National Report of JAPAN

For the Eighth Review Meeting

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

August 2024

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
GoJ	Government of Japan
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 of Doses	Notification of Establish Dose Limits in Accordance with the Provisions of the NRA Ordinance for 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 for 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 for Prevention of Radiation Hazards due to Radioactive Materials, etc. (renamed to the RI Regulation Act in 2019)
RANET	IAEA Response Assistance Network
Reactor Regulation Act	Act for the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors
RFS	Recyclable-Fuel Storage Company
RI Regulation Act	Act for the Regulation of Radioactive Materials
RPV	Reactor Pressure Vessel
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 on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (the Convention) as of the end of March 2024: nuclear power reactors, research reactors, nuclear fuel processing facilities for uranium enrichment or fuel fabrication, spent fuel interim storage facilities, spent fuel reprocessing facilities, waste interim storage facilities, waste disposal facilities, facilities which use more than a certain quantity of uranium or other nuclear material, facilities for handling radioactive materials and radioactive materials disposal facilities.

Among the above, spent fuel interim storage facilities and spent fuel reprocessing facilities correspond to "spent fuel management facility," and waste interim storage facilities and waste disposal facilities and radioactive materials 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 for the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors (Reactor Regulation Act). Twenty units among them are under decommissioning with Approval of Decommissioning Plans pursuant to the Act. As for research reactors, 14 out of 22 licensed units are under decommissioning with Approval of Decommissioning Plans pursuant to the Act.

There are seven nuclear fuel processing facilities and one 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, two waste interim storage facilities and four waste disposal facilities have been licensed.

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

Under the Act for the Regulation of Radioactive Materials (RI Regulation Act), 8,070

business sites that handle radioactive materials are licensed or registered, and seven sites of radioactive materials disposal facilities are licensed.

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

The Nuclear Regulation Authority (NRA) developed the regulatory requirements which reflected the lessons learnt from the accident at the Tokyo Electric Power Company's (TEPCO) Fukushima Daiichi Nuclear Power Station (NPS) and enforced those regulatory requirements 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 the Convention in December 2013.

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

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

through conformity review to comply with the regulatory requirements set by the NRA. Up to the end of March 2024, the NRA has received the applications for conformity review of, 27 nuclear power reactors, eight research reactors, six nuclear fuel processing facilities, one spent fuel interim storage facility, one spent fuel reprocessing facility, two radioactive waste interim storage facilities, and two waste disposal facilities.

Among the above are:

- 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 at the Kansai Electric Power Company Mihama Power Station
- Unit 1, 2, 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 pre-service inspections and have been in commercial operation. Furthermore, one spent fuel reprocessing facility, five nuclear fuel processing facilities, eight research reactors, two waste interim storage facilities, have obtained the permission for the amendment of existing permits. Also, Mitsubishi Nuclear Fuel Co., Ltd. and Nuclear Fuel Industries, Ltd. Kumatori, which hold the permit of nuclear fuel processing facilities, and JRR-3 of JAEA, KUR and KUGA of Kyoto University, and a research and test reactor facility of Kinki University have started operation.

The NRA has continued to make efforts to improve regulatory requirements, for example by adopting state-of-the-art knowledge, even after the regulatory requirements were established in 2013, reflecting the lesson learnt from the accident at TEPCO Fukushima Daiichi NPS, and has also continued to address regulatory challenges, including reform of inspection system.

Based on the recommendations and suggestions made by the IAEA's Integrated Regulatory Review Service (IRRS) mission which took place in January 2016, the NRA revised the Reactor Regulation Act and the RI Regulation Act in 2019. By these revisions, the following improvements were adopted 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 fuel materials and radioactive materials.

The inspection system which incorporated risk-informed and performance-based concept, 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 of the NRA since the last national report regarding the safety for spent fuel management and radioactive waste management have been the regulation of clearance and disposal of uranium waste reported in Section E, F and K,

the items to be considered in geological disposal reported in Section K, and the criteria for the final confirmation of decommissioning of nuclear facilities reported in Section F. Also, regarding spent fuel management, from the safety point of view, the NRA recommends the 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 to transition and to achieve reasonable regulation, the NRA has revised relevant ordinances and guides as reported in Section E, as well as 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's Fukushima Daiichi Nuclear Power Station (FDNPS), decommissioning work is being carried out based on the "Mid-and-Long-Term Roadmap towards the Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station" (adopted by the Inter-Ministerial Council for Contaminated Water and Decommissioning Issues on December 27, 2019, and hereinafter referred as "Mid-and-Long-Term Roadmap"). Once again in the Mid-and-Long-Term Roadmap, "coexistence of reconstruction and decommissioning" which promotes the early risk reduction and safety assurance as a top priority, was positioned as the main principle. Based on this principle, individual measures are also being reviewed. GoJ continues to take charge in advancing this work safely and steadily, based on the on-site situation at FDNPS, and the results of research and development related to decommissioning while continuously reviewing the Mid-and-Long-Term Roadmap.

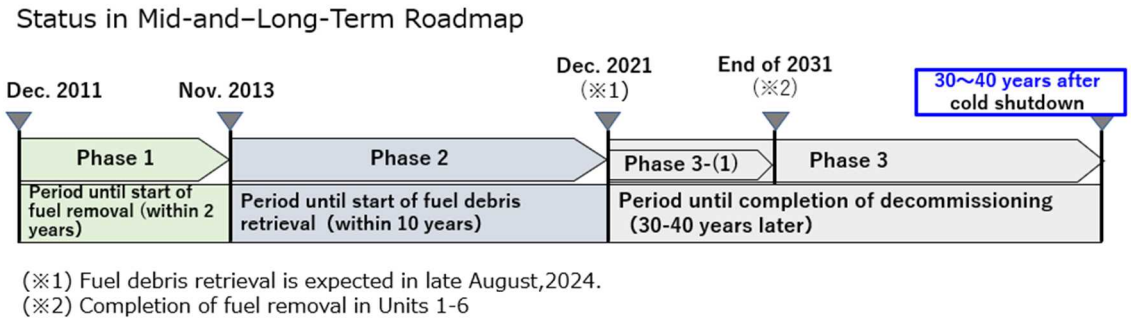


Figure Status in Mid-and-Long Term Roadmap (as of August 2024)

Decommission is a work to reduce the risk of radioactive materials to local people and environment, and there are 5 main tasks:1) Fuel removal, 2) Fuel debris retrieval, 3) Management of contaminated water, 4) Handling of ALPS treated water, 5) Waste treatment and disposal/dismantling of reactor facilities, etc.

1) Fuel removal: For Unit 4, removal of fuel is completed in December 2014 by transferring all 1,535 fuels to the common pool. For Unit 3, removal of fuel has started in April 2019 and completed the removal of all 566 fuels in February 2021. For Unit 1, installation of large covers for the entire building has started in June 2021. For Unit 2, dose reduction work on the operating floor began in August 2021, and construction work started in June 2022 for the installation of a fuel removal platforms. Effort will continue to be made to complete the removal of fuel from all units by the end of 2031 with safety as the top priority.

2) Fuel debris retrieval: The inside of the reactor buildings of Units 1-3, where the fuel debris is located, have high radiation levels and are not easily accessible to people. Therefore, decontamination and the survey inside the reactors are being conducted using remote-controlled equipment and devices, etc. In order to confirm the condition of the fuel debris in Unit 1, ROVs (Remotely Operated Vehicle) were used to survey the inside of the reactor containment vessel by March 2023. It was confirmed that the lower part of the inner wall of the pedestal was damaged almost all the way around and that the reinforcement bars were exposed. TEPCO and the Nuclear Regulation Authority have evaluated that even if the pedestal were to lose its support function, there would be no risk with the structural integrity of the reactor building and no significant radiation exposure risk to the surrounding area. Previous investigations of Unit 2 found distribution of fuel debris in the reactor containment vessel and status of damage to the structure of the reactor. Deposits resembling fuel debris were also identified. In February 2019, during a survey, deposits resembling fuel debris were successfully picked up and lifted. A trial of retrieval of fuel debris is now under work and the scale of retrieval will be gradually expanded. For Unit 3, in July 2017, the survey was conducted using ROV (Remotely Operated Vehicle), and it was found that several pieces directly below the reactor pressure vessel (CRD housing support bracket) were damaged in multiple locations, and an existence of a melted object which could possibly be a fuel debris was confirmed in addition to pieces of the first-floor platform and reactor core that may have fallen to the bottom of the reactor containment vessel inside the pedestal. From March 2023, the sub-committee established by the Nuclear Damage Compensation and Decommissioning Facilitation Corporation started a full-scale study on a new method (RPV* filling and

solidification) for the future large-scale removal at the Unit 3 reactor, in addition to the methods that have been discussed in the past (partial submersion method and submersion method). The report has been published on March 8, 2024, by the Nuclear Damage Compensation and Decommissioning Facilitation Corporation. Based on the recommendation in the report, TEPCO will now proceed with a specific design study using a combination of partial submersion method and partial submersion method option (RPV filling and solidification).

3) Management of contaminated water: Inside the reactor buildings, the stable state is maintained by cooling the fuel debris, the fuel that melted by the nuclear accident, with water. Water comes in contact with the fuel debris and contains high concentrations of radioactive materials. When this water mixes with groundwater and rainwater that flows into the buildings "contaminate water" is generated. In September 2013, Basic Policy for the Contaminated Water Issue has been announced by Nuclear Emergency Response Headquarters. The preventive and multi-layered measures have been taken following three principles; 1) isolating ground water from the contamination source, 2) preventing leakage of the contaminated water, and 3) removing the source. Through these measures, the generation of contaminated water has been suppressed and reduced, from approx. 540 m3/day (in May 2014) before implementing measures to approx. 80 m3/day (in FY2023), achieving the milestone of "suppressing the amount of contaminated water generated to 100 m3/day or less during average rainfall within FY2025." Measures will proceed to further reduce the amount of contaminated water generated and suppress it to approx. 50-70 m3/day by FY2028.

4) Handling of ALPS treated water: Please refer to K2-2 Discharge into the Sea of ALPS Treated Water.

5) Waste treatment and disposal/dismantling of reactor facilities: Radioactive waste such as rubble from the FDNPS is currently stored in storage tanks and outdoor temporary storage facilities, depending on the radiation dose rate. We will reduce the volume of such waste as much as possible and consolidate it in the buildings for the purpose of shielding it and suppressing its dispersal. We are eliminating the temporary storage area by around fiscal year 2028.

For the stable management of radioactive waste in TEPCO Fukushima Daiichi NPS along with the long-term future decommissioning work, 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. Considering the progress of the work for management of radioactive waste, the NRA made a decision in February 2019 to eliminate the Committee and integrated its functions into the Committee on Oversight and Evaluation of the Specified Nuclear Facility to implement the oversight and evaluation more comprehensively and effectively in order to ensure mid- and long-term safety of TEPCO Fukushima Daiichi NPS.

TEPCO announced the Waste Storage 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 Facility in February 2017. The plan has been reviewed by TEPCO about once a year since the announcement.

According to the plan, there is rubble generated at the time of and after the accident, secondary waste generated by water treatment process, and radioactive solid waste which has been stored before the accident at the premises of TEPCO Fukushima Daiichi NPS. The rubble is stored in open-air temporary storage areas or solid waste storage facilities depending on its surface dose rate. The secondary waste generated by the water treatment process is stored in temporary storage facilities.

There are currently many waste storage areas across TEPCO Fukushima Daiichi NPS premises. Approximately 470,000 m^3 of the rubble are stored in the open-air temporary storage areas and approximately 28,000 m^3 of which are stored in the solid waste storage facilities. The secondary waste generated by the water treatment process is approximately 1,400 used vessels and 4,300 high integrity containers. Both of which are temporarily stored in storage facility buildings, as of 29 February 2024.

In order to further decrease the risk, TEPCO plans to reduce the volume of rubble before placing in storage facility buildings, and to eliminate the open-air temporary storage areas located outside of the solid waste storage facilities by the end of FY 2028. A solid waste incinerator has been installed as the volume reduction facility. This has been reducing combustibles through incineration since the end of FY 2015. Subsequently, an additional solid waste incinerator has been installed and started operation in May 2022. For metals and concrete, another volume reduction facilities were started to operate in February 2024. The construction of the ninth solid waste storage facility was completed in FY 2017, followed by the 10th and 11th which are scheduled for construction.

TEPCO plans to eliminate the open-air temporary storage areas as much as possible by shifting to indoor storage for the secondary waste generated by the water treatment process. The construction work of the large waste storage facility to store adsorption columns has been conducted since June 2020, aiming to start operation in FY2021. However, the NRA review of the application for amendment of the implementation plan has been prolonged due to insufficient explanation on the concept of seismic classification and its evaluation. When shifting from the open-air waste storage to indoors, volume reduction treatment or stabilization treatment will be explored and implemented according to the characteristics of the waste.

A final disposal method for the rubble and the secondary waste generated by the water treatment process has not yet been decided. To study the method and its safety, it is necessary to understand the characteristics of the rubble and the secondary waste. Therefore, a first Radioactive Material Analysis and Research Facility was constructed at the site and started operation in June 2022.

Liquid radioactive waste, i.e., contaminated water, is purified by multiple purification systems including Advanced Liquid Processing System (ALPS). However, treated water containing tritium, which cannot be removed by these systems, is stored at the site. Following the approval of the amendment of the implementation plan regarding the installation of facilities related to the discharge of ALPS treated water in July 2022, the amendment of the implementation plan for the operation of the facilities was also approved in May 2023. Then, the pre-service inspection of the facilities was completed in July 2023. Regarding the discharge of ALPS treated water into the sea, explanations are given to local governments and other stakeholders as well as the IAEA published "IAEA Comprehensive Report on the Safety Review of the ALPS-Treated Water at the Fukushima Daiichi Nuclear Power Station" in July 2023 after completion of the IAEA review which concluded that the discharge is consistent with the relevant international safety standards. On 24 August 2023, the discharge of the ALPS treated water was started and was confirmed through inspections by the NRA that the discharge is being carried out in compliance with the approved implementation plan.

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

A-3-2-1 Decontamination

Full-scale decontamination in the Special Decontamination Area (SDA) was completed at the end of March 2017, where the national government, mainly the Ministry of the Environment (MOE), had implemented decontamination. In the Intensive Contamination Survey Area (ICSA), where municipalities had implemented the decontamination, full- scale decontamination was completed at the end of March 2018. This means that all full-scale decontamination was completed in 100 municipalities in 8 prefectures except for the Restricted Area. Monitoring after the decontamination represented that the air dose rate in the environment decreased, and the effect of decontamination was confirmed.

In the Restricted Area, the Specified Reconstruction and Revitalization Base Area (SRRBA) was established, taking account of the significant decrease of air dose rate and strong requests from local residents to return to their hometowns. In the SRRBA, the environment arrangement was implemented, including decontamination and demolition of houses, and by November 2023, all evacuation orders in the SRRBA were lifted as planned, in all 6 municipalities. In the Restricted Area other than the SRRBA, the Special Residential Revitalization Area (SRRA) was established, in order to let residents who intend to return to their hometowns do so, over the course of 2020's, aiming at return of people and reconstruction of their living environment by lifting evacuation orders. From December 2023, environmental restoration initiatives such as decontamination and demolition of houses have been in progress.

A-3-2-2 Interim Storage Facility and Managed Recycling

A-3-2-2-1 Interim Storage Facility

The Interim Storage Facility (ISF) is a group of facilities, in which removed soil and waste generated from off-site decontamination in Fukushima have been stored intensively and safely before their final disposal. In the premise of the ISF, 9 Soil Separation Facilities and 8 Soil Storage facilities were constructed, to separate and store the removed soil and waste generated from off-site decontamination, and also 3 Volume Reduction Facilities as well as 3 Waste Storage Facilities were constructed, to treat and store the waste generated from off-site decontamination etc.

By the end of March 2022, the MOE had transported almost all of the removed soil and waste to the ISF, which were temporarily stored in Fukushima Prefecture (except for

the Restricted Area). As of the end of March 2024, about 13.76 million cubic meters of removed soil and waste had been transported to the ISF. Going forward, the MOE will continue to implement the transportation of the removed soil and waste by obtaining local understandings by placing first priority on safety.

A-3-2-2-2 Managed Recycling

As for the removed soil and waste generated from decontamination in Fukushima Prefecture, it is stipulated in a law to take necessary measures to complete the final disposal outside Fukushima Prefecture within 30 years from the start of interim storage. In order to reduce the amount of final disposal outside Fukushima Prefecture, the MOE has made efforts for volume reduction and recycling of the removed soil and waste. With regard to the managed recycling, currently a demonstration project of development of farmland in Iitate Village, Fukushima Prefecture, and a demonstration project of road embankment in the premise of the ISF have been implemented. The MOE makes its efforts to build understanding for the necessity and safety of the managed recycling, by disseminating achievements etc. of the demonstration projects.

A-3-2-3 Fukushima Regeneration / Future Oriented Project

In response to the local needs in Fukushima Prefecture, the MOE has promoted not only environment restoration efforts, but also future-oriented initiatives, toward the next stage of reconstruction of Fukushima, to create and rediscover the strengths of the region from the environmental perspective, e.g., de-carbonization, resource recycling, and coexistence with nature. The MOE is also involved with 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 started its operation in October 2020)
- 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 Reprun Fukushima)

A-3-2-4 IAEA-MOE Experts Meetings

Upon the request of the MOE, the IAEA held four Experts Meetings on "Environmental Remediation of Off-Site Area after the Fukushima Daiichi Nuclear Power Station Accident" between 2016 and 2017. In March 2023, the IAEA published the "Consolidated Report" of the IAEA-MOE Experts Meeting, which contains contents of discussion during the Experts Meetings, as well as information about environmental remediation in Fukushima. In addition, in 2023 and 2024, three IAEA-MOE Experts Meetings on "Volume Reduction and Recycling of Removed Soil Arising from Decontamination Activities" were held with the objective to provide assessment, advice and support, from technical and social perspectives, with the MOE's initiatives on the managed recycling and the necessary final disposal of removed soil. The summary report of the first and second meeting was published in September 2023, and January 2024, respectively. The final report is scheduled to be published in around summer of 2024.

For updated information for environment remediation and restoration, please visit the following MOE website:
http://josen.env.go.jp/en/

A-4 Preparation of the Report

This report describes activities taken by Japan to comply with its obligations under the Convention and is a compilation of information available at the end of March 2024, unless otherwise specified.

This report describes those measures article by article, and its description is focused on the mechanism to ensure safety. In addition, response to challenges identified at the 7th Review Meeting are reported in Section K.

The Guidelines on the Structure of National Report, INFCIRC/604/Rev4, is taken into account to develop this National Report. In Japan, multiple government organizations oversee implementation of the obligations under the Convention. This list describes the general allocation of responsibilities.

