studied on clearance of uranium waste based on the idea of the

radionuclides of natural origin and of artificial origin described in the IAEA General Safety Requirements GSR Part 3 “Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards” (2014), and the idea of the EU Council Directive “2013/59/EURATOM” (2013). The NRA has also studied on regulation of disposal of uranium waste based on the IAEA Specific Safety Requirements No. SSR-5 “Disposal of Radioactive Waste” (2011) and IAEA Specific Safety Guide No. SSG-29 “Near Surface Disposal Facilities for Radioactive Waste” (2014). The NRA continues discussions on the Japanese regulatory framework for uranium waste taking into consideration the international standards, international guidance and preceding cases in various countries.

In April 2019, the NRA held a meeting with the international advisors and had discussion on the topic of clearance and disposal of waste contaminated with the radionuclides of natural origin. The international advisors mentioned that it is important to join discussions for formulation of a document of IAEA standards; it needs the process based on the safety significance (graded approach); and the influence of generation of progeny nuclides from uranium which has not yet reached radioactive equilibrium (build-up) should be considered.

The NRA continues discussions on the regulatory framework of clearance and disposal of uranium waste actively, and has been discussing it in several Commission Meetings, open to the public, since 2020.

K-2 Response to the Challenges Identified in the 6th Review Meeting

K-2-1 Achieving the Planned Risk Reduction Program for TEPCO Fukushima Daiichi NPS

The NRA formulated the "Measures for Mid-term Risk Reduction at TEPCO Fukushima Daiichi NPS" (Measures for Mid-Term Risk Reduction) in February 2015 in order to set forth immediate targets for about the next three years from a safety point of view. According to the progress of the decommissioning work, it has been reviewed periodically and revised 7 times up to 2019. The revision is discussed by the Committee on Supervision and Evaluation of the Specified Nuclear Facilities, which monitors and evaluates the efforts toward solving issues and oversees the progress. Among the Measures for Mid-Term Risk Reduction, a total of 35 targets have been achieved,

including treatment of contaminated water accumulated in flange-type tanks with high risk of leakage, treatment of remaining stagnant water in unit 1 radioactive waste building and unit 4 buildings, decision of removal policy of spent fuel assemblies stored in unit 1 and unit 2 spent fuel pools, and closing of the opening of unit 3 turbine building to prevent out-flow of stagnant water from the building due to tsunami.

The Measures for Mid-Term Risk Reduction, which had been originally intended to set forth specific targets to be addressed urgently, was revised considerably in March 2020, taking into account that the risks which could have a significant impact on the off-site have been decreasing and that future goals for risk reduction are expected to take a relatively long period or time because of the work under higher dose rate than ever before and technical difficulties. In doing so, the NRA reviewed the structure of the risk reduction areas referring to "Mid-and Long-Term Roadmap towards the Decommissioning of TEPCO Fukushima Daiichi Nuclear Power Station" established by the Government, developed a picture to aim for in about 10 years, and newly included the retrieval of fuel debris.; the removal of spent fuel from spent fuel pools of all units and its dry storage as much as possible; the removal of high-dose zeolite sandbags which remains in process main building etc. and their stable storage; the resolution of outdoor storage of rubbles etc. and secondary waste generated from water treatment; the installation of facility to analyze the characteristics of fuel debris and other radioactive solid waste; and the suppression of under-ground water inflow into reactor buildings, etc. by sealing outer wall of buildings. In addition, it shows major targets for risk reduction in about 3 years which are required to accomplish the aimed picture, and therefore it is used as a guideline for measures to be taken.

K-2-2 Progress on Regulatory Framework for Intermediate Depth Disposal

Radioactive waste, e.g. core internals, which radioactivity exceeds the concentration limit for pit disposal shall be disposed of in the depth enough to isolate it from the biosphere in order to protect public and environment from radiological consequence. The NRA started a study on regulatory framework for intermediate depth disposal in 2015. The NRA introduced regulation on prohibition of unauthorized excavation at disposal site and regulation of closure criteria of access tunnels upon the enforcement of the amendment of the Reactor Regulation Act in April 2017.

Then the NRA continued discussions on regulatory requirements for technical issues of intermediate depth disposal as well as discussions on the optimization concept to

increase effectiveness of radiological protection in the long-term. The NRA summarized an outline of regulatory requirements for intermediate depth disposal as follows in August 2018;

(1) Siting of disposal facility: clarification on siting requirements for volcanic activity, faults, enough depth with due consideration of uplift and erosion, etc.;
(2) Structures of disposal facility: concentration limit, containment performance, safety assessment scenarios including radionuclides concentration limit scenario, and their dose standards for after closure;
(3) Operational safety of disposal facility: requirements against damages from earthquake or tsunami, requirement on shielding, and requirement on monitoring,
(4) Criteria on approval of closure plan and decommissioning plan, and criteria on approval of the termination of decommissioning; and
(5) Regulatory confirmation of waste: Technical Standards for waste package.

In July 2020, the NRA solicited public comments on the outline of regulatory requirements for intermediate depth disposal. Meanwhile, the NRA continues discussion on requirements on faults especially evaluation of the extent of mechanical impact of fault motion.

K-2-3 Improvement of Regulatory Framework for DPC

As stated in Section K1-3.

K-2-4 Develop Milestones and Plans of deep Disposal Facilities (Set More Detailed Milestones on the Process Including Strategies for Public Communication, Regulatory Process, and Related Requirements)

As for the geological disposal of high-level radioactive waste, a final disposal facility will be constructed through the selection process of three stages, based on "The Final Disposal Act" enacted in March, 2000.