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

* As of April 2024

	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. Recyclable-Fuel Storage Co. (RFS) Spent Fuel Storage Facility
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, 2) Ohi (1,2) Onagawa (1) Fukushima Daini (1-4) Monju ,Fugen	Fukushima Daiichi (1-6)
Disused sealed sources	Return to manufacturers, Long-term Source user storage	Source user	Return to manufactures, Storage in facility	-

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 GoJ 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 GoJ 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[1] (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.

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.

[1] The "Spent Nuclear Fuel Reprocessing Implementation Act" was amended by the "Partial Revision of the Electricity Business Act and Other Acts for Establishing Electricity Supply Systems for Realizing a Decarbonized Society" and the "Spent Nuclear Fuel Reprocessing Implementation and decommission facilitation Act" was enforced in April 2024.

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 as early as possible in the first half of FY2024. 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 2024. As of the end of March 2020, the amount of spent fuel stored in nuclear power plants of LWR in Japan amounts to approximately 17,000 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 Centre in 2010 at Mutsu city, Aomori Prefecture, which is Japan's first off-site interim spent fuel storage facility. In March 2024, RFS applied to Aomori Prefecture and Mutsu City for safety agreement to starting operations in the second quarter of FY2024. The Storage Centre 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 GoJ 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.

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. Then, in November 2020, a literature survey was initiated in Suttu Town and Kamoenai Village, Hokkaido..

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 GoJ 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 Centre 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 2024, about 372 cubic meters of liquid

waste and 354 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 GoJ 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 GoJ includes the spent fuel stored in reprocessing facilities in the scope of the Convention.

The GoJ 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 has declared that reprocessing of spent fuel is a part of spent fuel management, spent fuel management facilities in Japan include nuclear power reactors, a spent fuel interim storage facility, and spent fuel reprocessing facilities. Spent fuel generated in nuclear power reactors is stored at each NPP for a certain period of time and then shipped to the spent fuel interim storage facility or spent fuel reprocessing facilities.

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

The location, main purpose and features of these major spent fuel management 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 two types of radioactive waste management facilities. They are the radioactive waste disposal facility where radioactive waste is disposed of as final disposal, and the radioactive waste interim storage facility where radioactive waste is stored temporarily before final disposal. Types of waste disposal facilities are under operation, they are a near surface disposal facility, a trench type disposal facility, and a pit type disposal facility. Very low level radioactive waste is disposed of at the trench type disposal facility, and solidified waste (homogeneous waste package or cemented waste package) in drums is disposed of at the pit type disposal facility. In the radioactive waste interim storage facility, high level radioactive vitrified waste package generated by spent fuel reprocessing is temporarily stored.

Radioactive waste management facilities are also located in nuclear facilities defined by the Convention.

Radioactive waste management facilities at NPP include a waste processing system, a solid waste depository where treated waste (homogeneous waste packages, cemented waste packages, other miscellaneous solids) in drums is stored, a depository where replaced steam generators and other large solid waste 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 management facilities at nuclear fuel processing facilities for uranium enrichment or fuel fabrication include a radioactive waste processing system and a solid waste depository where treated radioactive waste is stored.

Radioactive waste management facilities at spent fuel reprocessing facilities include a radioactive waste processing system, a waste depository where vitrified waste and high level liquid waste are stored, and a waste depository where low level liquid waste and low level solid waste are stored.

Radioactive waste management facilities at research reactors and major facilities that use more than a certain quantity of uranium or other nuclear material include a waste

processing system for low-level radioactive waste, and solid waste depository for drums of treated waste, etc.

Major radioactive waste management facilities licensed under the RI Regulation Act include a waste storage facility for containers containing processed waste generated at facilities for handling radioactive materials. They are facilities that obtained permission for waste disposal activity under the RI Regulation Act.

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 management facilities are listed in Section L.

D-4 Inventories of Radioactive Waste

D-4-1 Radioactive Waste in Storage

As of the end of March 2024, the waste stored at NPP in radioactive waste management facilities include approximately 700,000 of 200 litre drums of low level radioactive waste (LLW), 35 of disused steam generators, disused control rods, channel boxes, dumped ion-exchange resin. Rubble, trimmed trees, dumped protective clothing generated after accident, etc. [498, 900 m^3 in total], and secondary waste from contaminated water treatment [5,716 of Caesium absorber columns etc. and 423 m^3 of sludge] have been temporarily stored in TEPCO Fukushima Daiichi NPS.

At facilities other than NPP, 2,530 of vitrified waste packages of high level radioactive waste (HLW) and approximately 616m^3 of high level liquid waste are stored in spent fuel reprocessing facilities as of the end of March 2024. 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 management facilities in NPP have been transferred to 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 360,000 drums (200-litre-drum equivalent) of waste as of the end of March 2024. At Japan Atomic Energy Agency (JAEA) Nuclear Science Research Institute, approximately 1,670 tons of very low level waste (concrete rubble) resulting from dismantling of Japan Power Demonstration Reactor (JPDR) was disposed in 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 Reactor Regulation Act or 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 2024, 20 units in total are under decommissioning:

- Japan Atomic Power Company's (JAPCO) Tokai NP;
- JAPCO's Tsuruga Unit 1;
- Tohoku Electric Power Company's Onagawa Unit 1;
- Tokyo Electric Power Company's Fukushima Daini Unit 1 thru 4;
- Chubu Electric Power Company's Hamaoka Unit 1 and 2;
- Kansai Electric Power Company's Mihama Unit 1 and 2;
- Kansai Electric Power Company's Ohi Unit 1 and 2;
- Chugoku Electric Power Company's Shimane Unit 1.
- Shikoku Electric Power Company's Ikata Units 1 and 2;
- Kyushu Electric Power Company's Genkai Unit 1 and 2;
- JAEA's Fugen Advanced Thermal Reactor; and
- JAEA's Monju Prototype Fast Breeder Reactor.

Since the last national report, five NPP have been granted the approval of decommissioning plans. Details of NPP under decommissioning (name, classification, date of Approval of Decommissioning Plan, completion schedule for decommissioning) are listed in Section L. Also, current situations of major decommissioning activities are reported as follows.

Reactor at JAPCO's Tokai NPS ceased operation in 1998. Decommissioning work has been conducted since December 2001. Since 2006, equipment other than reactor such

as turbines and feed water pumps were dismantled followed by heat exchangers. Dismantling of a reactor vessel will begin in FY 2029 and will take approximately 6 years. Decommissioning is expected to be completed in FY2035.

The JAEA's Prototype Advanced Thermal Reactor Fugen ceased operation at the end of March 2003, and has been under decommissioning. Its decommissioning plan was approved 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 a reactor is currently underway. The decommissioning is planned to be completed in FY2040.

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. Fuel removal from the core was completed as the first step of four steps in the decommissioning process in October 2022. From FY 2023, dismantling preparation of sodium components and dismantlement of power generation equipment such as water-steam system was commenced as the second step. The decommissioning is planned to be completed in FY 2047.

Chubu Electric Power Company's Hamaoka Unit 1 and 2 ceased operation in January 2009. Its decommissioning plans which set out both a basic decommissioning policy for Units 1 and 2 and activities in the first stage of 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 of dismantling of systems and of equipment other than the reactor was approved and being conducted. In March 2023, an amendment for the decommissioning plan for the third stage of dismantling of the reactor was applied and is scheduled to be commenced after its approval. The decommissioning is planned to be completed in FY2042.

TEPCO decided to decommission TEPCO Fukushima Daiichi Unit 5 and 6 which were not damaged by the accident, whereas Unit 1 thru 4 were severely damaged by the accident in March 2011 and were decided to be decommissioned in July 2019. These six units are in a state of permanent shutdown prior to decommissioning stage.

D-5-2 Research Reactors

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

- JAEA's Japan Research Reactor No.2 (JRR-2), JRR-4, Transient Experiment Critical Facility (TRACY);
- JAEA's Reactor Facilities of the Nuclear Ship Mutsu;
- JAEA's Deuterium Critical Assembly (DCA);
- Hitachi Ltd.'s Hitachi Training Reactor (HTR);
- Toshiba Corporation's Training Reactor-1 (TTR-1);
- Rikkyo University Institute for Atomic Energy (RUR);
- Tokyo City University (formerly the Musashi Institute of Technology) Research Reactor (MITRR); and
- The University of Tokyo Research Reactor (Yayoi).

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

Decommissioning plans of JAEA Nuclear Science Research Institute's Tank-type Critical Assembly (TCA) and Oarai Research and Development Institute's Japan Materials Testing Reactor (JMTR) were approved in March 2021. That of Toshiba Energy Systems & Solutions Corporation's Nuclear Critical Assembly (NCA) and that of IAEA Nuclear Science Research Institute's Fast Critical Assembly (FCA) were approved in April 2021 and in September 2021 respectively, and each decommissioning work has been started.

D-5-3 Spent Fuel Reprocessing Facilities

The JAEA's Reprocessing Facility received the approval of the decommissioning plan in June 2018. The vitrification of high-level radioactive liquid waste had been restarted since January 2016 and operated intermittently, however its operation was interrupted in October 2022 due to trouble with the melter, and replacement work of the melter is underway as of March 2024. The resumption of the operation of vitrification is anticipated sometime around the first quarter of FY 2026 in light of the replacement work of the equipment. Accordingly, the planned time when the production of the vitrified canister will be completed was also reviewed in light of the progress of vitrification up to this point and has been postponed from the initial schedule of FY 2028 to FY 2038. As for the decommissioning of the main component of the reprocessing facility, the cleaning process to take out the recoverable radioactive materials that remained in some

equipment including the main component of the reprocessing facility was completed in February 2024, and the decommissioning is planned to continue for approximately 70 years hereafter through dismantling equipment in sequence following works such as 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, Atomic Energy Basic Act is the most primary piece of legislation and defines basic principles of nuclear energy use in Japan.

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

As an act to enhance management of spent fuel and radioactive waste, in order to take measures to achieve steady reprocessing and organizing the business environment for nuclear power generation, Japan has implemented Spent Nuclear Fuel Reprocessing Implementation and Decommission Facilitation Act. Meanwhile, 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 Act for Special Measures Concerning Nuclear Emergency Preparedness (Nuclear Emergency Act), which stipulates responses to nuclear emergencies.

The NRA settles 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. The Reactor Regulation Act clearly stipulates the NRA's authorities to revoke permits and suspend 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 use and

handling of radioactive materials and radiation generating components. The RI Regulation Act clearly stipulates the NRA's authorities to revoke permits and suspend the use, and impose penalties for violation of its provisions.

Additionally, in the Act for Punishment of Conduct Endangering Human Life by Generating Radiation, penalties are imposed for those who cause a nuclear fission chain reaction of nuclear fuel material or release radiation by recklessly handling radioactive material, by improperly operating nuclear fission equipment, etc. or by using any other unreasonable means, and thus has endangered the life, body or property of another.

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 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 achievements 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, in light of established international standards, it has been added by an amendment that the purpose is to contribute to the protection of life, health and property of the people, preservation of the environment and security of Japan. Furthermore, new provisions concerning an 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 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, provisions for prevention for release of abnormal level of radioactive material by severe accident, regulation which considers occurrence of large-scale natural hazards and criminal acts including terrorist activities as well as safety objectives of the Atomic Energy Basic Act were added.

The objective of the Act is as follows:
"This Act, in accordance with the spirit of the Atomic Energy Basic Act, is enacted for the purpose of providing the necessary regulation on refining activities, fabrication and enrichment activities, storage activities, reprocessing activities and waste disposal activities, as well as on the installation and operation, etc. of reactors, while taking into consideration the possibility of large scale natural disasters, terrorism, or other criminal acts, and also for the purpose of providing necessary regulation on the uses of international controlled material to execute treaties or other international agreements concerning the research, development and use of nuclear energy, in order to ensure that the uses of nuclear source material, nuclear fuel material and reactors are limited to for the purposes of peace, and at the same time, to ensure public safety by preventing hazards due to the event that a severe accident at a nuclear facility causes a discharge of an abnormal level of radioactive materials outside the factory or place of activity where the relevant nuclear facility is installed, or otherwise resulting from nuclear source material, nuclear fuel material, and reactors, and protecting nuclear fuel material, thereby contributing to protecting people's lives, health, and property, conserving the environment, and assuring national security."

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 was already permitted or approved.

The Reactor Regulation Act stipulates regulation for spent fuel storage, spent fuel reprocessing and radioactive waste disposal, such as Permit of Business, Approval of Design and Construction Plan, Pre-Service and Periodic Checks performed by licensee, Approval of Operational Safety Program, Nuclear Regulatory Inspection, regulatory procedures for decommissioning, and obligation to maintain conformity to regulatory requirements. Radioactive waste is categorized into three types: Category 1 waste disposal (geological disposal), Category 2 waste disposal (intermediate depth disposal and near surface disposal), and waste interim storage as shown in Table E2-1 and Table E2-2. The Act also prescribes administrative penalties such as a suspension of operation, a revocation of permit, and criminal penalties such as imprisonment or a fine, in case that an operator fails to comply with the provisions of the Reactor Regulation Act.

Furthermore, the Act stipulates a system for employee feedback (whistle blowers) that an employee of licensee or any other person is able to provide to the NRA information about breaching the Act. The Act stipulates also that it must be prohibited that the licensee shall not treat the whistle blower in her or his disadvantage for the whistle blowing act.

Regarding specified nuclear facility where nuclear disaster has been experienced, the Reactor Regulation Act stipulates that its provision can be partially applied to the facility as long as an action plan to implement necessary measures is prepared 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. The ordinance prescribes 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 was

hosted in January 2016, recognized needs for an improvement of inspection system at operational stage and for other issues, which had been identified as future challenges by the NRA itself. The NRA revised the legislation including the Reactor Regulation Act in April 2017. The major changes of the Act were (1) reform of the inspection system, (2) requirement for consideration on decommissioning from an early stage of design, and (3) review and revise of regulatory system for disposal of radioactive waste generated from decommissioning.

(1) The inspection system has reformed to achieve 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 reformed inspection system is different from previous one which checks various items in fragments and had been conducted as a trial from 2018 to collect area of improvement for changes. The system has been fully operated since 2020 as the systematic reformed inspection program.

(2) With regard to decommissioning of nuclear facilities, in order for licensees to consider decommissioning at an early stage of design and to facilitate more smooth transition from operation stage to decommissioning, licensees are required to prepare a 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 force in October 2018, and licensees have developed the Decommissioning Policy and disclosed it to the public. The Policy should include an estimate of amount of waste generated, an estimate of decommissioning cost and methods of raising funds, any other necessary items to implement decommissioning.

(3) For a disposal site for core internals, whose radioactivity exceeds upper limit for pit disposal among Cat-2 waste disposal, a regulation on backfilling of tunnel of pit disposal site has been established. Activities such as excavation at intermediate depth disposal and geological disposal site are restricted. Also, since the excavation restriction is for those other than waste disposal licensees and affects land sales contracts, regulations related to real estate contracts were revised and enforced in October 2018.

In the reformed inspection system, licensees were obliged to maintain compliance with regulatory requirements of nuclear facilities including storage facilities for

radioactive waste and to check status of nuclear facilities by themselves. The system allows the NRA to check safety activities of licensees at all times. Furthermore, the NRA comprehensively evaluates the level of safety activities of each nuclear facility and implements performance-based regulation to reflect the safety performance in the next year's inspection plan. As a result, licensees are encouraged to independently maintain and improve the level of safety. Towards the start of full operation of the system in April 2020, discussions were held in the "Review Team for the Inspection System" consisting of NRA Commission members, NRA officials and experts, and trial operation was conducted from autumn 2018 to March 2020. Based on the above, government ordinances and related regulations were revised, and an inspection guide was prepared. The NRA started its operation as a nuclear regulatory inspection in April 2020. As for the result of nuclear regulatory inspections, the NRA reports its result quarterly. A comprehensive evaluation of each nuclear facility is published every fiscal year based on the inspection results and safety performance indicators for the year.

In order to continuously improve the nuclear regulatory inspection, the NRA established the "Meeting to Exchange Opinions on the Inspection Program" to exchange opinions with outside experts and nuclear licensees. The meetings were held five times in FY 2020, three times in FY 2021, three times in FY 2022, and three times in FY 2023. They discussed the status report on the nuclear regulatory inspections, continuous improvement of the inspection system, and significance determination of nuclear fuel facilities. Based on the above, the guidelines for the operational improvement for the nuclear regulatory inspection were revised.

In light of the introduction of nuclear regulatory inspections in FY 2020, the NRA decided to regulate the entire TEPCO Fukushima Daiichi NPS, including Units 5 and 6, in an integrated manner primarily on the implementation plan, and to implement conventional inspections without applying the nuclear regulatory inspections. At that time, the NRA reviewed the inspections at the TEPCO Fukushima Daiichi NPS, clarifying the obligation of TEPCO to carry out their conformance checks, and receiving inspections conducted by the NRA to be more flexible according to the progress of decommissioning work. In addition, preparatory work, including the preparation of related laws and regulations necessary for the review was promoted. The revised regulations at the TEPCO Fukushima Daiichi NPS have been in operation since FY 2020.

Figure E2-1 Structure of Major NRA Ordinances for 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 Requirements)

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

Major Ordinance for Nuclear Facilities in General

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

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.

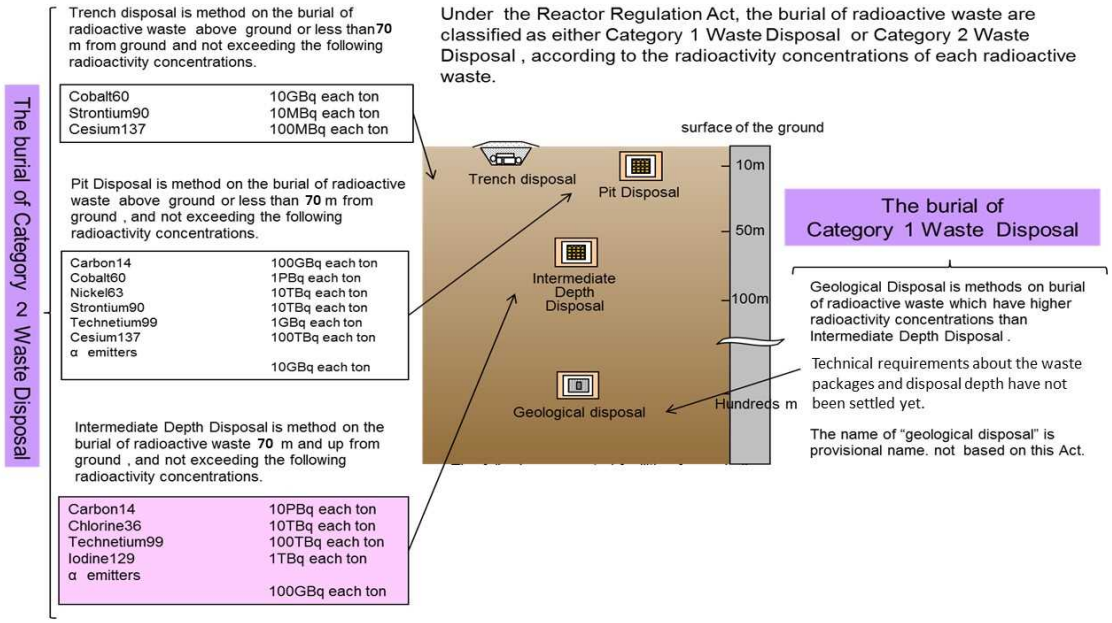
*2 The Order for Enforcement of the Act on the Reactor Regulation Act.

*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 for 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 the package design approval and the 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.

The regulations, notifications and guides for the transport of radioactive materials under the jurisdiction of the NRA have been revised in order to adopt the 2018 version of the IAEA Safety Requirements for the Transport of Radioactive Materials (IAEA Transport Requirements) and to respond to the points pointed out in the IAEA IRRS Follow-up Mission took place in January 2020. The main contents of the revision are to require consideration of aging in the design of packages and to introduce approval procedures for nuclide values not listed in the IAEA Transport Requirements. After discussions in the NRA, public comments and consultations with the Radiation Council, the Regulations for the Transport of Nuclear Fuel Materials Outside Facilities, the Regulations for the Use of Nuclear Source Materials and related notifications were revised in November 2020. The revised Regulations came into effect in January 2021.

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

In March 2021, the NRA decided on "Regulatory Concept for Clearance and Burial of Uranium Wastes". In this regulatory concept, the NRA decided to treat the clearance of uranium waste in the same way as artificial origin nuclides. This is due to the fact that uranium contained in uranium waste is also included in the waste generated by an industrial product after its progeny nuclides are removed through processes such as smelting of uranium and changing its isotopic ratio for nuclear use. Therefore, an exposure to uranium waste can be understood as planned exposure situation. In formulating the regulatory requirements for the clearance of uranium waste, it is important to ensure commonality and coordination with the international standard and the regulatory standards of the EU countries which have already introduced the clearance system, because the cleared material may be distributed internationally.

Based on this concept, the NRA revised the rules and examination standards for the clearance in September 2021.

See F4-5 for general regulations on the clearance.

E-2-3-3 Amendments on Regulations for Cat-2 Waste Disposal

In September 2021, the NRA made the following amendments regarding intermediate-depth disposal among the regulatory requirements for the Cat-2 Waste Disposal.

(1) For waste disposal sites at intermediate depths, new regulations are stipulated concerning the prevention of significant damage to engineered barriers caused by faults, volcanic phenomena, and other natural phenomena, and the assurance of depth in consideration of erosion.

(2) From the viewpoint of the function of suppressing the transfer of radioactive materials after the completion of decommissioning, concerning the design of the location, structure, and equipment of waste disposal sites, the NRA shall newly stipulate that licensees shall indicate the process for setting options for the location of waste disposal sites, setting options for the design of engineered barriers, and selecting the final design based on these, and that the NRA shall confirm the appropriateness of these, and also newly stipulate regulatory requirements for the collection of radioactive waste, drainage facilities, monitoring and measurement facilities, etc.

(3) An examination guide for waste disposal sites at intermediate depths, which specifies methods for determining damage areas of active faults, determining large faults, and determining volcanic activity centres was formulated.

In addition, the following amendments were made regarding the disposal of uranium waste in near surface (trench disposal and pit disposal) disposal concerning Cat-2 Waste Disposal. (For details, see K1 -5)

(1) With regard to uranium waste, measures are taken to keep the average radioactivity of uranium sufficiently low from the beginning of its disposal, and the exposure of the public is reduced by applying the current concept of ensuring the safety of Cat-2 Waste Disposal.

(2) Therefore, the current regulatory requirements for Cat-2 Waste Disposal are basically applied without major changes to the framework, even when only uranium waste is disposed or together with other radioactive waste.

"Keeping the radioactivity concentration sufficiently low" means that the average radioactivity of uranium in the waste disposal site does not exceed 1 Bq/g at the

beginning of the disposal.

E-2-4 RI Regulation Act

The purpose of the RI Regulation Act is to regulate, in accordance with the spirit of the Atomic Energy Basic Act, the use, sale, lease, waste management, and other handling of radioactive materials, the use of radiation generators, and other handling of objects contaminated with radioactive materials or by radiation emitted from radiation generators (Radioactive Contaminants), thereby preventing radiation hazards caused by those activities, to secure specified radioactive materials and to ensure the safety of the public. The Cabinet Order for Enforcement of the RI Regulation Act and the NRA Ordinance for enforcement have been enacted under the RI Regulation Act.

Regarding facilities for handling radioactive materials and radioactive materials disposal facilities, licensees and registrants for the use of radioactive materials or radiation generating equipment as well as licensees for waste disposal activity shall prepare the radiation hazard prevention program and appoint a Radiation Protection Supervisor, and notify the NRA before commencement of handling radioactive materials or radiation generating equipment. Those licensees who own a storage facility or radiation generating equipment 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 regulatory requirements for facility and usage, measuring doses within and at the boundary of their establishment as well as exposure doses of radiation workers, conducting education and training, and providing health surveillance. When disposing of radioactive materials or of radioactive contaminants, licensees and registrants shall ensure that storage within the facility or at disposal facility conform to the regulatory requirements.

At the same time that the Reactor Regulation Act was amended in 2017, as described in E2-2, the Radiation Hazards Prevention Act was revised. The name of which was changed to Act for the Regulation of Radioactive Materials, etc. in 2019, and special provisions concerning the disposal of radioactive materials were added. When licensees and registrants under the RI Regulation Act entrust disposal to disposal licensees under the Reactor Regulation Act, such radioactive materials and radioactive contaminants can be regarded as radioactive waste under the Reactor Regulation Act. Thus, the NRA can regulate waste disposal in waste disposal facility installed under the Reactor Regulation Act.

If necessary, NRA radiation inspectors conduct inspections to check regulatory compliance with the requirements. Licensees and registrants must notify the NRA when they cease to use radioactive materials or radiation generators and report any necessary subsequent measures.

E-2-5 Nuclear Emergency Act

This Act was promulgated in 1999 to protect lives, bodies and properties of the people 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 The Spent Nuclear Fuel Reprocessing Implementation and Decommission Facilitation 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 the 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 was established in 2016, and its 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)). Because of enforcing the "Partial Revision of the Electricity Business Act and Other Acts for Establishing Electricity Supply Systems for Realizing a Decarbonized Society", the "Spent Nuclear Fuel Reprocessing Implementation and decommission facilitation Act" was enforced in April 2024. As a result, the Nuclear Reprocessing Organization of Japan (NuRO) was renamed the Nuclear Reprocessing and decommission facilitation Organization of Japan (NuRO), and NuRO was added to the decommissioning management service.

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. The METI takes measures to promote activities on management of spent fuel and radioactive waste in accordance with the "Spent Nuclear Fuel Reprocessing Implementation and Decommission Facilitation Act" described in E2-6 and the "Final Disposal Act" described in E2-7. The NRA regulates the safety of business in accordance with the "Reactor Regulation Act" described in E2-2). Thus, responsibilities of institutions involved in the different steps are clearly allocated according to the legislative framework. With regard to nuclear emergency preparedness, based on the Nuclear Emergency Preparedness Act described in E2-5, the Cabinet Office is responsible for the overall coordination of off-site nuclear emergency preparedness measures. On-site response as well as technical and expert judgment related to off-site measures are responsibility of the NRA.

In addition, a policy for back-end measures for decommissioning of nuclear facilities owned by research institutes are responsibility of the Ministry of Education, Culture, Sports, Science and Technology.

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 the 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 the regulations 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 1,081 as of April 1, 2024.

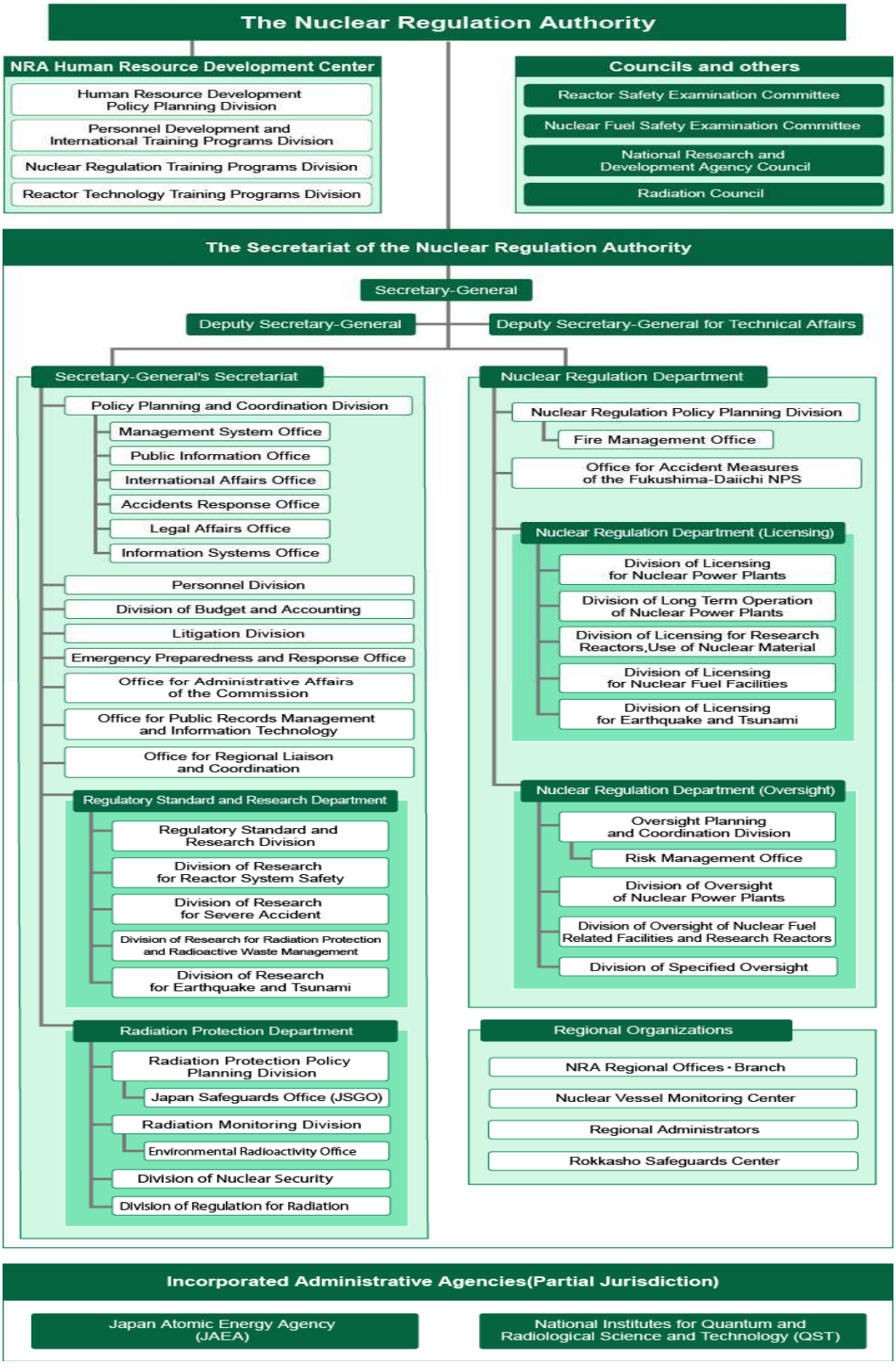
The NRA has the following committees and a council composed of external experts designated by the NRA in accordance with the Act for Establishment of the NRA. They are the Reactor Safety Examination Committee, which conducts examinations and reviews on the safety of nuclear power reactors, the Nuclear 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 NRA has divisions and departments, such as the General Affairs Division, Personnel Division, Budget and Accounting Division, Litigation Division, and other management organizations of the Secretary-General's Secretariat; the Regulatory Standard and Research Department, which prepares standards and guidelines; conducts safety research on nuclear reactor systems, serious accidents, nuclear fuel, waste, radiation protection, earthquakes and tsunamis; the Radiation Protection Department, which is responsible for the establishment of the nuclear emergency response system, the protection of nuclear materials, the supervision of radiation monitoring, the regulation of radiation sources, and safeguards based on international

agreements; and the Nuclear Regulation Department, which consists of the Nuclear Regulation Policy Planning Division, the Nuclear Regulation Department (Licensing), and the Nuclear Regulation Department (Oversight).

There are 22 nuclear regulatory offices located in each of its nuclear facilities with nuclear operation inspectors, nuclear emergency preparedness specialists, senior radiation emergency preparedness specialists, and physical protection officers.

Figure E3-1 Organization Chart of the NRA



E-3-2 Regulatory Resources of the NRA

E-3-2-1 Financial Resources

The financial resources for all NRA activities are 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 2023 is 63.8 billion yen.

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

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. Specifically, during the period from April 1, 2020, to March 31, 2024, 109 employees with specialized knowledge and experience and 133 new graduates were hired. At the same time, efforts to secure human resources were continued, including the recruitment of employees with specialized knowledge and experience and the diversification of hiring methods for new graduates.
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 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.

In addition, with regard to the study hours of staff defined in "Basic Policy for HR Development of NRA Staff”" the actual results were ascertained and incorporated into the personnel evaluation in FY 2023.

E-3-2-3 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, radiation protection, nuclear security, and safeguards, 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 has been utilizing the NRA HR Development Centre, 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.
They can be divided into the following four.

- Specialized training in regard to the nuclear regulation to the “Nuclear Inspector” and “nuclear emergency preparedness officer” 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;
- Training to improve language skill such as oral communication in English; and
- Short-term overseas training to improve not only expertise but also internationality.

Specifically, 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 Centre 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.

In order to promote human resource development and human resource exchange utilizing joint research, a total of 70 researchers were engaged in the research, and 1 researcher was dispatched to the JAEA to engage in test research conducted by the Agency.

As reported in 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 the processes and discussions leading to final decisions, the NRA developed the following basic policies in "Policy on Ensuring Operational Transparency of the NRA": 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. Since 2020, the NRA has developed and started NRA Archive and Retrieval System (N-ADRES) in order to archive important information resources that are currently available on the NRA website, such as the records of the meetings held in the NRA, the records of the review process with the regulated parties, and the records of discussions on regulations, and to make them widely available to the public for several decades. The N-ADRES was updated in March 2024 to improve convenience and searchability.

In addition, regarding meetings with licensees for open conformity reviews, 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 broadcasted live on YouTube, and abridged editions of meetings not broadcast live are also released.

Additionally, 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, the policy was changed to disclose the summary of meetings with administrative organizations in charge of the promotion of the use of nuclear energy in a similar manner, and the operation started in January 2023.

Furthermore, the Technical Information Committee, in which examines whether the latest findings require a regulatory response, frequently used materials obtained from overseas regulatory agencies on the premise of non-disclosure, so this meeting itself was conducted as closed. The transparency of such meetings has 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 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 a 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 uploaded the next day on the website.

E-3-3-2 Taking Opinions from Outside

One of the NR'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. With regard to interviews with related experts and business operators, on the premise of ensuring sufficient transparency, efforts were made to communicate more densely and establish a relationship with them in order to gather domestic and overseas knowledge, promote a full understanding of the content of regulations, and respond promptly in an emergency. 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 centre.

E-3-4 Ensuring NRA Independence

The NRA performs its regulatory activities in a fair, neutral, and independent manner based 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 through 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 the 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 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 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.

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 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 component contributing to the improvement of the safety of nuclear facilities or strengthening the protection of specified nuclear fuel material, a 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 endeavour to further formulate voluntary measures to develop a system for thorough crisis management for each of their nuclear facilities in order to prevent the occurrence of an accident at the 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 of the nuclear fuel material or the material contaminated by the nuclear fuel material. These measures are detailed in the NRA Ordinances under 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 the Operational Safety Program in Nuclear Regulatory Inspections.

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

The Reactor Regulation Act stipulates that the licensee take necessary measures for operational safety in the event of failure to meet its legal responsibilities; this can be cited as an institutional mechanism for ensuring that licensees fulfill their responsibilities. For example, if a nuclear facility does not meet the Technical Requirement prescribed by law and ordinances or if its operation contravenes regulatory requirements, the NRA can require the licensees to adopt an operation method of the NRA's designation or order it to take any other measures deemed necessary, according to the Act. If the licensees violate this order, the NRA may revoke its permission or order it to suspend the operation of the facility for a specified period not exceeding one year.

If an operator installs a nuclear facility without permission, it shall be sentenced to imprisonment and/or a fine, according to the Act. The same shall apply if licensees fail to obtain approval for Operational Safety Program or amend it without approval, or if licensees and/or employees fail to comply with the Operational Safety Program.

As radiation applications take a variety of different forms, for example, the use of radioactive materials as a source of radiation beam or as radiation generator components, sealed or unsealed source, with different radioactivity as well, the safety regulation under the RI Regulation Act applies stage by stage requirements depending on the form of activity and its radioactivity for the licensing or the registration. Radioactive waste is stored at a facility where the waste was generated, and most of

the waste is 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. Also, the licensee of the waste management shall establish and implement the Radiation Hazard Prevention Program, appoint the Chief Engineer of Radiation Handling, and undergo the necessary inspections.

The amendment of the RI Regulation Act in April 2017, explicitly stipulates the legal responsibility of licensees and registrants 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 radioactive materials while taking into account the latest knowledge on safety gained in research, development and usage of nuclear energy."

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

In Japan, since a business that generates spent fuels or radioactive waste is regulated by the Reactor Regulation Act, it is unlikely that unidentified spent fuels or radioactive waste will be found. Orphan nuclear fuel material is rarely found, but in case it is found, the 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 measure, Operational Safety Program and physical protection as prescribed in the Reactor Regulation Act, and shall be subject to the 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 the regulation. In addition, the above-mentioned persons shall develop a Decommissioning Plan, have it approved by the NRA, carry out decommissioning, and obtain the confirmation of the completion of decommissioning from the NRA.

An orphan source is regulated under the RI Regulation Act as described in J2-3 that the owner of the discovery site or facility will manage it in compliance with the law. In

most cases, the Japan Radioisotope Association (JRA) collects and properly manages the said orphan sources. Concerning the RI Regulation Act, in case of revocation of the license of a waste disposal business, the JRA is subject to its regulation, regarded as licensed, until the decommissioning work is completed. 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 radioactive materials.

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 a liquidator even 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 a Permit of Business prescribed in the Reactor Regulation Act, the NRA verifies that an applicant possesses the technical capability necessary to conduct the said business. In the case of licensees of nuclear power generation or spent fuel reprocessing, the NRA verifies that they have the technical capability to prevent and mitigate severe accidents.