On the other hand, as we could not even start the literature research by now, we will change the approach.

Specifically, problem on final disposal of high-level radioactive waste is tackled as the responsibility of current generation which created radioactive waste not to pass the burden on to future generations and reversibility and retrievability of the radioactive waste are required to solve the high-level radioactive waste issue so that future

generations may select the best disposal method at any time in the future, and the national government indicates the region suitable for site of the final disposal facility from a scientific viewpoint to ensure a deeper public concern and understanding of the geological disposal and understanding of site location from the public.(Refer to Section B)

The government of Japan published the "Nationwide Map of Scientific features for Geological Disposal" in July, 2017. With this as momentum, the Japanese government will continue the conversation nationwide for the public acceptance of the final disposal facilities.

The government of Japan published the "Nationwide Map of Scientific features for Geological Disposal" in July, 2017. With this as momentum, the government of Japan started the conversation nationwide for the public acceptance of the final disposal facility and further started the conversation at the area recognized to be preferable from November, 2018.

NUMO released "NUMO safety case report – Development of Pre-siting SDM-based Safety Case – (Draft for external review)" ("Safety Case Report") in Japanese in November 2018. This report systematically organizes scientific knowledge and technology accumulated on how to survey the suitability of the site, conduct the design, construction, operation and closure of the safe facility and ensure the post-closure long-term safety. More detailed information has been continuously provided for the public to understand literature survey at plural municipalities.

Regulatory requirements for geological disposal facilities will be put in place by the NRA. In the "Basic Policy on the Final Disposal of Designated Radioactive Wastes", in order for the process of the selection to progress in a reasonable manner, it is appropriate for the NRA, sequentially responding to the progress, to provide essential points to be considered to ensure nuclear safety in the selection of preliminary and detailed investigation areas, under the fundamental premise that any prejudgment won't be made for any safety regulatory review in the future. In site selection, the above mentioned essential points, i.e. viewpoints from safety regulation, are necessary to be considered.

K-3 Overarching Issues Identified in the Final Report of the 6th Review Meeting

K-3-1 Implementation of National Strategies for Spent Fuel and Radioactive Waste Management

On July, 2018, the Cabinet approved the new Strategic Energy Plan as the basis for the orientation of Japan's new energy policy towards 2030 and further towards 2050, considering the changes in energy environments inside and outside Japan. This plan includes the policy related to spent fuel and a radioactive waste management. Specifically, as described in the section B, while studying a wide range of locations as possible sites, 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 to expand the storage capacity of spent fuels. Based on that, Japanese utilities made their plan which aim to expand approximately 6000tU capacity by around 2030. In order to achieve this objective, they are working to apply the regulatory review of NRA.
Issues related to the nuclear fuel cycle cannot be solved in a short period but require a mid- to long-term approach. Moreover, it is important to adopt a flexible approach, since it is necessary to respond to various uncertainties, including the technological trend, energy supply-demand balance and the international situation. Since these activities are closely related in particular to the outlook of the future operating situation of nuclear power plants, the amount of nuclear fuel required and the quantity of spent fuels generated, they will be conducted while taking into consideration all of these factors, as well as other factors including the reduction of the volume and harmfulness of high-level radioactive waste, effective utilization of resources and its costs, and the intentions of relevant municipalities,

Radioactive waste is disposed of based on appropriate classification of the radioactivity level, properties, type of radioactive material and other factors as described in Sections B3-1 and B3-2.
“Basic Policy on the Final Disposal of Designated Radioactive Wastes” indicates while we basically decided to ensure the policy regarding final disposal and the reversibility of the final disposal project to respond flexibly and appropriately to the possibility of future changes in technology and other factors, future generations may select an

optimal disposal method at any time in the future when it is put into practical use.

K-3-2 Safety Implications of Long Term Management of Spent Fuel

In "Basic Policy on the Final Disposal of Designated Radioactive Wastes", the government of Japan and related research institutes, to ensure a wide range of the disposal option, are to promote surveys and research on direct disposal of spent fuel and other disposal methods. In addition, they will proceed with surveys and research on the impact of maintaining the retrievability without closing the geological disposal facility (GDF), and specify the management of designated radioactive waste until the closure of the GDF.

While making efforts on geological disposal, it is stated that the storage capacity of spent fuel will be expanded, to safely manage spent fuel produced by nuclear power generation. Specifically, while studying a wide range of locations as possible sites, 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 interim storage facilities or dry storage facilities. As for Japanese utilities, they collect information about other nations' cases and check the condition of spent fuel being stored in nuclear facilities to accumulate knowledge of long-term storing in metallic casks.

NUMO will construct the GDF with sufficient scale and annual disposal capacity by an appropriate time to facilitate final disposal of designated radioactive wastes (high level radioactive wastes generated from spent fuel reprocessing) whose storage period will have ended, and will safely and reliably dispose of the waste at the GDF.

K-3-3 Long Term Management and Disposal of Disused Sealed Radioactive Sources

As reported in J2-5.

K-4 Overview on the IRRS Follow-Up Mission

The IAEA conducts the IRRS which provides holistic review on the wide range of areas including legal framework and organizational structure with regard to nuclear

regulation, as one of the review services IAEA provides upon request from Member States. The NRA hosted an IRRS mission in January 2016, and since then it has been continually addressing the recommendations and suggestions made by the mission. The NRA requested the IAEA to conduct further review on the status of those implementations, and thus it hosted an IRRS follow-up mission in January 2020.