The Reactor Regulation Act stipulates that licensees shall take necessary measures to ensure operational safety, set forth Operational Safety Program before commencing construction of a facility, and obtain its approval from 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 for Reprocessing Business stipulates that only those with the requisite knowledge shall operate the plant; and that spent fuel reprocessing plant shall only be operated when an adequate number of capable staff are secured. Moreover, it stipulates that licensees shall prepare to check items to be confirmed before start-up, during and after the operation, and also licensees shall oblige personnel to comply with them.

Operational Safety Program, for example, according to the NRA Ordinance for Reprocessing Business, shall prescribe matters relating to operational safety education for those who operate and manage a spent fuel reprocessing plant including the content of operational safety education and the policy on its implementation. The quality management system to be set in the Operational Safety Program is required to contain human resource (HR) provisions. It needs to describe that the competence required for the personnel involved in duties that affect nuclear safety should be identified, measures for education and training should be implemented in case of any shortfall of competence, and the effectiveness of education and training should be evaluated.

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

For example, a licensee of a reprocessing business shall appoint a Chief Engineer for Nuclear Fuel Material Handling to supervise operational safety in handling of nuclear fuel materials. 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 the expertise and experience necessary to conduct the said duties and also has the practical experience of more than three 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 materials. 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 the expertise and practical experience necessary to conduct the said duties. Licensees or registrants under the RI Regulation Act shall appoint a Chief Engineer for Radiation Handling. A Chief

Engineer for Radiation Handling shall be selected from those who have a certificate of Chief Engineer for Radiation Handling. A certificate for Cat-1 Chief Engineer for Radiation Handling and Cat-2 Chief Engineer for Radiation Handling is granted to those who have passed a national examination and completed the designated seminar courses. A certificate for Cat-3 Chief Engineer for Radiation Handling is granted to those who have completed the seminar courses for Cat-3 Chief Engineer for Radiation Handling.

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 human resources who have the necessary knowledge for nuclear safety and nuclear regulation extensively, therefore the NRA has conducted the HR Development Project for Nuclear Regulation with universities and colleges of technology, etc., since FY 2016. The NRA examines details of proposed projects through document screening and adoption interviews. 17 projects of four adopted in FY 2020, six in FY 2021, four in FY 2022, and three in FY 2023, are being carried out as of April 2024. The NRA currently is calling for new proposals. The NRA has been elaborating 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 of the NRA is described in E3-2-2.

F-2-2 Financial Resources

In the process of licensing a nuclear facility except for a facility which uses more than a certain quantity of uranium or other nuclear material, 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 to prove that it possesses the necessary financial basis.

For the waste disposal business, this financial basis is required to cover the entire project period including the period from closure of disposal site 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 the nuclear facility use.

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

In line with the quality management requirement, to ensure that operational safety activities responding to different stages from commencement to decommissioning are conducted based on an appropriate quality management system, licensees are required to establish a quality management system (QM system)in their Operational Safety Program and to plan, implement, evaluate and improve operational safety activities based on the QM system. Meanwhile, continuous improvement of the OM system itself is also required.

Specifically, for operational safety activities, the NRA Ordinance requires the establishment of the OM 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, the graded approach and the systemic approach are adopted.

The RI Regulation Act stipulates licensees or registrants including that of waste disposal business to specify that they shall manage, maintain, and inspect radiation

facilities in their Radiation Hazard Prevention Program to securely conduct the operational safety.

F-3-2 Licensees' Practice

To meet the above regulatory requirements, licensees specify requirements for each of 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," in their Operational Safety Program and that establish an OM system, implement quality assurance activities, and continuously improve to maintain its effectiveness 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.

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 the personnel and conduct education and training for the personnel to reach the necessary level of competence as specified.

To meet procurement management requirements, licensees 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 the quality management system.

To prevent ordering from suppliers with inappropriate quality assurance structures, it is standard practice for licensees to have suppliers submit a quality assurance plan and to directly audit the supplier to confirm that they meet 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 the personnel with necessary expertise provide the said services. This includes, for example, confirming that there is a technician who can perform the

specialized work such as welding.

Audits are conducted on the quality assurance program for the operation 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 CEO so that the insights that could improve the system gained from the audits can quickly reach 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, spent fuel reprocessing, waste disposal, and radioactive waste interim storage are detailed by the NRA Ordinances established under the Reactor Regulation Act. Requirements such as dose limits, etc. are specified in the Notification of Establish Dose Limits under the provisions of the NRA Ordinance for Activity of Refining Nuclear Source or Nuclear Fuel Materials, etc. (Notification of Doses).

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

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

Radiation Controlled Area is an area with a risk of radiation exposure in order to properly manage the exposure of workers in a nuclear facility. It is 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 its degree of radiation risk. Similarly, with regard to radiation control based on the RI Regulation Act, the rules established by the NRA stipulate the obligation set Radiation Controlled Areas with demarcation, and access control. The limit of radiation dose of the Radiation Controlled Areas and at the boundaries of the premises is stipulated in the Notification of Doses.

Preserving Area is an area outside Radiation Controlled Area that requires special control to ensure the safety of spent fuel reprocessing facilities. The Preserving Area shall be clearly distinguished from other areas by placing signs or offering means of access control, lock control, and restriction of taking out of objects in accordance with the necessity of control.

Surrounding Monitored Area is an area outside the Radiation Controlled Area where the dose limit set by the NRA is not likely to be exceeded. Human habitation is prohibited in this area. A fence must be placed along the boundary to restrict the entry of people, other than those who enter the area to work.

Surrounding Monitored Area is an area outside the Radiation Controlled Area, and the dose limit set by the NRA is not likely to be exceeded. Human habitation shall be prohibited in this area. A fence must be placed along the boundary to restrict the entry of people, other than those who enter the area to work.

For radiation control of radiation workers, nuclear licensees are obliged to ensure that the dose of radiation workers should not exceed the dose limits set by the NRA and that 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 a disaster at a nuclear facility, licensees are allowed to engage radiation workers in emergency work within the dose limits set by the NRA. The dose limits are shown in 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 the measures required by the regulation, such as compliance with the designation of Radiation Controlled Areas and the observation of 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 As Low as Reasonably Achievable (ALARA) concept, the regulation for nuclear facilities having safety functions requires 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 widely accepted by licensees. Essentially, in conducting radiation works, it is a basic recognition that unnecessary exposure should be avoided. In a nuclear facility in operation, three elements (time, distance, and shielding) for reducing exposure are implemented, such as controlling access to Radiation Controlled Areas, reducing the

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

duration of work by performing radiation work in a planned manner, ensuring the distance from radiation sources, and installing the shield.

Based on the Reactor Regulation Act, licensees are required to record the exposure dose of the radiation workers and keep the records during the period specified by the NRA Ordinance. The record is transferred to the organization designated by the NRA after five years from recording or the concerned person ceases to be 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

At the time of the earthquake at TEPCO Fukushima Daiichi NPS, the system for access control and dose data collection/processing was damaged, and electronic dosimeters and battery charging equipment became unusable, which led to the situation where individual dose control could not be adequately implemented. 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/returning electronic dosimeters were newly put in place.

Just after the earthquake, the 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 in almost all the places at the site to prevent body contamination and internal exposure. To reduce the contamination levels and the dose in the site, measures have been implemented such as the installation of radiation shields against high dose areas like the operating floor of Unit 3, treatment to remove nuclides from highly contaminated water stored in temporary storage tanks, removal of high-dose rubble and cutting down of trees, removal of surface soil and deep plowing, and facing of the soil surface with mortar spraying or asphalt paving.

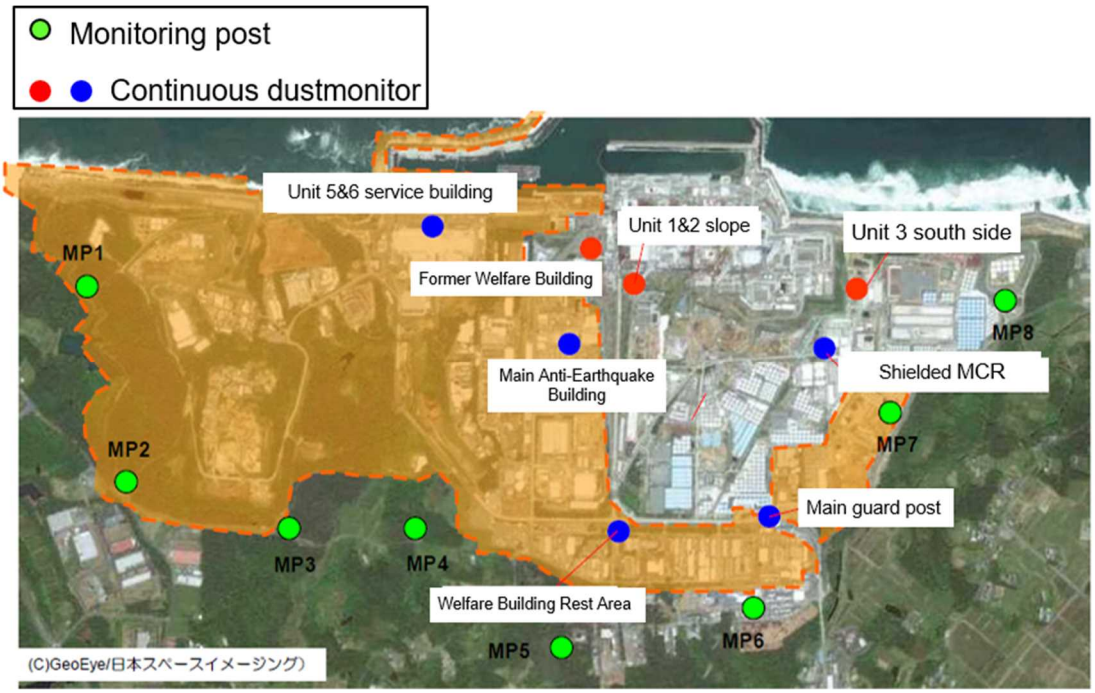
Due to the improvement of the site environment, areas were classified based on the contamination level from November 2011. For areas where the concentration of radioactive material in the air was below the threshold value for wearing a full face mask, disposable particle masks were worn during work. In March 2016, further progress enabled to expansion of the areas without full face masks up to about 90% of the site. At the same time, wearing normal working clothes, instead of protective suits, became possible in these areas. Currently, 96% of the site does not require a 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 a full face mask.

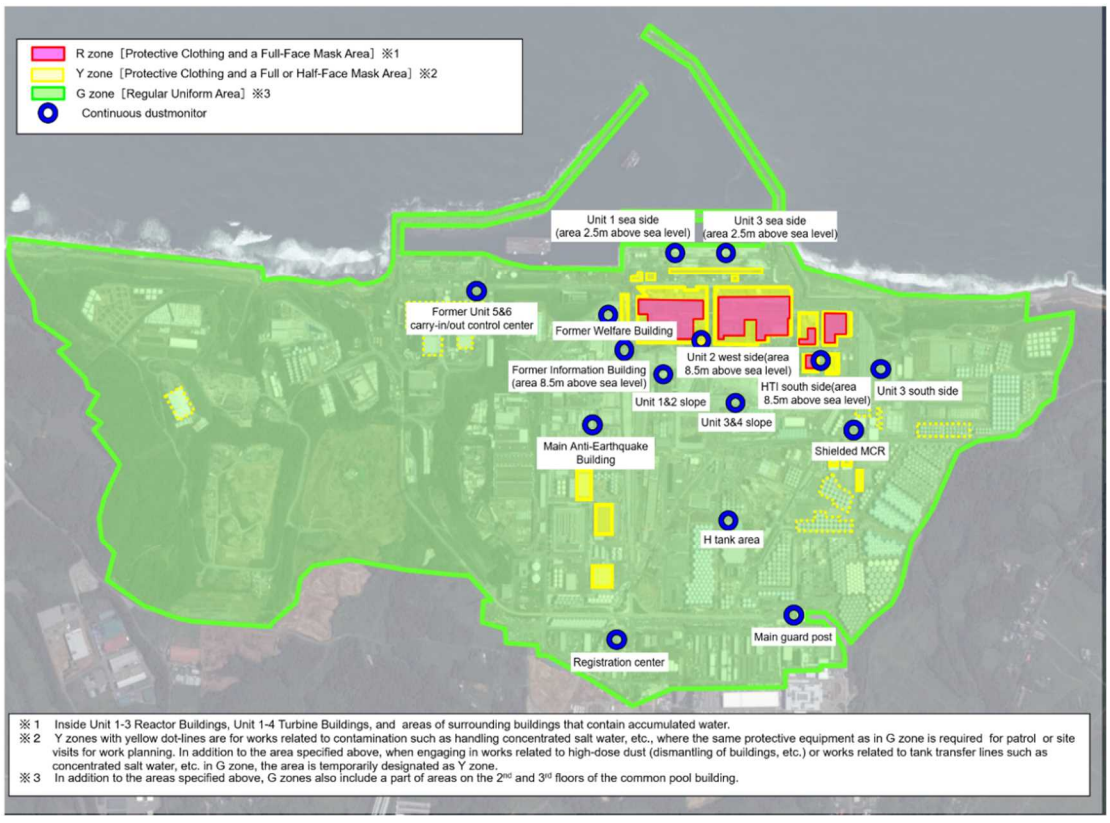
By September 2016, the measures mentioned above led to the reduction of the dose rate at the height of the chest or ground surface became 5 μSv/h or less at most of the site except some areas such as around unit 1 through 4 buildings. Along with the dose reduction at the site, while the average monthly exposure dose rate of workers in FY 2012 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 changed to the areas where work is performed so that workers can grasp the air dose rate at work locations.

On the other hand, areas of high dose rates remain around the reactor buildings, being obstacles to decommissioning work. 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 with a large amount of air, and then, measure and monitor the concentration of radioactive materials at its release. In the case of liquid waste, licensees reduce the concentration of radioactive material as much as possible by filtration, evaporation, adsorption by ion exchange resin method, radioactive decay over time, or dilution with a large amount of water in a drainage facility, and then, measure and monitor the concentration of radioactive materials at 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 Surrounding Monitored Area shall not be exceeded. To ensure that release levels are below the legal limits outside the Surrounding Monitored Area, licensees set the control limits based on the annual release quantity specified by laws and regulations.

Furthermore, licensees set a limit for the exposure dose limit of the public living near nuclear facilities (dose limit) 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 set an allowable annual volume or an average rate of the release as a control limit for the release of radioactive material to meet the dose limit and describe it in Operational Safety Program subject to approval by the NRA. In Nuclear Regulatory Inspections, the NRA checks the safety activities of licensees including the 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 that have negligible impact on human health with negligible low doses 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 to clear the materials which have negligible impact on human health with negligible low doses from the regulation of the Reactor Regulation Act. This clearance level is set for 257

types of radionuclides of artificial origin defined in the IAEA General Safety Requirements No. GSR Part 3 and for 17 types of radionuclides originally defined by the NRA as well. 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) divided by individual clearance level (C) is less than 1 ($\Sigma D/C \leq 1$).

The clearance system in Japanese regulation has 2 steps: 1) approval of methods for measuring and evaluating radioactivity concentrations; and 2) confirmation by the NRA.

In the first step, the NRA reviews an application indicating a selection of radionuclide(s) to be evaluated, measurement equipment and conditions the licensees use, and an uncertainty quantification associated with measurement. 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 the summation of D/C in descending order of D/C.
- Maximum weight for evaluation unit: the maximum weight of the 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, utilization of nuclide composition, sampling analysis, and statistic processing are conducted. With appropriate evaluation of uncertainties in the above work, the upper limit of Σ D/C shall not exceed 1 when the 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 a reference source is used, appropriate geometry shall be maintained at the measurement.

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

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

Chubu Electric Power Co., Chugoku Electric Power Co., Kansai Electric Power Co.,

Japan Atomic Power Co., and the JAEA have submitted 12 applications in total for approval of methods for measurement and evaluation of the concentration of radioactivity. The NRA has reviewed and approved eight applications as of June 2020. The Agency for Natural Resources and Energy (ANRE) and Fukui Prefecture are planning a project to centralised dispose of clearance waste from decommissioning wastes of NPPs. The NRA decided to confirm the position of the plan in terms of utilization policy from the viewpoint of safety regulation and to discuss legal and technical issues at the open meetings. For this purpose, the NRA held three open meetings with the ANRE, Fukui Prefecture, and licensees of NPPs in July and October 2023 and February 2024.

The NRA examined the regulation for clearance of uranium waste, based on the IAEA General Safety Requirement No. GSR Part 3 "Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards" and the EU Council Directive 2013/59/EURATOM about the concept of clearance for radionuclides of natural origins and artificial origin. As a result of this examination, "Concept of Regulations Concerning the Clearance and Burial of Uranium Wastes" was decided in March 2021. Based on this concept, the NRA Ordinance for Clearance Regulation was revised in September 2021. (See E2-3-3 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 to 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 the public, local governments in prefectures where reactor facilities are located also conduct radiation monitoring around the nuclear facilities.

After TEPCO Fukushima Daiichi NPS accident, the GoJ developed a "Comprehensive Radiation Monitoring Plan" in August 2011 to ensure systematic implementation of environmental radiation monitoring related to the accident. After series of revisions, the 14th edition was published in March 2024. Environmental radiation monitoring is being conducted collaboratively by relevant ministries and the local government of Fukushima Prefecture per the Comprehensive Radiation Monitoring Plan.

Environmental radiation monitoring data are uploaded on the website of the Monitoring Information of Environmental Radioactivity Level (https://radioactivity.nra.go.jp/en), which is run by the NRA, enabling the public to see the data in real-time in Japanese. Furthermore, in August 2019, Japan agreed to exchange 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.

Additionally, Japan has performed inter-laboratory comparisons (ILC) with support from the IAEA's Marine Environment Laboratories to improve international credibility and transparency of monitoring, data of the sea area around Fukushima. The IAEA and Japan have collected marine samples collaboratively at the same location in each year since 2014. They have individually analysed the samples, and mutually confirmed the results. The IAEA reported that the Japanese analysis institutions had high level of accuracy and competence. According to the latest report released by the IAEA in January 2024, the IAEA reported that Japan's marine sample collection procedures followed the appropriate methodological standards required to obtain representative samples, and that the Japanese institutions which participated in the analysis of radionuclides in marine samples in sea area monitoring programs had high level of accuracy and competence.

The IAEA has also conducted comparative evaluation as a part of its review of safety related aspects of handling of ALPS treated water at TEPCO Fukushima Daiichi NPS in order to collaborate the results of the sea area monitoring since 2020.

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 the discharge of gaseous radioactive waste, or 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 spent fuel reprocessing facilities, it is

prescribed that doses due to the discharge of liquid radioactive waste monitored at the ocean release facility shall not exceed the dose limit for three months. The rules also stipulate that licensees shall immediately report to the NRA when any of these limits are exceeded, and report within ten days on details of the event and the corrective measures to be taken.

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

Licensees establish in Operational Safety Program the measures to be taken in the event of an emergency; these include 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 spent fuel reprocessing facilities with a relatively large inventory of radioactive materials, it is stipulated that a fire or explosion due to fine metal particles from fuel cladding or organic solvents, criticality accidents, leakage or loss of function due to damage or failure of equipment or piping, or spent fuel handling failure shall not cause the risk of excessive radiation exposure to the public.
When an event prescribed in Article 10 of the Act for Special Measures Concerning Nuclear Emergency Preparedness, i.e. detection of radiation dose more than 5μSv/h, occurs around the boundary of a nuclear facility, emergency activities shall be initiated according to the procedure under 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. In addition, when there is a risk of radiation damage or real damage occurs during the use or transport of radioactive materials, it is obligatory to take emergency measures such as rescue and evacuation of those who have suffered radiation damage, prevention and removal of contamination, prohibition of entry into areas.

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

F5-1-1 Precautionary Protective Measures

Based on the Nuclear Emergency Act, nuclear licensees have the responsibility of preventing the occurrence and expansion of a nuclear emergency and taking action for recovery from a nuclear emergency. Licensees shall develop their EPR plan for each nuclear site and, before its development, shall consult with the governor and the mayor where the nuclear facility is located, as well as with the governors of the neighbouring prefectures. After developing the plan, licensees shall submit it to the Prime Minister 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 the prevention of occurrence or mitigation of a nuclear emergency.

Licensees shall 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 shall be notified to the NRA. The NRA may order licensees to establish a nuclear emergency preparedness organization, allocate nuclear emergency preparedness personnel, and appoint or dismiss the nuclear emergency preparedness manager or deputy manager if they violate these requirements.

Upon the occurrence of an event specified in the Cabinet Order, the nuclear emergency preparedness managers shall report it to the Prime Minister, the NRA, the governor, and the head of the city, town, or village where the nuclear facility is located, as well as to the governors of the neighbouring 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 are called specified events.

Licensees are obliged 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 violate these requirements. Licensees shall 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 centre for emergency response actions and post-nuclear emergency actions. This facility is called an Off-site Centre. 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 Centre.

The Government's emergency exercises are conducted following the plan developed by the Prime Minister.

Licensees shall 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 the prevention or mitigation of a nuclear emergency.

The Nuclear Emergency Act provides for the obligation of other licensees to strive to cooperate. Licensees shall 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.

F5-1-2 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 or 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, a 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, that requires the Article 10 Notification, occurs, the nuclear emergency preparedness manager must immediately order the nuclear emergency preparedness organization to take emergency actions for the prevention or mitigation of a nuclear emergency. Licensees shall report the summary of the actions to the Prime Minister, the NRA, the governor, and the head of the city, town, or village where the nuclear facility is located, as well as to the governors of the neighbouring prefectures.

F5-1-3 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 shall 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 comprehensively. In the Basic Disaster Management Plan, the section on 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 outlined in the Basic Disaster Management Plan:

- Precautionary protective measures: ensuring the safety of facilities; disseminating knowledge of disaster prevention; promoting research 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: cancelling 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 the Act on Special Measures Concerning Nuclear Emergency Preparedness. Local governments provide basic measures in the plans based on the 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 shall 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 heads 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 smoothly. 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 on 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

F5-3-1-1 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 depends 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 Emergency Response Zone is basically to be established for each facility considering its inherent risk and the degree of potential impact at the time of the accident.
The Nuclear Emergency Response Zone is divided into 2 areas: the Precautionary Action Zone (PAZ) is an 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 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 Emergency Response Zone 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 that store spent fuel only in dry casks), radioactive waste disposal facilities, and waste storage facilities, no Nuclear Emergency Response Zone is required since the threat assessment demonstrated that no event requiring off-site protective actions is assumed.

F5-3-1-2 Nuclear Emergency Category and Emergency Action Level (EAL)

In Japan, emergency situations are divided into three 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 shall 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 shall 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 shall 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 shall 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 shall enhance the information collection activities to grasp the development of the event by emergency monitoring and other means and, mainly in the PAZ, shall 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 expansion of nuclear disasters and report on the outline of such measures. The Government shall 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 shall 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 shall 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 three emergency categories and for each of three 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 facilities, which is the scope of the 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 for 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.

F5-3-1-3 Operational Intervention Level (OIL)

In a GE, after the 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 the 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

<table>
<tr><th></th><th>Classification</th><th>Description</th><th colspan="3">Default Values</th><th>Outline of Protective actions</th></tr>
<tr><td rowspan="2">Urgent protective actions</td><td>OIL1</td><td>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</td><td colspan="3">500μSv/h
(Air radiation dose rate when measured 1m above the ground)</td><td>Identification of zones within a few hours and subsequent evacuation (including ordering those who cannot easily move to shelter indoors temporarily)</td></tr>
<tr><td>OIL4</td><td>Criteria for conducting decontamination to prevent inadvertent ingestion intake and external exposure via skin contamination</td><td colspan="3">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)</td><td>Contamination screening of those who are ordered evacuation or relocation and prompt primary decontamination when the results exceed the criteria</td></tr>
<tr><td>Early protective actions</td><td>OIL2</td><td>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</td><td colspan="3">20μSv/h
(Air radiation dose rate measured at 1m from ground)</td><td>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</td></tr>
<tr><td rowspan="2">Restriction on intake of food and drink</td><td>Food and drink screening standards (corresponding to OIL3)</td><td>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</td><td colspan="3">0.5μSv/h
(Air radiation dose rate measured at 1m from ground)</td><td>Identification of zones where radionuclide concentrations in food and drink should be measured</td></tr>
<tr><td>OIL6</td><td>Criteria when restricting</td><td>Nuclide</td><td>Drinking water,</td><td>Vegetables, cereals,</td><td>Screening and analysis</td></tr>
</table>

	Classification	Description	Default Values			Outline of Protective actions
		food and drink intake in order to prevent radiation exposure via ingestion intake		milk, dairy products	meat, eggs, fish, other	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	

F5-3-1-4 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 provide the basis for appropriately implementing protective actions for residents and those engaged in disaster prevention work. Measures will be taken to prevent the 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 Centre in the Off-site Centre 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 Centre consists of the Government, the prefecture where the nuclear facility is located, the neighbouring 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.

F5-3-1-5 Development of Medical Care in a Nuclear Emergency

Medical care allows specified first-aid emergency healthcare institutions to provide healthcare in a nuclear emergency and a chain of command is in place even under normal circumstances to provide necessary healthcare 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 Centre" 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 Centre" which assumes a central and leading role among Advanced Radiation Emergency Medical Support Centres; and "Nuclear Emergency Medical Support Centre" 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 Centres, Advanced Radiation Emergency Medical Support Centres, and Nuclear Emergency Medical Support Centres, and reviews them for compliance with the facility requirements basically every three years. The prefecture and the city, town, or village within the Priority Area for Nuclear Disaster Prevention Measures designates and registers Nuclear Emergency Core Hospitals and Nuclear Emergency Medical Cooperative Institutions, and reviews them for compliance with the facility requirements basically every three years.

F5-3-1-6 Intake of Stable Iodine

To prevent or reduce internal exposure to the thyroid from radioiodine in a nuclear emergency, intake of stable iodine at an appropriate time is important. Thus, in PAZ, immediate evacuation and intake of stable iodine are to be executed as precautionary protective actions in the event of a 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 a 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 centres on the way to 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.

F5-3-1-7 Thyroid Gland Dose Monitoring

In April 2022, the Nuclear Emergency Response Guidelines stipulated that thyroid gland dose monitoring should be carried out to measure gamma rays from the thyroid gland among residents under 19 years old and pregnant women who were temporarily relocated by the OIL at the time of the nuclear disaster. Since thyroid gland dose monitoring requires a large number of personnel and equipment, the prefectures where thyroid gland monitoring is located should promote the construction of an implementation system.

F5-3-1-8 Setting-up of an Off-Site Centre

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 Centre as a centre for implementing nuclear emergency response actions in a coordinated manner in the area where the nuclear facility is located.

The Off-site Centre 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

F5-3-2-1 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 is 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.

F5-3-2-2 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 Centre, make a request for the necessary personnel under the mobilization plan, and start emergency monitoring.

F5-3-2-3 Evacuation, Temporary Relocation and Sheltering-in-Place

If an abnormal level of radioactive material and radiation is released or is 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 materials 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

Concerning nuclear emergency exercises, there are various kinds including the one conducted by the Government based on the Nuclear Emergency Act, and the one by local administrative agencies based on the Disaster Countermeasures Basic Act. To check the effectiveness of emergency response systems per 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, and nuclear licensees, has been conducted mainly for nuclear power reactors. The most recent drill was carried out for 3 days in November 2019 in the Shimane region, which concerned 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

Under the Nuclear Emergency Act, licensees shall conduct nuclear emergency exercises, report the results of the exercises to the NRA, and disclose the summary.
Activities in the exercises of licensees include scenarios without pre-shared training and sharing of good practices 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 to severe accidents to ensure that upon nuclear emergency, emergency actions to secure power supply and water sources will be taken promptly and appropriately; 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 centre and media relations.

The Nuclear Emergency Act requires that a licensee 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 the 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 develops indices for the evaluation of nuclear operator emergency exercises and evaluates the exercises, open to the public to lead to 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 the 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-Defence Forces, and nuclear operators should participate. 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, the national government conducts several trainings (for beginners, for drivers of transport services, e.g. bus drivers, for nuclear emergency preparedness headquarters staff), and tabletop exercises at headquarters 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. According 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 Neighbouring 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 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 disaster management plans to the residents before 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 residents. Press briefings, covered in television and radio broadcasts, will be held as required at the local Off-site Centres and the Emergency Response Centre 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 Neighbouring Countries

Japan is an island nation surrounded by ocean in East Asia and shares no land borders with any countries. However, since its neighbouring 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 in Japan, China, and South Korea in August 2008. In 2015, the three countries organized a 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 the 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 Neighbouring 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 neighbouring country, the 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.

Concerning 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 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 the decommissioning start. This Operational Safety Program clarifies the staff, organization, and 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 the knowledge necessary for operational safety management. The NRA checks the safety activities of licensees, including conformity to the Operational Safety Program in Nuclear Regulatory Inspection.

F-6-1-2 Financial Resources

The " Spent Nuclear Fuel Reprocessing Fund Act " was revised by the "GX Decarbonized Power Source Law" enacted in May 2023. As a result, the name of "Nuclear Reprocessing Organization of Japan" was changed to " Nuclear Reprocessing and Decommissioning facilitation Organization of Japan " and decommissioning promotion activities such as comprehensive coordination of nationwide decommissioning, joint implementation of research and development and equipment procurement related to decommissioning, and management of funds necessary for decommissioning were added to the activities to be conducted by the said organization. In addition, the new act requires electric utilities to pay a decommissioning

contribution to the Organization in order to cover the costs required for the decommissioning promotion work to be performed by the Organization.

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 Nuclear Emergency Act, to prepare for emergency response, unless they are excluded by the NRA's approval and designation.

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 the method, period and the name of equipment decommissioned, as each process of decommissioning work is finished.

This allows 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.

For facilities that use radioactive material, etc., and for the discontinuance of their use, it is necessary to submit a notification at the time of discontinuance, to prepare a decommissioning plan, to transfer radioactive material, etc., to remove contamination, etc., by a decommissioning plan, and to submit a report in the completion of measures after the discontinuance.

F-6-5 Decommissioning of Facilities Requiring Special Consideration for Safety

Regarding the decommissioning of the facilities which requires special safety consideration, the NRA establishes the safety oversight team and continuously confirms the status of the licensee's efforts to ensure safety for decommissioning. Concretely, the "Safety Oversight Team for Prototype Fast Breeder Reactor Monju Decommissioning" for the decommissioning needs special attention for the treatment of Sodium and the "Safety Oversight Team for Tokai Reprocessing Facility and Other Facilities" for the said facility which has suspended the vitrification of the high-level liquid radwaste which contains a high concentration of radioactive materials were established.

As for Monju, the safety oversight team was established in January 2017. The said team reviewed the decommissioning plan and kept up with the status of the implementation of the removal work of fuel assemblies at the meetings. The JAEA completed the transfer of all 530 fuel assemblies from the reactor vessel and other facilities by FY 2022 and finished the first stage of the decommissioning work. In FY 2023, the JAEA shifted to the second stage of the preparation period for dismantling and started the removal of 599 shielding plates in total from the reactor vessel and other facilities, and the dismantling of water and steam systems for power generation as the first half of the second stage of decommissioning work. The transfer of the shielding plates from the reactor vessel and other facilities to the fuel pond commenced in June 2023 and completed the transfer of 14 plates by the end of March 2024. The safety oversight team also conducts on-site observations.

As for JAEA's Tokai Reprocessing Facility, the safety oversight team, established in January 2016, has reviewed the decommissioning plan and confirmed the status of implementation of the vitrification for risk reduction and confirmed the measures against Tsunami and earthquake at the meetings. In April 2019, the "JAEA Back-end Measures Monitoring Team" was established, separating from the "Safety Oversight Team for Tokai Reprocessing Facility and Other Facilities" and the reorganized "Safety Oversight Team for Tokai Reprocessing Facility and Other Facilities" continues to monitor issues related to the decommissioning of Tokai Reprocessing Facility. As for the vitrification of high level radioactive liquid waste, it had been restarted in January 2016 and was operated intermittently. However, the operation has been suspended since October 2022 due to the fault of the melting furnace and the replacement of the melting furnace has been in progress at the time of March 2024. The restart of the

vitrification facility is expected in the first quarter of FY 2026, considering the status of the renewal work of equipment. As for the manufacturing of the vitrificated product, it has been rescheduled to be completed in FY 2038, being revised from the original schedule of FY 2028 based on the status of vitrification implemented so far. As for other works than the vitrification, the washing of the reprocessing system to remove the radioactive waste residues in the equipment was completed in February 2024. Hereafter the equipment after decontamination would be dismantled one by one and the whole decommissioning would be completed in about 70 years. As for the safety countermeasures against Tsunami and the earthquake, it is prioritized on the measures against the high radioactive liquid waste storage plant and the solidification technical development facility. The basement improvement and the Tsunami protection fence installation were completed by the end of FY 2023 and other works such as measures against Tornado are behind schedule because of the interference of work areas but will be completed in FY 2024.

The newly established "JAEA Back-end Measures Monitoring Team" deals with the extraction of the challenges regarding the back-end issues of aged facilities and radioactive waste management for the entire organization of the JAEA comprehensively and monitors that implementation status. The JAEA established "Decommissioning and Radioactive Waste Management Head Office" to manage a series of back-end activities for the whole organization in a unified manner, utilizing the limited resources and staff, implementing the decommissioning and radwaste management smoothly and systematically, prioritizing the safety as well. The said head office, in cooperation with each sector, conducts technical development for the common challenges, implements its real application, establishes necessary technical standards for each field, develops human resources and works on the model projects. The JAEA assigns the decommissioning of the Reprocessing Special Research Building and the Plutonium Research Building of the Nuclear Science Research Centre as model projects from FY2022 and elaborates on the creation of the success model which completes the decommissioning safely and efficiently by shortening the decommissioning period and reducing cost.

F-6-6 Criteria for Decision on Confirmation of Decommissioning of Nuclear Facilities

In the IAEA Integrated Regulatory Review Service (IRRS) conducted in 2016, it was

recommended to establish criteria to judge whether the release of a nuclear or radiation facility may be permitted at the end of decommissioning because there were no clear criteria to judge the release of a site at the end of decommissioning. This regulatory standard was for the termination of decommissioning of nuclear facilities, and although the legal framework had already been stipulated, the criteria for determining the termination of decommissioning and the methods for confirming the criteria had not been developed.

According to the Reactor Regulation Act, a licensee that intends to decommission nuclear facilities shall implement decommissioning by a decommissioning plan approved by the NRA and receive confirmation from the NRA at the time of completion of decommissioning. A nuclear facility that receives this confirmation loses the validity of the Installation Permit, etc. based on the Reactor Regulation Act, and the regulation on the licensee is terminated.

The NRA Regulations stipulate the following criteria for confirming the completion of decommissioning of nuclear facilities:

- Transfer of nuclear fuel materials has been completed.
- Soil on the site of the facility is subject to decommissioning and the facilities remaining on the site are in a state where no measures to prevent damage from radiation are required.
- Disposal of nuclear fuel materials or materials contaminated with nuclear fuel materials has been completed.
- Delivery of radiation control records to an organization designated by the NRA has been completed.

As for the second item of these, it was necessary to establish criteria to determine whether the situation "does not require the measure to prevent damage due to radiation".

In March 2022, the NRA established the "Regulatory Guide for Judgement of Completion of Decommissioning". The main contents are as follows.

- Concerning site soil that is not likely to be contaminated by the business, if the determination is made based on records of contamination status, it is confirmed

that the site soil is not contaminated by the said business which requires measures to prevent radiation based on the results of radiation measurements.

- Concerning site soil with business-related contamination, based on the records, an area, including areas that are likely to be affected, with business-related contamination in site soil is appropriately designated, soil with business-related contamination, including soil that may be affected, is separated and appropriately removed, and it is confirmed that the average concentration of radioactivity in the soil after the business-related contamination has been removed does not exceed the clearance level.
- Concerning the remaining facilities, in addition to the results of contamination surveys and records of contamination status, etc., it is confirmed that there is no business-related contamination based on the results of radiation measurements in the areas of the remaining facilities that were used as radiation controlled areas or areas with a history of leakage of radioactive materials.

Section G Safety of Spent Fuel Management

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

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

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

Regarding the storage method of spent fuel, the NRA has established the requirements in either the case of dense packing storage by spent fuel pool re-racking or dry storage, referring to the latest scientific knowledge and the IAEA regulatory standards. The methods that have been confirmed to conform to the standards ensure the level of safety required by the standards, so the NRA does not intend to limit the storage method of spent fuel. However, at the same time, the NRA considers that "dry storage" is preferable because it has safety advantages such as cooling by natural convection of air without using water or electricity.

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 Periodic Checks, Approval of Operational Safety Program and Nuclear Regulatory Inspection conducted by the NRA.