As a result of the follow-up mission, the IRRS team recognized that significant progresses have been made such as completing the implementation of 10 recommendations and 12 suggestions out of 13 recommendations and 13 suggestions made by the 2016 IRRS mission through introducing a new inspection system, etc. Remaining 2 recommendations and 1 suggestion are related to the implementation of integrated management system, and the other 1 recommendation is related to coordination with other regulatory agencies. For these issues, further effort will be made by the NRA. In the review on the regulation of land transport of radioactive materials, which was added into the scope for the follow-up mission, the IRRS team recognized that Japan implements regulations generally in accordance with IAEA safety standards, and 4 recommendations and 1 suggestion were specifically made for improvement (see the IRRS follow-up report to Japan, page 69).

The IRRS follow-up mission report is made public in the following Web site of the NRA.
https://www.nsr.go.jp/english/cooperation/organizations/IAEA_20200318_02.html

Section L ANNEXES

L1 Inventory of Spent Fuel

L2 Inventory of Radioactive Waste

L3 List of Spent Fuel Management Facilities and Radioactive Waste Management Facilities

L4 Main Nuclear Reactors under Decommissioning

L-1 Inventory of Spent Fuel *

Facility		Inventory (tons)	Type of spent fuel assemblies
JAPCO	Tokai No. 2 Power Station	370	Uranium oxide fuel
	Tsuruga Power Station	630	
Hokkaido Electric Power Co., Inc.	Tomari Power Station	400	
Tohoku Electric Power Co., Inc.	Higashidori NPS	100	
	Onagawa NPS	480	
TEPCO	Fukushima Daiichi NPS	2,130	
	Fukushima Daini NPS	1,650	
	Kashiwazaki-Kariwa NPS	2,370	
Chubu Electric Power Co., Inc.	Hamaoka NPS	1,130	
Hokuriku Electric Power Co., Inc.	Shika NPS	150	
The Kansai Electric Power Co., Inc.	Mihama Power Station	470	Uranium oxide fuel, MOX fuel
	Ohi Power Station	1,710	Uranium oxide fuel
	Takahama Power Station	1,290	
The Chugoku Electric Power Co., Inc.	Shimane NPS	460	
Shikoku Electric Power Co., Inc.	Ikata Power Station	720	Uranium oxide fuel MOX fuel
Kyushu Electric Power Co., Inc.	Genkai NPS	1,010	Uranium oxide fuel
	Sendai NPS	1,000	
JAEA	Reactor Decommissioning R&D Center	70	Uranium oxide fuel, MOX fuel
	FBR Research and Development Center	9	MOX fuel Uranium oxide fuel
	Reprocessing Facility of the Nuclear Fuel Cycle Engineering Laboratories, Tokai Research and Development Center	41	Uranium oxide fuel, MOX fuel
	Nuclear Science Research Institute	18	Uranium oxide fuel
	Oarai Research and Development Institute–	16	Uranium oxide fuel, MOX fuel
JNFL	Rokkasho Reprocessing Facility	2,968	Uranium oxide fuel
Total		19,183	

* Data is provided by licensees.

L-2 Inventory of Radioactive Waste

L2-1 High-Level Radioactive Waste*1

Facility		Vitrified waste (number of containers*2)	High-level liquid radioactive waste
JAEA	Reprocessing facility	316	365m³*3
JNFL	Reprocessing facility	346	211m³*3
	Waste storage facility	1,830	—
Total		2,492	576 m³

*1 Data is provided by licensees.
*2 Unit: JAEA: 120-liter container, JNFL (reprocessing facility): 160-liter container; JNFL (waste storage facility): 170-liter container.
*3 Amount of high-level liquid waste stored before vitrification.

L2-2 Power Station Waste

1. Homogeneous Solid, Packed Solid and Miscellaneous Solid*1

Power station		Homogeneous (drums)	Packed (drums)	Miscellaneous (drums)	Total (drums)
JAPCO	Tokai Power Station	0	0	1,351	1,351
	Tokai No. 2 Power Station	239	901	59,686	60,826
	Tsuruga Power Station	2,628	3,204	64,266	70,098
Hokkaido Electric Power Co., Inc.	Tomari Power Station	1,164	0	11,462	12,626
Tohoku Electric Power Co., Inc.	Onagawa Nuclear Power Station	1,804	140	29,820	31,764
	Higashidori Nuclear Power Station	0	0	12,104	12,104
TEPCO	Fukushima Daiichi NPS	14,947	2,925	169,727	187,599*2
	Fukushima Daini Nuclear Power Station	702	1,717	19,376	21,795

	Kashiwazaki-Kariwa Nuclear Power Station	662	1,107	27,751	29,520
Chubu Electric Power Co., Inc.	Hamaoka Nuclear Power Station	3,377	4,314	28,811	36,502
Hokuriku Electric Power Co., Inc.	Shika Nuclear Power Station	8	2,166	4,908	7,082
The Kansai Electric Power Co., Inc.	Mihama Power Station	2,470	620	24,054	27,144
	Takahama Power Station	5,162	0	37,675	42,837
	Ohi Power Station	4,180	3,531	21,075	28,786
The Chugoku Electric Power Co., Inc.	Shimane Nuclear Power Station	293	1,846	33,578	35,717
Shikoku Electric Power Co., Inc.	Ikata Power Station	1,422	1,708	22,389	25,519
Kyushu Electric Power Co., Inc.	Genkai Nuclear Power Station	4,579	3,168	30,671	38,418
	Sendai Nuclear Power Station	2,108	0	25,195	27,303
JAEA	Reactor Decommissioning R&D Center	2,000	0	17,565	19,565
	Fast Breeder Reactor Monju, Research and Development Center	21	0	7,404	7,425
Total		47,766	27,347	648,868	723,981

∗1 Data is provided by licensees. The storage unit is 200liter drums (including 200liter drums conversion for miscellaneous solids).