Spent fuel reprocessing is a process of retrieving uranium and mixed uranium-

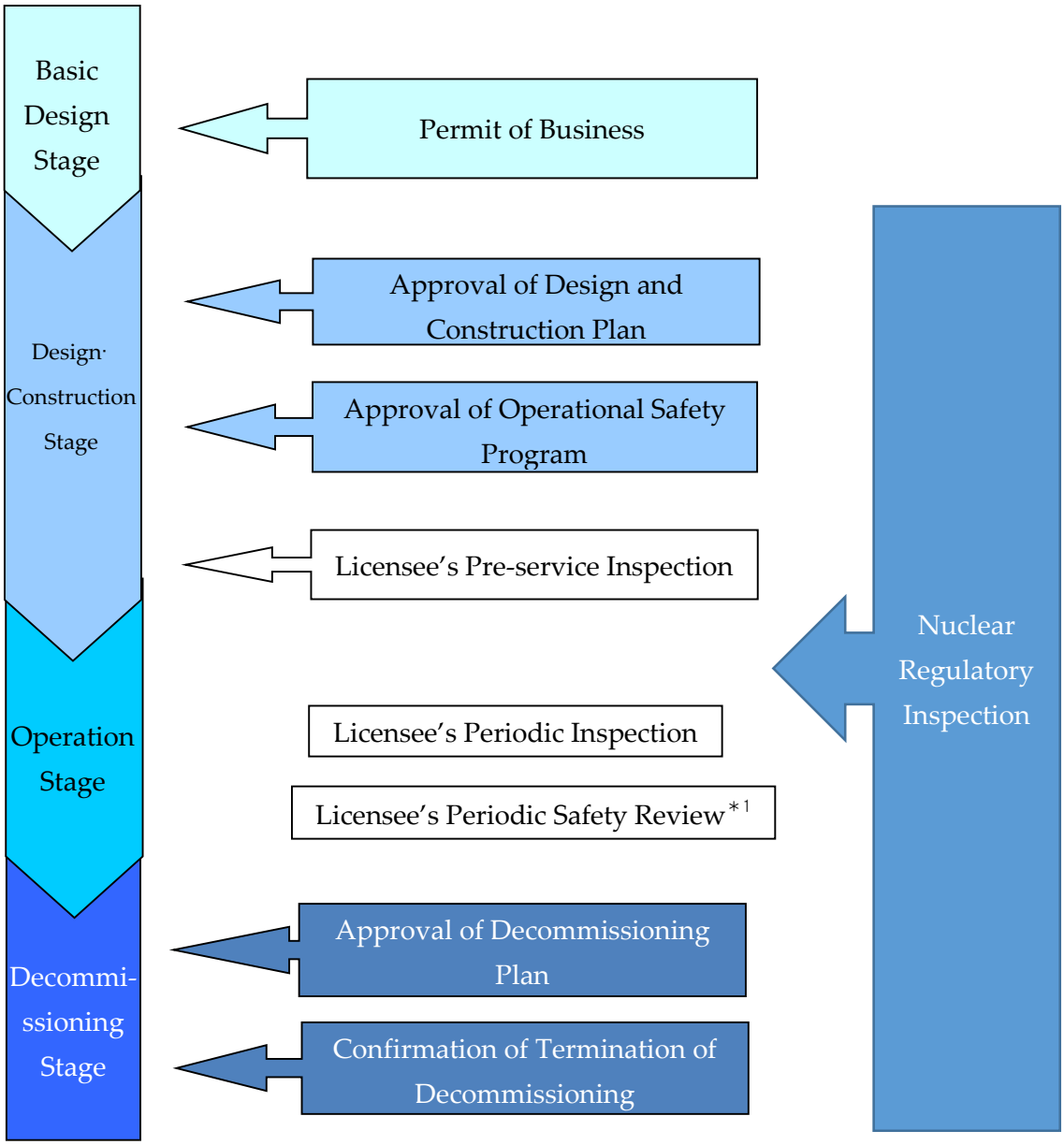
plutonium oxide as useful material by shearing, dissolving, and chemically separating uranium, plutonium, and fission products from spent fuel after a certain period of storage inside the NPPs and spent fuel reprocessing facilities. Retrieved uranium is reprocessed for uranium fuel, and mixed uranium-plutonium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

In Japan, two spent fuel reprocessing facilities hold the Permit of Business.

JNFL Rokkasho Reprocessing Facility obtained a Permit of Business in 1992. Its spent fuel storage facility has already completed its construction in 1999 and has begun operation as reported in B2-1. The spent fuel reprocessing facility is now in the stage of Pre-service Check. The licensee applied for permission to amend its permit in January 2014, following the enforcement of the regulatory requirements established after TEPCO Fukushima Daiichi NPS accident in December 2013. After review meetings and amendments to the application, the NRA permitted the amendment to its permit in July 2020. Consecutively, an application for a design and construction plan was submitted to the NRA in five instruments in total. The first submission, consisting of one out of five instruments of the application, was approved in December 2022. The second submission, consisting of the rest of the instruments of the application, was received in December 2022 and is currently under conformity review by the NRA. Separated fission products generated from the reprocessing processes are vitrified as high level radioactive waste. Transuranic waste (TRU) and low level radioactive waste are generated through the processes. The safety of the reprocessing facilities is reported in this section. The disposal of radioactive waste including those from the reprocessing facilities is stated in Section H.

An application for a design and construction plan for the MOX fuel facility, located next to the Rokkasho Reprocessing Facility, was submitted to the NRA in seven instruments the first of which was approved in September 2022. The second instrument was received in February 2023, and is currently under conformity review. JAEA Tokai Reprocessing Facility is under decommissioning as described in 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 the decay heat of the spent fuel with a passive system.

For equipment with safety functions in spent fuel reprocessing facilities, measures to prevent nuclear fuel material from reaching criticality must be taken by the ways 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 the 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 is anticipated during operation in compliance with regulatory requirements set by the NRA. For facilities that have safety functions, in case two or more single units are located, measures to prevent nuclear fuel material from reaching criticality must be taken by the ways of maintaining the proper layout of respective single units, using neutron shielding between respective single units or by way of combining these so that eliminates the 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 is anticipated during operation.

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

- equipment necessary to achieve and maintain a 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 is pressurized;
- equipment necessary to mitigate the impact due to the 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 the decay heat of spent fuel safely, and product storage facilities are required to be constructed in such a way that the 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 issued a technical document explaining design examples to consider minimizing the generation of radioactive waste and incorporate them into the

implementation of Decommissioning Policy explained in E-2-2 and the inspection system so that licensees are encouraged to take proactive actions.
Licensees of commercial power reactors make efforts to reduce the amount of radioactive waste generated as much as possible by adopting low activation materials at the time of construction and replacement of facilities, and also by implementing treatment such as segregation, decontamination, and volume reduction when radioactive waste is generated.

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

Spent fuel is stored in spent fuel storage facilities at NPP for a certain period after it is taken out of the reactor core and is under the regulation for nuclear reactors. The period for spent fuel to be stored in the spent fuel interim storage facility after transport is stipulated as spent fuel interim storage business, and the period for spent fuel to be stored and reprocessed in the 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 under the spirit of the Atomic Energy Basic Act. Its objective includes ensuring public safety by preventing hazards resulting from nuclear source material, nuclear fuel material, and nuclear reactors. Thus, the Reactor Regulation Act stipulates 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 require the prevention of damage due to external impacts such as natural phenomena.

Moreover, for spent fuel reprocessing facility, regulatory requirements set by the NRA require that safety functions 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 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 interim 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 Convention entered into force in Japan on November 24, 2003. At that time, the spent fuel management facility with license was the reprocessing facilities. Japan confirmed that the obligations described in the Convention were fulfilled by the national law and regulations when it joined the 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 Requirements 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 the 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 facilities, spent fuel reprocessing facilities, radioactive waste interim 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 to existing Business Permit, the review of Design and Construction Plan, and the review of Operational Safety Program.

The regulatory requirements request 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 phenomena as other safety measures. Existing nuclear facilities are required to comply with them. In the review of the application for the amendment to the operating license, the NRA reviews that the location, structure, and equipment of spent fuel storage interim facilities and the technical competence of licensees conform to the Licensing Requirements.

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

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

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

Licensees are required to conduct a Periodic Assessment in compliance with the 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 a period that doesn't exceed 10 years.

G-2-1-2 Reprocessing Facilities

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

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

In the up-to-date regulatory requirements for spent fuel 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 to Business Permit, the NRA reviews the location, structure, and equipment of the reprocessing facilities, and whether the technical competence of licensees of spent fuel reprocessing facilities is compliant with the Licensing Requirements.

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

In the review of the Operational Safety Program, the NRA reviews that licensees take measures to comply with the 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 spent fuel reprocessing facilities.

For spent fuel reprocessing facilities in which the Business Permit, Design and Construction Plan, and Operational Safety Program are authorized through conformity review, the NRA confirms Licensee's Pre-service Check if the facility conforms to the Approved Design and Construction Plan as well as the Technical Requirements, by Nuclear Regulatory Inspection.

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 for Periodic Safety Assessment of Continuous Improvement were introduced. In this system, licensees are required to evaluate the safety of their facility by itself every time within six months after the completion of its periodic inspection and are 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 spent fuel reprocessing facility.

For the other nuclear fuel facilities, licensees are required to evaluate the safety of their facilities periodically following the regulations for each activity. For instance, licensees of spent fuel interim storage business are required to evaluate the 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 every ten years per 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 evaluations.

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 a Permit from the NRA according 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 the spent fuel interim storage facility, and the storage method, to the NRA. Documents concerning the conditions of weather, ground, hydrologic, seismic, and social conditions at the site of the spent fuel interim storage facility are requested to be submitted as a part of the attachment of the application.

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

The applicable scope of this requirement is a spent fuel interim storage facility adopting a metallic dry cask for the transportation and storage of spent fuel.

In the Licensing Requirements, 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 Requirements require 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 for the permit of spent fuel interim storage business, e.g. accepting audience to a meeting, live streaming on YouTube, 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 a Permit of Business according to the Reactor Regulation Act. Any person who intends to obtain a Permit shall submit 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 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 a permit unless it confirms that the location, structure, and equipment of the facility conform to the Licensing Requirements.

The Licensing Requirements stipulate 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. Spent fuel 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 Requirements stipulate installing the facility for measures to manage severe accidents.

The NRA discloses conformity review of a reprocessing business, e.g. accepting audiences to a meeting, live streaming on YouTube, 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 neighbouring countries. Moreover, the spent fuel management facilities in Japan are located in a place with sufficient distance from the land of neighbouring 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 a 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 Requirements and gives Approval.

With the limitation of radiation impact that might influence individuals, society, and the environment, the Technical Requirements require that the metallic cask shall have a structure that does not leak spent fuel material and that a 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, a 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 the water at the boundary of Surrounding Monitored Area be equal or below the value defined by the NRA.

The technology used for the design and construction of spent fuel interim storage facilities is evaluated in the process of the review of the Design and Construction Plan. Licensees must prove that the design of the facility complies with the Technical

Requirements, 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 the 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 a 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 the permitted business license and the Technical Requirements, and gives Approval.

With the limitation of radiation impact that might influence individuals, society and the environment, the Technical Requirements require that equipment with safety function shall have a structure to maintain confinement and that reprocessing facilities 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 reprocessing facilities concerned during operation and outage, and that the equipment shall be capable to dispose of the radioactive waste to keep the concentration of radioactive substance in the air outside of the Surrounding Monitored Area and the dose rate of a 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 substances and radiation to the outside of reprocessing facilities in case of a severe accident.

The technology used for the design and construction of spent fuel reprocessing facilities is evaluated in the process of the review of the Design and Construction Plan. Licensees of reprocessing business must prove that the design of the facility complies with the Technical Requirements, 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, and intended usage method.

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

As described in E2-2, due to the revision of the Reactor Regulation Act in 2017, licensees of spent fuel interim storage facility and spent fuel reprocessing facility must establish and publicly disclose a Decommissioning Policy immediately after licensing. In the Decommissioning Policy, the method of dismantlement of the facility, decontamination, plan, and timeline of decommissioning are described, and a 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 per 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 for the licensing and design/construction phase for spent fuel interim storage facilities are described in Section G3 and Section G4 and through these processes, the safety assessment is conducted. Licensees conduct Pre-service Check and the NRA confirms it before commencement of use as reported in Section G6-1. This confirms the fulfillment of the performance based on the safety assessment carried out before construction.

Concretely, the person who intends to obtain a Permit of Business for the spent fuel interim storage business 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 an accident at spent fuel interim storage facility, those assumed to be caused in case of misoperation, 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 Requirements, 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 are required for each equipment are described. A systematic evaluation concerning safety is performed following 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 a document that explains that the Design and Construction Plan is compliant with the Technical Requirements. When the NRA permits the application, these documents are also reviewed. In the Technical Requirements, the performance needed for the facility is 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. A systematic evaluation concerning safety is performed per the Technical Requirements. 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 for the licensing and design/construction phase for spent fuel reprocessing facilities are described in G3 and G4 and through these processes, the safety assessment is carried out. Licensees conduct Pre-service Check and the NRA confirms it before commencement of the use as reported in G6-2. This confirms the fulfillment of the performance based on the safety assessment carried out before construction.

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

- Necessary facilities as a measure 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 measure and organization for severe accidents and for accidents to potentially become severe accidents, 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 the licensing process. The Licensing Requirements stipulate 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 accidents, prevention of damage by fire, earthquake, tsunami, and performance of severe accident management facility. To grant a Permit, a systematic evaluation of the application is performed in line with these requirements.

After obtaining a Permit of Business, licensees of spent fuel reprocessing facilities are required to obtain Approval for the 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 the Design and Construction Plan is consistent with the requirements of the Technical Requirements in the process of approval. When the NRA approves the application, these documents are also reviewed. In the Technical Requirements, 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 per the regulatory requirements. At this phase, evaluation is performed based on the specific design for the concrete equipment, so is more detailed than that of the 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

Under the Reactor Regulation Act, licensees cannot start operation without conducting Pre-service Check and receiving its confirmation from NRA. Licensee's Pre-service Check confirms whether construction and functions comply with Design and Construction Plan approved by the NRA and the Technical Requirements.

Licensees should obtain Approval of the 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 not exceeding one year. The main items to be indicated in the Operational Safety Program are a system for operational safety, a 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 a Periodic Check to confirm 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 the 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, shielding, decay heat removal function or function for prevention of fire or explosion in spent fuel interim storage facility, 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, or 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 the above functions.

Acceptance criteria for Approval of Decommissioning Plan are that spent fuel has been already removed from the 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

Under the Reactor Regulation Act, licensees of spent fuel reprocessing facilities cannot start operation without conducting Pre-service Check and receiving its confirmation from the NRA. Licensee's Pre-service Check confirms whether construction and functions comply with Design and Construction Plan approved by the NRA and the Technical Requirements.

Licensees of spent fuel 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 revoking permits or suspending the operation of facilities not exceeding one year. The main items to be indicated in the Operational Safety Program are a system for operational safety, a 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 spent fuel reprocessing facilities shall conduct Periodic Check whether facilities are maintained to comply with the NRA's regulatory requirements and shall report the plan and result to the NRA. 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 occur in the same manner as spent fuel interim storage facility explained in G6-1.

In the case of decommissioning spent fuel 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 the spent fuel interim storage facility explained in G6-1. Acceptance criteria for Approval of Decommissioning Plan are that nuclear fuel material is removed from the main process of the reprocessing plant, management and transfer of spent fuel, material separated from nuclear fuel material or spent fuel is 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

Under 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 G2.
If a safety-significant event occurs, licensees are required to report this to the NRA without delay, by the provisions of the Reactor Regulation Act. After examining the cause and developing measures for 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 a 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 F3-1, licensees are required to establish a quality management system in the Operational Safety Program according to quality management requirements. Corrective actions and preventive actions are taken in the quality management system. Operational experiences obtained not only from their 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 and strives to extract lessons learned for enhancing safety. As necessary, the NRA requests licensees to reflect the lessons learned in operational safety and reflect them in regulatory activities.
In the information collection and analysis process in the Secretariat of the NRA, through the first step of the screening process, information possibly related to the regulation of Japan is chosen from the collected information, and through the second step of the screening process, "technical information which needs measure to be taken" is selected. The Secretariat of the NRA studies the "technical information which needs measure to be taken" and develops the measure in the Technical Information Study Committee periodically held, reports to the Reactor Safety Examination Committee and the Nuclear Fuel Safety Examination Committee periodically, gets advice and report to the NRA Committee periodically. Through such a process, a variety of domestic and foreign experiences and knowledge are collected, analyzed, and reflected in the regulation in Japan.
Licensees manage the Nuclear Information Archives, a database for nuclear facilities'

information that is disclosed to the public, cooperating with the Japan Nuclear Safety Institute (JANSI). The database of the Nuclear Information Archives contains operating information from the first nuclear power reactor in 1966 to the current reactors or reprocessing plants and is shared not only by licensees but also by the public for transparency.

In addition to that, as for the collection, analysis, assessment, and utilization of operating information among licensees, JANSI, as a third party that is independent of atomic energy activity operators, collects domestic and abroad information such as events at nuclear facilities, analyse, 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 has 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, whose main purpose is the 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 in this item.

The Reactor Regulation Act stipulates requirements, for the 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 before construction work, licensees' obligation to conduct Pre-service and Periodic Check, Approval of Operational Safety Program and Nuclear Regulatory Inspection by the NRA. Under the Act, regulatory requirements are established as the NRA Ordinance: Licensing Requirements for the stage of Permit of Business, and Technical Requirements 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 Pre-service and Periodic Check, Approval of Operational Safety Program and Nuclear Regulatory Inspection by the NRA.

As reported in E2-2, the radioactive waste management business regulated under the Reactor Regulation Act is 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 the waste interim storage business, a facility that handles over 3.7 TBq of nuclear fuel material or material contaminated with nuclear fuel material is defined as a specified waste storage facility, and currently licensed two waste interim storage facilities are both in this definition. A specified waste interim storage facility is required to obtain Approval of the Design and Construction Plan before commencing construction work, and the above-mentioned Technical Requirements have been established for specified waste storage facilities. As such, this section reports mainly on specified waste interim storage facilities. Two licensed facilities: the Waste Storage

Facility of JNFL and, the Waste Storage Facility of JAEA Oarai Research & Development Institute, submitted applications on compliance with the regulatory requirements; the former facility obtained Permit in August 2020 and the latter obtained Permit in August 2018. The NRA received approval applications for the design and construction plans from JNFL in December 2022 and from the Oarai Research Institute of JAEA in September 2017. The former stores vitrified waste canisters generated from spent fuel reprocessing in the UK or France, which was reported in B4-1.

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

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

There are four licensed Cat-2 waste disposal facilities: Waste Disposal Facility Unit 1, 2, and 3 of the JNFL, and Waste Disposal Facility of the JAEA Nuclear Science Research Institute. Currently, reviews for the Permit of Business or its amendment are underway for the 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, as described in F6-5, 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 measures for decommissioning and radioactive waste management of aged facilities and continues oversight hearing 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 per 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 radioactive materials shall obtain permission from the NRA per 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 the waste repacking facility, waste storage facility, and disposal facility (radioactive waste management facilities). Upon granting permission, the NRA reviews as to whether radioactive waste management facilities comply with the Technical Requirements per the NRA Ordinance. As for the location, structure, and equipment of each facility, shield wall and other shielding structures, 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 a facility shall be installed at a location where landslide and flooding are not likely to occur, and the major structure of a facility shall be fire-resistant or made from non-combustible materials.