*2 Rubble, trimmed trees, disused-protective clothing generated after accident, etc. [total 345,300m^3], and secondary waste from contaminated water treatment [3,586 cesium absorption apparatus and absorption vessel etc. and Sludge 597m^3] have been temporarily stored.

2. Steam Generator (SG)*

Power station		Number of stored SGs
The Kansai Electric Power Co., Inc.	Mihama Power Station	7
	Takahama Power Station	6
	Ohi Power Station	8
Shikoku Electric Power Co., Inc.	Ikata Power Station	4

Kyushu Electric Power Co., Inc.	Genkai Nuclear Power Station	4
	Sendai Nuclear Power Station	6
Total		35

＊ Data is provided by licensees.

3. Control Rods, Channel Boxes, Others[*1]

Power station		Control rod (number)[*2]	Channel box (number)	Others (m^3)	Resin, (m^3)
JAPCO	Tokai Power Station	91 m^3	0	1,289	60
	Tokai No. 2 Power Station	306	3,621	17	880
	Tsuruga Power Station (Unit 1)	173	2,158	49	850
	Tsuruga Power Station (Unit 2)	63	290	0	96
Hokkaido Electric Power Co., Inc.	Tomari Power Station	312	0	0	107
Tohoku Electric Power Co., Inc.	Onagawa Nuclear Power Station	231	3,112	1	480
	Higashidori Nuclear Power Station	67	644	0	137
TEPCO	Fukushima Daiichi NPS	1,448	22,099	193	3,534
	Fukushima Daini Nuclear Power Station	699	12,289	43	5,285
	Kashiwazaki-Kariwa Nuclear Power Station	800	13,549	0	2,659
Chubu Electric Power Co., Inc.	Hamaoka Nuclear Power Station	774	11,276	35	2.727
Hokuriku Electric Power Co., Inc.	Shika Nuclear Power Station	69	1,094	0	158
The Kansai Electric Power Co., Inc.	Mihama Power Station	968	0	0	108
	Takahama Power Station	1,396	0	0	124
	Ohi Power Station	1,596	0	0	109

Power station		Control rod (number)*2	Channel box (number)	Others (m^3)	Resin, (m^3)
The Chugoku Electric Power Co., Inc.	Shimane Nuclear Power Station	285	4,909	56	822
Shikoku Electric Power Co., Inc.	Ikata Power Station	852	0	0	184
Kyushu Electric Power Co., Inc.	Genkai Nuclear Power Station	912	0	0	192
	Sendai Nuclear Power Station	486	0	0	176
Subtotal		11,437 +(91 m^3)	75,041	(1,683m^3)	(18,688 m^3)
		Control rod (number)	Neutron detector (number)	Others (number*3)	Resin, etc. (m^3)
JAEA	Reactor Decommissioning R&D Center	54	128	756	220.08
		Guide tubes of control rod driver (number)			
JAEA	Fast Breeder Reactor Research and Development Center (Monju)	15			

*1 Data is provided by licensees.
*2 Figures of the Tokai Power Station are not included.
*3 The unit of storage is a number of containers calculated by the volume of 2.2 ㎥ per each.

L2-3 Long Half-Life Low Heat Generating Radioactive Waste*1

Facility		Drum (number)	Bituminized solid (drums)	Plastic solidified (drums)	Other waste (drums)	Total (drums)
JAEA	Reprocessing facility	31,812	29,967	1,812	13,121	76,712
JNFL	Reprocessing facility	17,748*2	—	—	30,646	48,394
JNFL	waste storage facility	0	—	—	1,100	1,100
Subtotal		49,560	29,967	1,812	44,867	126,206

		Sheared cladding (drums)	Spent filter (drums)	Sample bottle (drums)	Total (drums)
JAEA	Reprocessing facility	5,098	315	1,391	6,804
JNFL	Reprocessing facility	221*3	—	—	221
		Low-level concentrated liquid waste (m^3)	Sludge (m^3)	Waste solvent (m^3)	
JAEA	Reprocessing facility	3,055	1,162	108	

(Note) Unit: 200-liter drum, including values equivalent to 200 liters per drum.

＊1 Data is provided by licensees.

＊2 Includes waste resin and waste sludge, fuel channels and burnable poisons, spent filters, sample bottles, etc

＊3 Unit for a piece of sheared cladding: 1,000-liter drum

L2-4 Uranium Waste

		Drum (number)	Other waste (drums)	Total (drums)	Low-level liquid waste (m^3)
Global Nuclear Fuel-Japan Co., Ltd.		16,741	2,576	19,317	0.15
Mitsubishi Nuclear Fuel Co., Ltd.		12,787	615	13,402	1.78
Nuclear Fuel Industries, Ltd.	Tokai Works	5,875	430	6,305	5.2
	Kumatori Works	8,629	71	8,700	13.6
JAEA	Prototype Uranium Enrichment Plant	586	56	642	0.141-
JNFL	Enrichment and Disposal Office	10,026	2,376	12,402	2.17
Total		54,644	6,124	60,768	23.041

(Note) Unit: 200-liter drum, including values equivalent to 200 liters per drum.

L2-5 Waste Stored in Research Facilities

Waste stored by licensees of research reactor operations and those of nuclear reactor facilities used for research, excluding power reactors used for power generation, and those stored by users of nuclear fuel materials related to usage facilities of such materials pursuant to Article 41 of the Ordinance for Enforcement of the Reactor Regulation Act

Name of facility		Solid waste (drum*)	Liquid waste (m^3)	Remarks
JAEA	Nuclear Science Research Institute	130,223	—	Sum of values for reactor facilities and those for facilities using nuclear fuel materials
	Nuclear Fuel Cycle Engineering Laboratories	65,516	28.4	Facility using nuclear fuel materials
	Oarai Research and Development Institute (North Area)	1,652	—	Sum of values for reactor facilities and those for facilities using nuclear fuel materials
		31,052	—	Waste storage facility

	Oarai Research and Development Institute(South Area)	191	0.03	For solid wastes, values refer to those for reactor facilities, sum of nuclear fuel use facilities . For liquid wastes, values refer to facilities using nuclear fuel materials
	Ningyo-toge Environmental Engineering Center	15,361	11.3	Facility using nuclear fuel materials
	Mutsu Office, Aomori Research and Development Center, JAEA	1,094	22.81	Nuclear facility
Nuclear Professional School, School of Engineering, the University of Tokyo		28.9	3.0	For solid wastes, values refer to the sum of those for reactor facilities and those for facilities using nuclear for temporary storage. For liquid wastes, values refer to those for reactor facilities
Kyoto University Institute for Integrated Radiation and Nuclear Science		169	0.00	The values refer to the sum of reactor facilities and for facilities using nuclear fuel materials
Nuclear Material Control Center	Tokai Safeguards Center	550	—	Facility using nuclear fuel materials
	Rokkasho Safeguards Analytical Laboratory	0	—	Facility using nuclear fuel materials
Institute for Atomic Energy, Rikkyo University		166.7	0	Nuclear facility
Atomic Energy Research Institute, Tokyo City University (former Musashi Institute of Technology)		119	—	Nuclear facility
Atomic Energy Research Institute, Kinki University		3.11	—	Nuclear facility
Nippon Nuclear Fuel Development Co., Ltd.		448	15.8	Facility using nuclear fuel materials
Nuclear Development Corporation		2,539	—	Facility using nuclear fuel materials

Toshiba Energy Systems & Solutions Corporation	Research Reactor Center	76.1	—	Nuclear facility
	Nuclear Engineering Lab.	1,605	0.74	For solid wastes, the values refer to the sum of reactor facilities and facilities using nuclear fuel materials. For liquid wastes, the values refer to facilities using nuclear fuel materials
Hitach Cooperation Ozenji Center		589	—	Reactor facility
Total		25,138.725	82.08	

(Note) The data in this table includes those of long half-life low heat generating radioactive waste and uranium waste generated in the facilities.

＊ Unit: 200-liter drum, including values equivalent to 200 liters per drum.

Wastes stored by a licensee of waste management pursuant to Article 4.2.1 of RI Regulation Act			
Name of facility		Amount of waste (drum*)	Remarks
Japan Radioisotope Association	Kanto Waste Relay Station II	9,886	
	Ichihara Office	57,141	
	Kansai Waste Relay Station	0	
Vesta Co., Ltd.		55,001	
JAEA	Nuclear Science Research Institute	103,886	
	Oarai Research and Development Institute	36,106	
T. N. Technos Co., Ltd. Tsukuba Research Institute		337	
Total		262,357	

＊：Unit: 200-liter

L2-6 Amount of Disposed Radioactive Waste

Name of facility		Major nuclides to be confirmed	Amount (drums)
Waste Disposal Facilities, Enrichment and Disposal Office, JNFL	Unit 1	Co-60、Ni-63、Cs-137、Sr-90、C-14	149,107*2
	Unit 2	Co-60、Ni-63、Cs-137、Sr-90、C-14	163,600*2
	Total	—	312,707*2

Nuclear Science Research Institute JAEA*1	Waste disposal facilities	Co-60, Ni-63, Cs-137, Sr-90, Ca-41, C-14, Eu-152, H-3	1,670 tons

*1 Disposing very low-level concrete waste generated by dismantling the JPDR, the decommissioning of which has been transferred to the phase of preserving the disposal site since October 1997.

*2 Unit: 200-liter drum.

L-3 List of Spent Fuel Management Facilities and Radioactive Waste Management Facilities