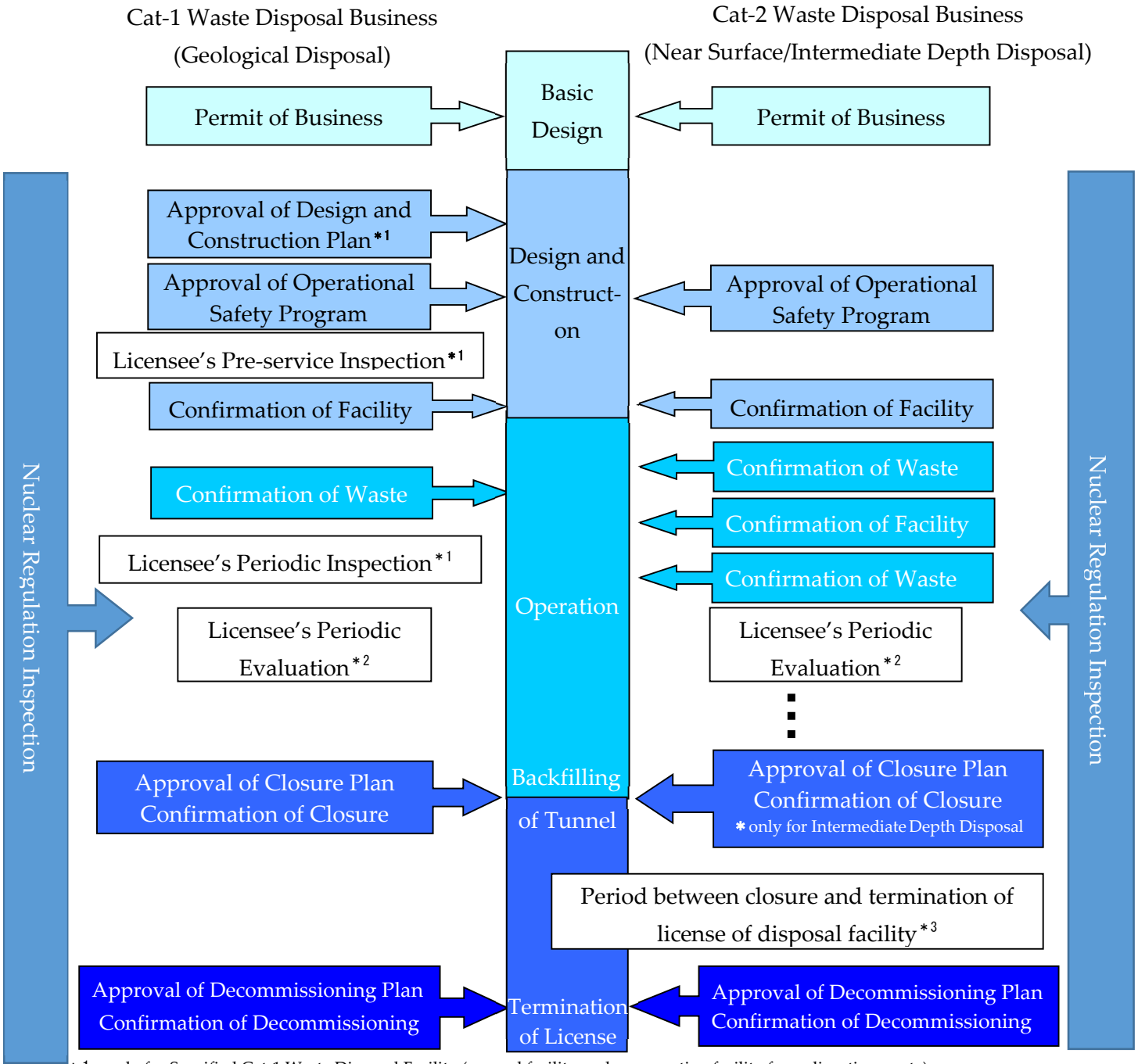
In addition, any person who has been granted permission for waste management business shall undergo and pass facility inspection before the use to be verified whether the radioactive waste management facility complies with the Technical Requirements. Waste management licensees shall prepare the Radiation 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 the commencement of business, and comply with it (for details, refer to Table H4 in Section H6). Furthermore, after starting the use of the facility, licensees shall undergo periodic inspection to be verified whether its facility complies with the Technical Requirements and undergo periodic confirmation as to contamination measurement and recording, description, preservation of records.

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) have enabled the disposal of radioactive materials and radioactive contaminants by disposal licensees under the Reactor Regulation Act rationally (refer to Section E2-3-2).

Radioactive materials, including nuclear fuel materials, and nuclear sources, have been widely used in fields such as research, medicine, industry, and agriculture. However, there are concerns about the safety and management risks of those materials that have already lost their intended use and are being stored without any actual use, and those materials that are not under legal control because their origin and background are not clear. Based on the description "Radioactive materials that are not used and stored are scattered in many private and public establishments throughout the country, and there are many cases where radioactive materials that are not under legal control are discovered. Therefore, there are concerns about the emergence of safety and physical protection risks. To reduce these risks, the relevant administrative agencies, the JAEA, etc. should cooperate and study the specific measures to realize the integrated management of radioactive materials." in the "Basic Policy for Nuclear Energy" (decided by the AEC on February 20, 2023), we discussed the realization of the integrated management of nuclear fuel materials without actual use with the relevant administrative organizations, JAEA, etc.

When such radioactive materials are found in a state where they are not properly managed, the NRA establishes a contact point for consultation on the handling of such radioactive materials and takes measures to ensure that appropriate management is carried out according to the situation.

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 facilities that store radioactive waste that contains more than a certain amount of radioactivity, the NRA regulatory requirements require that the necessary measures 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 G2-1.

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

For example, the NRA Ordinance for 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, including the requirements for which disposal stage are taken into account.

Besides, for relatively high-level radioactive waste such as reactor internals, as a 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 a 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 stages contain the requirements that consider the safety of the following stage.

As stated above, the regulatory system takes 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 following the spirit of the Atomic Energy Basic Act. Its objective includes ensuring public safety by preventing hazards resulting from nuclear source material, nuclear fuel material, and nuclear reactors. Thus, the Reactor Regulation Act stipulates 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 contained in disposed radioactive waste.

H-1-6 Avoidance of Impacts on Future Generations

Regulatory requirements for the prevention of radiation hazards after the termination of the 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 scenarios and human intrusion scenarios 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
	With the most conservative parameters scientifically reasonable	300 μSv/y	300 μSv/y	300 μSv/y
Human intrusion scenario		300 μSv/y	1 mSv/y	20 mSv/y

* Given in the guide, not regulatory requirements

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 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.

In response to the Basic Policy on the Final Disposal of Designated Radioactive Waste (Cabinet Decision in May 2017), the NRA, in August 2022, specified items that should be considered at least in terms of safety assurance based on the information available when selecting the site for the construction of a final disposal facility, targeting events that are difficult to deal with by design of the final disposal facility and that need to be dealt with by avoiding the establishment of the final disposal facility and when selecting the outline survey area for the final disposal site. Details are described in K1-6. In addition, in the Basic Policy, the NRA is to develop regulations to ensure the safety of final disposal.

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.

The Convention came into effect in Japan on November 24, 2003. At that moment, the radioactive waste management facilities that had already obtained Permit for Business included a waste interim storage facility and a 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 to improve safety, examples are reported 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 waste that has an especially high level of radioactivity such as HLW and cladding of spent fuel. Since these kinds of waste contain very high concentrations of radioactive materials, these would be risks to seriously impact the health of humans in case of the failure to maintain 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 the Design and Construction Plan and conduct Periodic Check.

The NRA may order the necessary measures to be taken – back-fitting system – regarding specified Cat-1 waste disposal facility when the location, structure, and equipment of the facility do not meet the requirements stipulated by the NRA Ordinance, or the performance of the facility is not enough compared to the Technical Requirements. Back-fitting system which requires existing nuclear facilities to comply with the regulatory requirements is reported in G2-1.

The same stipulations are also provided for radioactive waste interim storage facilities that handle nuclear material or material contaminated with nuclear fuel material over 3.7 TBq (specified waste storage facility), so a back-fitting system is applied. Regardless of the date on 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 the license,
- with the regular period not exceeding 10 years;
- before the transition of stages (such as the operation stage, and preservation stage);
- before the backfill of the tunnel (applicable for intermediate depth disposal only).
- Take necessary measures for the 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 the license with a regular period not exceeding 20 years and before 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 decommissioning with the regular period not exceeding 10 years;
- Take necessary measures for the maintenance of facilities based on the result of the periodic evaluation stated above.

H-2-2 Past Activities

In Japan, all radioactive waste including those generated from the activities conducted before the date 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 that need intervention for reasons of radiation protection as a result 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 the 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 a Permit from the NRA according to the provisions of the Reactor Regulation Act. The applicant shall submit application documents that describe the required items such as:

- the property and quantity of nuclear fuel material or material contaminated with nuclear fuel material that is 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;

In the case where the applicant intends to obtain a license for a Cat-2 waste disposal business;

- the timing for amendment of the measures taken for the operational safety of

Cat-2 waste disposal by 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 interim storage facility.

In addition, it is stipulated that the application form must be accompanied by a written explanation that describes the details of the application, including the status of weather, ground, hydraulic, earthquake, social environment, etc., the safety design of the facility, radiation exposure management, and the type and effects of the assumed accident.

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

- the applicant has sufficient technical capability and financial basis to properly execute the business;

- 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 under the Licensing Requirements;

- it is found that the system necessary for quality control of operations for safety conforms to regulatory requirements.

Concerning the design of the waste disposal facility to reduce the risk associated with the events assumed not only during 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 compliance with regulatory requirements, including dose standards for the public.

For intermediate depth disposal, it is under consideration to provide the guideline for the Licensing Requirements, that against the natural barrier where access tunnel is set up, back-filling not to create a 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, for intermediate depth disposal, the approval requirements for plans for backfilling of tunnels, blockage of tunnel openings, etc. ("closure measures".) require that the disposal can be closed so as not to significantly expand the leakage of radioactive materials in the event of an abnormal leakage outside the waste disposal site between the completion of closure measures and the start of decommissioning.

Furthermore, for intermediate depth disposal, the design of an underground waste disposal site is required to be formulated after a comparative examination of multiple proposals including different contents in the environment, structure, and other major matters surrounding the waste disposal site. In the comparison, the design that will minimize the dose to the public or the design that has the best performance in suppressing the transfer of radioactive materials to the outside of the waste disposal site is selected from the evaluation that considers the setting of the state of the engineered barrier and the natural barrier to be the most probable.

The Licensing Requirements for Cat-2 waste disposal facilities require that the location of the facility should not be in 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 the license.

The review meetings of the NRA concerning the procedure related to the permission for waste management business, are open to the public, e.g. accepting audience to a meeting, live streaming on YouTube, etc., therefore, the information on the review process and the 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 neighbouring countries. Moreover, the radioactive waste management facilities in Japan are located in a place with sufficient distance from the land of neighbouring countries. 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 a Permit of Business for a 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 the obtained Permit of Business and the Technical Requirements.

Concerning the limit of radiation effect which might threaten an individual, society, and the environment, licensees are required by the Technical Requirements 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 the Design and Construction Plan of the equipment in the 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 Requirements.
The technology used for the design and construction of a specified waste storage facility is evaluated in the process of the review of the Design and Construction Plan. Licensees must prove that the facility is designed to achieve performance that satisfies the Technical Requirements, 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, thus ensuring that the facility complies with the Technical Requirements 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, a surface facility such as a reception facility for radioactive waste out of cat-1 waste disposal facility is defined as a specified cat-1 waste disposal facility, and required to obtain Approval for the 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) that do not fall under the specified cat-1 waste disposal facility are not required to obtain Approval for Design and Construction Plan, but are required to obtain confirmation of the NRA (Confirmation of Facility). In this confirmation, at the construction stage after the Permit of Business, licensees submit an application to the NRA for confirmation as to whether a waste disposal facility is being constructed by the design. The NRA Ordinance for Business requires, in applying for confirmation, the 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 Requirements (stipulated in the NRA Ordinance on Business). The NRA Ordinance on Business mainly stipulates the following criteria as the Technical Requirements.

- 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 the Permit of Business as reported in Section H3-1.

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

As described in 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, the method of dismantlement of the facility, decontamination, plan, and timeline of decommissioning are described, and a 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.

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 procedures before the construction of radioactive waste storage facilities are as reported in Sections H3 and H4, and through these processes, the NRA assesses the safety. Regarding specified waste storage facility, licensees conduct Pre-service Check and the NRA confirms it before commencement of use as reported in H6-1. This confirms the fulfillment of the performance based on the 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, a review of these documents is also included. In the Licensing Requirements, the required performance that waste interim storage facility should have been 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 by these requirements.

Licensees are required to obtain the NRA's Approval of the Design and Construction Plan before starting construction of a specified waste storage facility after obtaining a Permit of Business. In this process of approval, licensees are required to submit a document explaining that, based on the detailed design, the Design and Construction Plan complies with the Technical Requirements. The review of these documents by the NRA is included in the process of approval. In the Technical Requirements, the performance needed for the facility and the performance of each equipment are described, such as prevention of criticality, shielding, confinement, heat removal, and prevention of damage from fire, earthquake, tsunami, and external impact. A systematic evaluation concerning safety is performed by this requirement. 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 the safety of the waste disposal facility is reported in Section H3 and H4. Regarding specified waste disposal facilities (surface facilities such as reception facilities for radioactive waste), licensees conduct Pre-service Check and the NRA confirms it before commencement of use as reported in Section H6-2. This confirms the fulfillment of the performance based on the safety assessment carried out before construction.

H-5-3 Others

In the absence of detailed requirements for decommissioning plans concerning usage facilities, etc., the NRA established in December 2021 examination standards for decommissioning plans for "usage facilities, etc. of nuclear fuel material that do not fall under the category of nuclear fuel material requiring pre-use inspection, etc." (usage facilities, etc. that do not fall under Article 41 of the government Ordinance[3]), which are highly necessary.

These Guidelines require the following for radioactive waste generated during decommissioning;

- It is indicated in the decommissioning plan that radioactive waste will be discharged by exhaust ventilation facilities or drainage facilities or stored and disposed of at a storage disposal facility.
- Until it is disposed of, radioactive waste to be stored and disposed of at a storage disposal facility shall be stored and disposed of at a storage disposal facility with a storage capacity commensurate with the projected generation amount.
- Indicate the disposal destination of the radioactive waste.

[3] Facilities that do not fall under Article 41 of the government ordinance: Facilities that handle less than a certain amount * of uranium or plutonium, such as hospitals and pharmaceutical companies.
Facilities that fall under Article 41 of the government ordinance: Facilities that handle more than a certain amount * of uranium or plutonium, such as nuclear research.
*1 g of plutonium, 1,200 g of uranium 235 amount of enriched uranium less than 5%, etc.

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 facilities that have obtained Approval of the Design and Construction Plan of the NRA cannot start operation without conducting Pre-service Check and receiving its confirmation from the NRA. Pre-service Check confirms whether construction and functions comply with Design and Construction

Plan approved by the NRA and the Technical Requirements. In the Technical Requirements, the required function of confinement, shielding, heat removal, and the prevention of damage from fire, earthquake, tsunami, and external impacts are described, and those are confirmed by Pre-service Checks verified by the NRA 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 a system for operational safety, a quality management system, education on operational safety, access control, oversight, and management of facilities, which are detailed in Table H-1.

Licensees shall conduct Periodic Check to confirm 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 their implementation and conformity to the 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, function for prevention of fire or explosion, or the 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., and transmit radiation control records to the organization designated by the NRA. The following instructions 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 are that nuclear fuel materials are removed from the 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) that have obtained Approval of Design and Construction Plan from the NRA cannot start operation without conducting Pre-service Check and receiving confirmation from the NRA. Pre-service Check to confirm whether construction and functions comply with Design and Construction Plan approved by the NRA and the Technical Requirements. In the Technical Requirements, the required function of confinement, shielding, heat removal, and the prevention of damage from fire, earthquake, tsunami, and external impacts are described, and those are confirmed by inspections.

As reported in H4-1-2, underground facilities (waste disposal site and tunnel) that do not fall under specified waste disposal facility are not required to obtain Approval for the 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 Requirements stipulated in the NRA Ordinance (Confirmation of Facility).

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

- 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 the integrity of the 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 one year. The main items to be indicated in Operational Safety Program are a system for operational safety, a 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 Periodic Check to confirm 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 the waste storage facility reported in H6-1 when events designated by the NRA occur.

Licensees of cat-1 waste disposal business are required to develop a 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 the Closure Plan, and to attach a document concerning management of radiation exposure during closure; possible kinds of incident, damage, and effects 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 the Closure Plan are that closing measures are consistent with contents described in the approved license application documents and that the closing measures are appropriate for the 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 following the Closure Plan.

Licensees of waste disposal business are required to obtain Approval of the Decommissioning Plan of the NRA based on the Reactor Regulation Act when the disposal business is terminated. As for termination of the license, licensees are required to dismantle auxiliary facilities at the site of the 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 the Decommissioning Plan in the same manner as radioactive waste storage facilities reported in Section H6-1. Approval criteria of Decommissioning Plan are that the backfilling of all the tunnels is completed, 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 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 from the NRA during the operation of the facilities as needed that the facilities and related measures for operational safety comply with the Technical Requirements stipulated in the NRA Ordinance (Confirmation of Facility).

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

- 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 the integrity of the 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 obtain permission for the activity of Cat-2 waste disposal facilities are required to get confirmation from the NRA that the facility and its Operational Safety Program comply with the 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 a system for operational safety, a 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 Requirements 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 per the Reactor Regulation Act in the same manner as the waste storage facility reported in Section H6-1 when events designated by the NRA occur.

Regarding intermediate depth disposal among Cat-2 disposal, licensees are required to develop a 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 H6-2. Upon closure, licensees are required to obtain confirmation from the NRA with each step of the tunnel closure and the NRA decides that the closing measures are conducted following the Closure Plan.

For near surface disposal among Cat-2 disposal, licensees shall obtain confirmation

from the NRA upon covering the disposal site with soil and sand to make sure that the measures comply with the Technical Requirements.

Licensees of the waste disposal business are required to obtain Approval of the Decommissioning Plan of the NRA based on the Reactor Regulation Act when the disposal business is terminated. As for termination of the 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 the waste disposal facility.

Licensees are required to attach documents to the application of the Decommissioning Plan in the same manner as the waste storage facility reported inH6-1.

Approval criteria of the Decommissioning Plan are:

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

Termination of the license is appropriate in terms of prevention of disasters caused by nuclear fuel materials.

H-6-4 Engineering and Technical Support

When engineering and technical support are needed to ensure the 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 the contractors must be equipped with competence and prerequisites necessary for ensuring the safety of the facilities, licensees are required to appropriately audit and manage the contractors by its 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 a 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 with radioactivity concentration that 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 wastes 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 is stipulated in the NRA Ordinance as listed in the following table, and based on these limitations radioactive waste is classified into either 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 a waste disposal business should obtain the Permit of Business according to the above-mentioned classification. However, it is not guaranteed to be granted a 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 the facility, which will be reviewed for its validity.