L3-1 List of Spent Fuel Management Facilities

（1）Facilities Related to Power Reactors

Facilities in which spent fuel management facilities are located	Location	Major purpose	Major feature
Tokai No. 2 Power Station, JAPCO	Ibaraki	Storing spent fuel	Pool storage (partially stored in dry cask storage)
Tsuruga Power Station, JAPCO	Fukui	Storing spent fuel	Pool storage
Tomari Power Station, Hokkaido Electric Power Co., Inc.	Hokkaido	Storing spent fuel	Pool storage
Onagawa NPS, Tohoku Electric Power Co., Inc.	Miyagi	Storing spent fuel	Pool storage
Higashidori NPS, Tohoku Electric Power Co., Inc.	Aomori	Storing spent fuel	Pool storage
Fukushima Daiichi NPS, TEPCO	Fukushima	Storing spent fuel	Pool storage (partially stored in dry cask storage)
Fukushima Daini NPS, TEPCO	Fukushima	Storing spent fuel	Pool storage
Kashiwazaki-Kariwa NPS, TEPCO	Niigata	Storing spent fuel	Pool storage
Hamaoka NPS, Chubu Electric Power Co., Inc.	Shizuoka	Storing spent fuel	Pool storage
Shika NPS, Hokuriku Electric Power Co., Inc.	Ishikawa	Storing spent fuel	Pool storage
Mihama Power Station, the Kansai Electric Power Co., Inc.	Fukui	Storing spent fuel	Pool storage
Takahama Power Station, the Kansai Electric Power Co., Inc.	Fukui	Storing spent fuel	Pool storage
Ohi Power Station, the Kansai Electric Power Co., Inc.	Fukui	Storing spent fuel	Pool storage
Shimane NPS, the Chugoku Electric Power Co., Inc.	Shimane	Storing spent fuel	Pool storage
Ikata Power Station, Shikoku Electric Power Co., Inc.	Ehime	Storing spent fuel	Pool storage
Genkai NPS, Kyushu Electric Power Co., Inc.	Saga	Storing spent fuel	Pool storage
Sendai NPS, Kyushu Electric Power Co., Inc.	Kagoshima	Storing spent fuel	Pool storage

Advanced Thermal Reactor *Fugen*, JAEA	Fukui	Storing spent fuel	Pool storage
Reprocessing Facility of the Nuclear Fuel Cycle Engineering Laboratories, JAEA	Ibaraki	Storing spent fuel	Pool storage
Rokkasho Reprocessing Plant, JNFL	Aomori	Storing spent fuel	Pool storage
Fast Breeder Reactor *Monju* nuclear installation, JAEA	Fukui	Storing spent fuel	Pool storage

(2) List of Spent Fuel Management Facilities (Related to Research and Test Reactors)

Facilities in which spent fuel management facilities are located	Location	Major purpose	Major feature
Nuclear Science Research Institute JAEA	Ibaraki	Storing spent fuel	Pool storage (partially stored in dry cask storage)
Oarai Research and Development Institute, JAEA	Ibaraki	Storing spent fuel	Pool storage
Kyoto University Institute for integrated Radiation and Nuclear Science	Osaka	Storing spent fuel	Pool storage

L3-2 List of Radioactive Waste Management Facilities

（1）Facilities Related to Power Reactors

Facilities in which radioactive waste management facilities are located	Location	Major purpose	Major feature
Tokai Power Station, JAPCO	Ibaraki	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration
Tokai No. 2 Power Station, JAPCO	Ibaraki	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration
Tsuruga Power Station, JAPCO	Fukui	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration

Facilities in which radioactive waste management facilities are located	Location	Major purpose	Major feature
Tomari Power Station, Hokkaido Electric Power Co., Inc.	Hokkaido	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration
Higashidori NPS, Tohoku Electric Power Co., Inc.	Aomori	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration
Onagawa NPS, Tohoku Electric Power Co., Inc.	Miyagi	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration
Fukushima Daiichi NPS, TEPCO	Fukushima	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration
Fukushima Daiini Nuclear Power Station, TEPCO	Fukushima	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration
Kashiwazaki-Kariwa NPS, TEPCO	Niigata	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration
Hamaoka NPS, Chubu Electric Power Co., Inc.	Shizuoka	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration
Shika Nuclear Power Station, Hokuriku Electric Power Co., Inc.	Ishikawa	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration
Mihama Power Station, the Kansai Electric Power Co., Inc.	Fukui	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration
Takahama Power Station, the Kansai Electric Power Co., Inc.	Fukui	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration

Facilities in which radioactive waste management facilities are located	Location	Major purpose	Major feature
Ohi Power Station, the Kansai Electric Power Co., Inc.	Fukui	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration
Shimane NPS, the Chugoku Electric Power Co., Inc.	Shimane	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration
Ikata Power Station, Shikoku Electric Power Co., Inc.	Ehime	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration
Genkai NPS, Kyushu Electric Power Co., Inc.,	Saga	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration
Sendai NPS, Kyushu Electric Power Co., Inc.,	Kagoshima	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing or incineration
Advanced Thermal Reactor *Fugen*	Fukui	Treating and storing waste from power reactors	Storing waste in storage after reducing the volume by compressing or incineration
Prototype fast-breeder reactor *Monju*	Fukui	Treating and storing waste from power reactors	Storing waste after reducing the volume by compressing

(2) List of Radioactive Waste Management Facilities (Excluding Those Related to Power Reactors)

Facilities in which radioactive waste management facilities are located*1		Location	Major purpose	Major feature
Global Nuclear Fuel-Japan Co., Ltd.	Facility for fabricating nuclear fuel materials	Kanagawa	Treating and storing uranium waste	Storing waste after reducing the volume by compressing
Mitsubishi Nuclear Fuel Co., Ltd.	Facility for fabricating nuclear fuel materials	Ibaraki	Treating and storing uranium waste	Storing waste after reducing the volume by compressing or incineration

Nuclear Fuel Industries, Ltd. Tokai Works	Facility for fabricating nuclear fuel materials	Ibaraki	Treating and storing uranium waste	Storing waste after reducing the volume by incineration
	Facility using nuclear fuel materials		Treating and storing waste from facilities using nuclear fuel materials	Storing waste after reducing the volume by incineration
Nuclear Fuel Industries, Ltd. Kumatori Works	Facility for fabricating nuclear fuel materials	Osaka	Treating and storing uranium waste	Storing waste after reducing the volume by compressing
	Facility using nuclear fuel materials		Storing waste from facilities using nuclear fuel materials	Storing waste after reducing the volume by compressing
Ningyo-toge Environmental Engineering Center, JAEA	Facility for fabricating nuclear fuel materials	Okayama	Treating and storing uranium waste	Storing waste after reducing the volume by incineration
	Facility using nuclear fuel materials		Treating and storing waste from facilities using nuclear fuel materials	Storing waste after reducing the volume by incineration
Nuclear Science Research Institute JAEA of National Research and Development Agency	Waste disposal facility	Ibaraki	Treating low-level radioactive waste materials	Trench disposal of concrete waste
	Research and test reactor facility (under operation: 5; under decommissioning: 3), facility using nuclear fuel materials disposal office		Treating and storing waste from research and test reactor facilities using nuclear fuel materials, and facilities using radioisotopes	Storing waste after reducing the volume by compressing or incineration

Nuclear Fuel Cycle Engineering Laboratories, Tokai Research and Development Center, JAEA	Reprocessing facility	Ibaraki	Treating and storing high-level radioactive waste and waste containing trans uranium	Storing high-level radioactive waste and waste containing trans-uranium after reducing volume by solidifying high-level radioactive waste with glass or incinerating the waste containing trans uranium
	Facility using nuclear fuel materials		Treating and storing waste from facilities using nuclear fuel materials	Storing waste after reducing the volume by compressing or incineration
Oarai Research and Development Institute JAEA of National Research and Development Agency	Research and reactor facilities (under operation: 3; under decommissioning: 1), waste storage facility, facility using nuclear fuel materials, and disposal office*2	Ibaraki	Treating and storing waste from research and test reactor facilities, facilities using nuclear fuel materials, and facilities using radioisotopes	Storing waste after reducing the volume by compressing or incineration
Mutsu Office, Aomori Research and Development Center, JAEA	Research and test reactor facility (under decommissioning: 1)	Aomori	Treating and storing waste from research and test reactor facilities	Storing waste after reducing the volume by compressing
Reprocessing facility, JNFL	Reprocessing facility	Aomori	Treating and storing high-level radioactive waste and waste containing trans uranium	Storing waste from storage facilities that accept spent fuel materials (a reprocessing facility is now under construction)
	Waste storage facility		Storing vitrified waste	Facilities for storing returned vitrified waste
Enrichment and Disposal Office, JNFL	Waste disposal facility	Aomori	Treating low-level radioactive waste materials	Waste disposal facilities Units 1 and 2
	Facility for uranium enrichment		Treating and storing uranium waste	Storing waste

Nuclear Professional School, School of Engineering, the University of Tokyo	Research and test reactor facility, facility using nuclear fuel materials (under decommissioning: 1)	Ibaraki	Temporarily storing waste from the research and test reactor facilities and facilities using nuclear fuel materials	Commissioned to the Nuclear Science Research Institute of the Tokai Research and Development Center, JAEA
Institute for Integrated Radiation and Nuclear Science, , Kyoto University	Research and test reactor facility (under operation: 2), facility using nuclear fuel materials	Osaka	Treating and storing waste from research and test reactor facilities and facilities using nuclear fuel materials	Storing waste
Institute for Atomic Energy, Rikkyo University	Research and test reactor facility (under decommissioning: 1)	Kanagawa	Treating and storing waste from research and test reactor facilities	Storing waste
Atomic Energy Research Institute, Tokyo City University (former Musashi Institute of Technology)	Research and test reactor facility (under decommissioning: 1)	Kanagawa	Storing waste from research and test reactor facilities	Storing waste
Atomic Energy Research Institute, Kinki University	Research and test reactor facility	Osaka	Storing waste from research and test reactor facilities	Storing waste
Radiotoxicology Experiment Building, National Institute of Radiological Science	Facility using nuclear fuel materials	Chiba	Storing waste from facilities using nuclear fuel materials	Storing waste
Tsukuba Center No. 2 Office, AIST	Facility using nuclear fuel materials	Ibaraki	Storing waste from facilities using nuclear fuel materials	Storing waste
On Site Laboratory, Rokkasho Safeguards Analytical Laboratory, Nuclear Material Control Center	Facility using nuclear fuel materials	Aomori	Treating and storing waste from facilities using nuclear fuel materials	Storing waste

Tokai Safeguards Center, Nuclear Material Control Center	Facility using nuclear fuel materials	Ibaraki	Storing waste from facilities using nuclear fuel materials	Storing waste in storage
Ichihara Office, Japan Radioisotope Association, Public Interest Incorporated Association	disposal office*3	Chiba	Storing waste from facilities using radioisotopes	Storing waste
Kanto Waste Relay Station 2, Japan Radioisotope Association, Public Interest Incorporated Association	disposal office*3	Chiba	Storing waste from facilities using radioisotopes	Storing waste
Kansai Waste Relay Station, Japan Radioisotope Association, Public Interest Incorporated Association	disposal office*3	Kyoto	Storing waste from facilities using radioisotopes	Storing waste
Research Reactor Center, Toshiba Corporation	Research and test reactor facility (under decommissioning: 1)	Kanagawa	Storing waste from the research and test reactor facilities	Storing waste
Nuclear Engineering Lab., Toshiba Corporation	Facility using nuclear fuel materials, research and test reactor facility	Kanagawa	Storing waste from research and test reactor facilities and facilities using nuclear fuel materials	Storing waste
Ozenji Center, Hitachi, Ltd.	Research and test reactor facility (under decommissioning: 1)	Kanagawa	Storing waste from the research and test reactor facilities	Storing waste
NFD Hot Laboratory, Nippon Nuclear Fuel Development Co., Ltd.	Facility using nuclear fuel materials	Ibaraki	Treating and storing waste from facilities using nuclear fuel materials	Commissioned to Oarai Research and Development Institute, JAEA
Fuel Hot Laboratory, Nuclear Development Corporation	Facility using nuclear fuel materials	Ibaraki	Treating and storing waste from facility using nuclear fuel materials	Storing waste after reducing the volume by compressing

Tsukuba Laboratory, T.N. Technos Co., Ltd.	disposal businesses office*2	Ibaraki	Treating and storing waste from facilities using radioisotopes	Storing waste after reducing the volume by incineration
Vesta Co., Ltd.	disposal businesses office*2	Chiba	Treating and storing waste from facilities using radioisotopes	Storing waste after reducing the volume by incineration

＊1　1 licensee operates 1 facility unless otherwise noted. When 1 licensee operates more than 1 facility or implements decommissioning measures for more than 1 facility, that situation will be clearly described.

＊2　Facilities managed by disposal service businesses refer to those approved pursuant to the RI Act.

＊3　Facilities managed by disposal service businesses refer to those approved pursuant to the RI Act and the Medical Care Act.

L-4 Major Nuclear Reactors under Decommissioning

L4-1 Major NPSs under Decommissioning*

Name of facilities		Type	Approval date of decommissioning plan	Scheduled completion date of decommissioning
JAPCO	Tokai Power Station	Reactor type: GCR Power output : 166MW	June, 2006	Fiscal year 2039
JAPCO	Unit 1, Tsuruga Power Station	Reactor type:BWR Power output : 357MW	Apr, 2017	Fiscal year 2039
Tohoku Electric Power Co., Inc.	Unit 1Onagawa Nuclear Power Station	Reactor type : BWR Power output : 524MW	Mar, 2020	Fiscal year 2053
Chubu Electric Power Co., Inc.	Units 1 and 2, Hamaoka Nuclear Power Station,	Reactor type: BWR Power output : 540MW [Units 1] 840MW [Units 2]	Nov, 2009	Fiscal year 2036
The Kansai Electric Power Co., Inc.	Units 1 and 2, Mihama Power Station	Reactor type:PWR Power output : Units 1:340MW Units 2:500MW	Apr, 2017	Fiscal year 2045
The Kansai Electric Power Co., Inc.	Units 1 and 2, Ohi Power Station	Reactor type : PWR Power output : Unit 1 : 1175 MW Unit 2 : 1175 MW	Dec, 2019	Fiscal year 2048
Chugoku Electric Power Co., Inc.	Unit 1, Shimane Nuclear Power Station	Reactor type:BWR Power output : 460MW	Apr, 2017	Fiscal year 2045
Shikoku Electric Power Co., Inc.	Unit 1, Ikata Power Station	Reactor type:PWR Power output:566 MW	June, 2017	Fiscal year 2056
Kyushu Electric Power Co., Inc.	Units 1 and 2, Genkai Nuclear Power Station	Reactor type:PWR Power output: Unit 1 : 559MW Unit 2 : 559MW	Unit 1 : Apr, 2017 Unit 2 : Mar. 2020	Unit 1: Fiscal year 2043 Unit 2: Fiscal year 2054
JAEA	Advanced Thermal Reactor *Fugen*	Reactor type: ATR Power output:165MW	Feb, 2008	Fiscal year 2033

Name of facilities		Type	Approval date of decommissioning plan	Scheduled completion date of decommissioning
JAEA	Reactor facility of Prototype Fast Breeder Reactor *Monju*	Nuclear reactor type : Sodium-cooled Fast Breeder Neutron Reactor Power output : 28MW	Mar. 2018	Fiscal year 2047

＊ Data is provided by licensees.

L4-2 Major Research Reactors under Decommissioning

Name of facilities		Type	Approval date of decommissioning plan
JAEA	JRR-2	Reactor type：Heavy-water-moderated cooling tank reactor Thermal output：10MW	Nov, 2006
JAEA	First Nuclear Ship Mutsu	Reactor type：Pressurized light-water moderated and cooled reactor; PWR Thermal output：36MW	Oct, 2006
JAEA	DCA	Reactor type：Heavy-water moderated reactor Thermal output：10MW	Oct, 2006
JAEA	TRACY	Reactor type：Transient Experiment Critical Facility Thermal output：10kW（in static operation） 5000MW（in transient operation）	June, 2017
JAEA	JRR-4	Reactor type：Light water moderated and cooled, swimming pool-type reactor with low-enriched uranium Thermal output：3,500kW	June, 2017
Hitachi, Co., Ltd.	HTR	Reactor type：Light-water moderated and cooled reactor Thermal output：100kW	Apr, 2007

Name of facilities		Type	Approval date of decommissioning plan
Tokyo City University Institute of Technology)	Furnace of Musashi Institute of Technology	TRIGA-Ⅱ Thermal output：100kW	June, 2007
Rikkyo University	Research and test reactor of Rikkyo University	TRIGA-Ⅱ Thermal output：100kW	June, 2007
Toshiba Energy Systems & Solutions Corporation	TTR-1	Training Reactor Thermal output：100kW	May, 2007
the University of Tokyo	YAYOI	Reactor type：Air cooling fast reactor using uranium as fuel Thermal output：2kW	Aug, 2012