H-6-6 Use of Operating Experience

Licensees are requested to evaluate the status of their 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 every 10 years following the NRA Ordinance on the 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 lessons learned from operational experiences of domestic and overseas facilities as a part of the 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 needs 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 needs 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
- Patrols and inspections of waste disposal facilities and related measures
- 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
- Matters related to the deputy of the Radiation Protection Supervisor
- 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
- Matters relating to measures to be taken to prevent radiation hazards in response to the attenuation of radioactivity contained in disposed waste buried in a waste disposal site
- 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 areas including the waste disposal facility site, surrounding area, and underground of that area (designated waste disposal area) before starting operation. Within the designated waste disposal area, no person shall excavate the site without a permit from the NRA. These provisions are stipulated in the amendment to 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 the closure of the site and also even after the termination of the license.

Also, the NRA 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 the 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 Reentry 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 E2-4, the use and disposal of radioactive materials and the use of radiation generating equipment is regulated by the RI Regulation Act. Sealed sources are also regulated by this Act. Licensees and registrants are responsible for safety and ensuring that radioactive materials are properly controlled.

The NRA, as the regulatory authority, conducts safety reviews and inspections in accordance with this Act.

The RI Regulation Act stipulates that if an appropriate management of radioactive materials is not carried out, a licensee may be ordered to suspend the use or disposal of radioactive materials, and if the licensee violates the order, the license may be revoked. The Act also stipulates penalties for those who violate the order to suspend the use or disposal of radioactive materials, and those who use or dispose of radioactive materials in the course of business without obtaining the license.

J-2 Management of Radioactive Sources

Legal restrictions are imposed to ensure that the possession of radioactive sources is only allowed by authorized licensees or registrants. There is a well-established mechanism for handover of disused radioactive sources to licensees or registrants with requisites. Licensees and registrants are obliged to submit notification of decommissioning of the place of business and decommissioning plan to the NRA when they terminate and abolish the use of all the sources, and to report result of the handover.

Licensees of the use of radioactive sources shall conduct an annual inventory check of

sealed and unsealed radioactive sources in their possession and report the results to the NRA, to prevent loss of radioactive sources. The NRA conducts inspections, if needed, and confirms that the inventory of radioactive sources corresponds to the content permitted to licensees. The RI Regulation Act prescribes penalties and underlines that the 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 are required to report to the NRA details of specification as well as receipt and transfer of any sealed sources exceeding a specified amount that 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 radioactivity are returned to the original foreign manufacturers. Regarding the distribution of radioactive sources in Japan, a single supplier (the Japan Radioisotope Association) organizes the entire process, from the 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 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 from 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 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 from

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 conduct 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 per 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 an owner of a 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, however 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 radioactive sources, 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 radioactive sources to a safe place and lockdown measure except persons concerned.

The NRA, the police, and the fire service will conduct immediate initial measures depending on the notification. Meanwhile, the NRA will dispatch personnel to instruct licensees on 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 re-entry of approved sealed sources that 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 regulations 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 per 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 Management Facility and Radioactive Waste Management Facility

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 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 regulatory requirements as back-fitting and for applications of existing facilities with modifications or of new constructions.

For example, regarding spent fuel reprocessing facilities, in accordance with the Reactor Regulation Act, the NRA may order suspension of operation, modification, repair or transfer of the facility, instruction 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 regulatory requirements. 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 latest regulatory requirements has become legal obligations.

JNFL's spent fuel reprocessing facility, waste interim storage facility, and MOX fuel processing facility granted permits in July, August, and December 2020 respectively, that facilities were complying with the regulatory requirements. The spent fuel reprocessing facility and MOX fuel processing facilities of JNFL were approved in December and September 2022 respectively, for their design and construction plans of the first divisional application to be in conformance to the regulatory requirements. Currently, the second application for the spent fuel reprocessing facility and the MOX fuel processing facility of JNFL and an application for approval of design and

construction plan of waste interim storage facility of JNFL are under conformity reviews. Also, the permits of the spent fuel reprocessing facility, the waste interim storage facility, and the MOX fuel processing facility of JNFL were amended to incorporate design basis seismic forces considering standard response spectra in October 2023.

JAEA submitted applications in five instalments between December 2019 and September 2021, for an approval of modification of decommissioning plan concerning a development of safety measures including earthquake and tsunami at Tokai Reprocessing Facility. The NRA confirmed the applications and approved all the applications by March 2022. In the process of conformity review, the NRA pointed out that the measures against tsunami flotsam during backwash of tsunami waves should be considered. In response, JAEA decided to install tsunami protection walls not only on seaside but also on land side of the Tokai Reprocessing Facility. The installation was completed by the end of FY 2023.

Regarding the spent fuel interim storage facility of Recyclable-Fuel Storage Company, its permit was amended to comply with the regulatory requirements in November 2020, followed by approvals for design and construction plan in August 2022, and for modification for Operational Safety Program in August 2023. Also, its permit was also amended to incorporate design basis ground motion considering standard response spectra in in February 2023, followed by the approval of modification of the design and construction plan to incorporate the amendment to the permit in June 2023. At present, the NRA is confirming that pre-operational checks by the licensee are properly carried out in regulatory inspections. The licensee plans to start operating the spent fuel interim storage facility from the end of September 2024.

The permit of Cat-2 waste disposal facility of JNFL, i.e., pit disposal facility, etc. was amended to conform to the regulatory requirements in July 2021. Consecutively, its Operational Safety Program was modified and was approved in September 2021. In December 2021, the NRA issued a certificate of conformity for Radiation Control Facility and Monitoring and Measurement Facility, both of which are parts of the Cat-2 waste disposal facility at JNFL, as a result of conformity inspection to the technical requirements. Since then, the NRA has issued a certificate of conformity each time when it is found that the concrete pits related facilities conform to the technical requirements. It is planned to check the conformity to the technical requirements for cover soil of the concrete pits, where homogeneous waste package will be disposed of.

Also, an application for conformity review of the Cat-2 waste disposal facility of JAPC was submitted in July 2015.

Waste Management Facility at Oarai Research and Development Institute of JAEA had its permit amended to comply with the regulatory requirements in August 2018, followed by another amendment to incorporate a design policy against tornadoes, which was permitted in May 2023. In addition, an application for design and construction plan were divided into five instruments. Four of which were approved by April 2022, and the fifth of which is now under conformity review.

As of March 2024, the conformity review is underway for the Cat-2 waste disposal facility of JAPC, which will be newly constructed.

To ensure transparency and openness of decision-making process for nuclear regulation, the NRA has a policy that meetings such as conformity review meetings are open to the public in principle. Therefore, the public are able to listen to meetings as audience, through live webcasting on YouTube and recorded video afterwards. In addition, materials distributed at conformity review meetings are made available beforehand at the NRA website. Also, meeting minutes are disclosed afterwards. When a meeting deals with confidential information such as nuclear security matters, it is not open to the public. Thus, materials and meeting minutes are not disclosed.

K-1-2 Communication with Stakeholders

The NRA holds meetings called "Exchange of opinions with CEOs of major nuclear utilities" since 2014. It aims to promote fostering safety culture and enhancing safety, and for the NRA to hear licensees' basic policy for safety improvement activities and perspectives on current regulatory system. Also, the NRA holds meetings called "Exchange of opinions with chief nuclear officers (CNOs) of major nuclear utilities" since 2016. It aims to contribute to smooth introduction of new regulatory requirements and for which to enhance predictability as well as improvement and clarification of safety reviews. Both meetings are open to the public.

As for radioactive waste management in the JAEA facilities, the NRA set up an oversight team in April 2019 to address comprehensive issues related to back-end radioactive waste, decommissioning of aged facilities and their radioactive waste

management. The team conducts hearing of measures from licensees in meetings.

Regarding the project for centralised clearance treatment of dismantling waste from nuclear power plants, which was reported in F4-5, the NRA, the ANRE, Fukui Prefecture, and related nuclear power reactor licensees have held a total of three meetings to exchange opinions in order to confirm the project's objective from the view point of utilization policy and to discuss legal and technical issues.

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. In addition, as a new initiative since April 2024, in order to convey the NRA's efforts in an easy-to-understand manner, the NRA has prepared and published easy-to-understand explanatory materials to convey the scientific knowledge and regulatory system to be the premise of the NRA's regulatory judgement by using plain language as much as possible and using many illustrations. Furthermore, the NRA Commissioners visit nuclear facilities and exchange opinion with local parties according to the "Visits of nuclear facilities by NRA Commissioners and exchange of opinions with local parties" based on the decision of the NRA Commission Meeting in November 2017, in addition to efforts to build understanding of the nuclear regulations through participation in explanatory meetings for local residents.

Also, the NRA collects voluntarily public comments and responds to them one by one.

K-1-3 Efforts Toward Risk Reduction through Shifting to Dual Purpose Cask Spent Fuel Storage

The NRA has recommended the transfer of spent fuel from wet storage to dry storage at NPP sites if spent fuel has been cooled for a certain period and its decay heat has been decreased. It is 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. 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 for Dual Purpose Cask (DPC). 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 regulatory requirements, which was an obstacle to shift to dry storage. Therefore, the NRA had been considering an adoptable regulatory system since 2017. The NRA revised and established relevant ordinances and guides followed by promulgation and enforcement in April 2019. Specifically, the NRA has stipulated the design conditions for DPC such as the uniform seismic forces, tsunamis, and tornados that are applicable to any candidate site in the notification, in which allows applicants to design a DPC using the uniform conditions specified. The NRA also added DPC into the system of Type Certification for Design and Type Designation when it is designed using the uniform conditions such as seismic forces. It allows the NRA to omit the relevant part from reviews on Reactor Installation Permit and Approval of Design and Construction Plan for each reactor 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 reactor site.

An application is needed both for transportation and storage before using DPC at a site. Items that are once reviewed for transportation will be omitted from the conformity review of both Installation Permit and Approval of Design and Construction Plan for 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 for Technical Details for Off-Site Transportation of Nuclear Fuel Materials, etc. and established a guide for application procedures, and enforced them on April 1, 2020.

The status of application regarding shifting from wet storage to dry storage is reported below. After revision of the regulatory system for NPP, the NRA issued eight Type Certifications for the application of DPC and one Type Designation for the application of DPC by the end of March 2024.

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 enforcement of the regulatory requirements, 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), Kyushu Electric Power Company (Genkai NPS),Tohoku Electric Power Company (Onagawa NPS) and Kansai Electric Power Company (Takahama PS). Among them, for Shikoku Electric Power Company (Ikata PS), Reactor Installation Permit was given in September 2020 and Approval of Design and Construction Plan was given in July 2021. For Genkai NPS, Reactor Installation Permit was given in April 2021. The NRA also received application for amendment to Reactor Installation Permit to incorporate the regulatory requirements including installation of spent fuel dry storage from Chubu Electric Power Company (Hamaoka NPS), and its conformity review is ongoing.

As for Type Certification for Design of dry casks to be used in a spent fuel interim storage facility, six 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. and Type Certifications for Design were issued to all of them by July 2021.

K-1-4 Implementation of Reformed Inspection System at Spent Fuel Management Facilities and Radioactive Waste Management Facilities

The inspection for nuclear fuel-related facilities were previously conducted by the NRA for one item by item and indicated its result one by one.

As reported in E-2-2, the reformed inspection system in full implementation since April 2020, covers licensees' whole activities relevant to safety with a focus on safety issues and concerns, which makes inspections more flexible in comparison to inspections under the previous inspection system. Moreover, it specifies an obligation of licensees to carry out their checks, and thus clearly defines that the prime responsibility for the safety rests with licensees. Regulatory oversight is reinforced by the system in which NRA inspectors can freely access to licensees' sites at any time.

The reformed inspection system introduces a graded approach for all facilities and activities, i.e., inspection items, number of samples and duration required for inspection is adjusted according to type of facility, significance of impact to the people and the environment by scale of facility, different facility stage such as construction or decommissioning.

K-1-5 Regulation of Clearance and Disposal of Uranium Waste

The NRA started a study on regulation regarding clearance and disposal of uranium waste in 2018. “Uranium waste” is defined as radioactive waste solely contaminated with uranium which is generated from nuclear processing facilities for fuel fabrication and from facilities in which more than a certain quantity of uranium or other nuclear material is used.

The NRA carried out studies into regulation of the clearance of uranium waste, referring to handling of 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 EU Council Directive “2013/59/EURATOM” (2013). For regulation of the disposal of uranium waste, the NRA referred to disposal of long-half-life radionuclides described in the IAEA Specific Safety Requirements No. SSR-5 “Disposal of Radioactive Waste” (2011) and the IAEA Specific Safety Guide No. SSG-29 “Near Surface Disposal Facilities for Radioactive Waste”.

In April 2019, the NRA held a meeting with external advisors who are appointed to people who have extensive knowledge and experience of nuclear regulation, and discussed on the topic of clearance and disposal of radioactive waste contaminated with radionuclides of natural origin. The advisors pointed out that it is important to join discussions for formulation of a document of the IAEA standards; the regulatory process needs to be based on the safety significance (graded approach); and the influence of progeny nuclides generated from uranium which has not yet reached radioactive equilibrium (build-up) should be considered.

Since 2020, the NRA has carried out extensive studies on the regulatory framework of clearance and disposal of uranium waste actively and has repeated discussions in several Commission Meetings. As a result, in March 2021, "Regulatory policy of clearance and disposal of uranium waste" was determined and of which regulatory concept states as follows.

1) Regarding the clearance of uranium waste, uranium contained in uranium waste is generated from industrial products which are remaining of changing isotope ratio for nuclear utilisation after removal of progeny nuclides through processes such as uranium refining, etc. Therefore, radiation exposure from

uranium waste can be understood as planned exposure which will be dealt with in the same way as radionuclides of artificial origin. In developing regulatory requirements for clearance of uranium waste, it is important to ensure commonality and coordination with international standards and regulatory requirements of EU countries that have established clearance system already considering cleared uranium waste may be distributed internationally.

2) Regarding near surface disposal of uranium waste, it is possible to reduce radiation exposure of the public by applying the current concept of ensuring safety of Cat-2 disposal waste by taking measures to keep an average activity concentration of uranium sufficiently low from a beginning of disposal. Therefore, the current regulatory requirements for Cat-2 disposal waste can be applied basically without major changes to its framework in both cases to dispose of waste contaminated with only uranium and to dispose of uranium waste with other radioactive waste. The framework of Cat-2 requires "sufficiently low activity concentration" which means an average activity concentration of uranium in a disposal site does not exceed 1 Bq/g at the beginning of disposal.

Based on this regulatory policy, the NRA revised the clearance regulation and the regulation on Cat-2 disposal waste in September 2021.

K-1-6 Items to be Considered for Ensuring Safety in Geological Disposal

Regarding the disposal of high-level radioactive waste and some low-level radioactive waste generated in reprocessing process of spent fuel, the Japan Nuclear Waste Management Organization (NUMO) is to select a site for final disposal facility through step-by-step surveys based on the Designated Radioactive Waste Final Disposal Act. In response to the Basic Policy on the Final Disposal of Designated Radioactive Waste (Cabinet decision in May 2017), the NRA has repeatedly discussed the items to be considered for ensuring safety (Considerations) when selecting survey areas. As a result, the following items 1 to 4 has been selected as "Considerations", which are difficult to solve by engineering design of final disposal facility, and which needs to be dealt with by avoiding to select for construction site of final disposal facility. In particular, regarding item 2 below of “Volcanic Phenomena”, the NRA had inputs from experts on mechanism of volcano formation.

1. Capable Faults: The following capable faults shall be avoided:
   a) Geological fault which might be active after Late Pleistocene (after about 120,000 ~ 130,000 years ago) cannot be denied, and which are considered as hypocentres
   b) Damaged zone of capable fault mentioned in a)
   c) Faults, whose activity after Late Pleistocene cannot be denied, and which caused permanent displacement due to seismic activity, and landslide surface of which caused displacement
   d) Large-scale faults other than the faults mentioned in a) and c)
2. Volcanic Phenomena: The following area shall be avoided:
   a) Area where a trace of volcanic activities such as conduits and dikes during Quaternary Period (from now until about 2.58 million years ago) are found, which may cause destruction of engineered barriers due to magma intrusion
   b) Area within approximately 15 kilometres of an activity centre of a volcano which was active during Quaternary Period
   c) Area where there is a possibility of new volcano formation even if there are no volcanoes that were active during Quaternary Period
3. Erosion: To secure a deeper depth than the intermediate-depth disposal. In doing so, a decrease in depth due to erosion shall be considered, with uplift, downwelling, and sea level changes caused by climate change.
4. Mining of mineral resources: No record indicating an existence of mineral resource deposits of sufficient quantity and quality which may lead to excavation of mineral resources, and geothermal gradient shall not be significantly large.

The NRA decided on the "Considerations" in August 2022 after collecting public comments. The "Considerations" indicates as those that shall be appropriately taken into consideration at all time of selection of the survey areas for final disposal based on information available at each survey step.

K-2 Response to the Challenges Identified in the 7th Review Meeting

K-2-1 Definition of a Clear and Detailed Roadmap for the Construction and Operation of a Geological Disposal Facility

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.

In December 2013, the Ministerial Conference on Final Disposal was established to discuss the direction of the review, and experts held discussions in the Radioactive Waste Working Group and the Geological Disposal Technology Working Group of the Subcommittee on Nuclear Energy of the Electricity and Gas Industry of the Advisory Committee for Natural Resources and Energy. In May 2015, the Basic Policy based on the Law on Final Disposal of Radioactive Waste was revised (approved by the Cabinet). The government has decided to take the initiative in presenting areas that are scientifically considered to be more suitable for geological disposal in order to deepen public interest in and understanding of geological disposal.

The GoJ 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 GoJ published the "Nationwide Map of Scientific features for Geological Disposal" in July 2017. With this as momentum, the GoJ 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.

It is assumed that it will take about 20 years to complete the three stages of investigation required by law: about 2 years for a literature survey, about 4 years for a preliminary investigation, and about 14 years for a detail investigation. It is also assumed that it will take about 10 years to construct the repository, and that operations (delivery, placement, and backfilling of radioactive waste) will be carried out in parallel in the area where construction has been completed, but that it will take more than 50 years to operate and close all the tunnels. Therefore, the geological disposal

project is estimated to be a 100-year or longer project.

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-2-2 Provision of Items to be Considered for Ensuring Safety in Geological Disposal in the Site Selection Stage

As reported in Section K1-6.

K-2-3 Define roadmap for the implementation of the near surface repository for the non nuclear power wastes

According to the amendment of the “Law for the Incorporated Administrative Agency, JAEA”, in 2008, JAEA was designated as the implementing entity of the disposal of the radioactive waste (waste from research facilities, etc.) generated from research and development and the utilization of radiation, excluding nuclear power plant field.

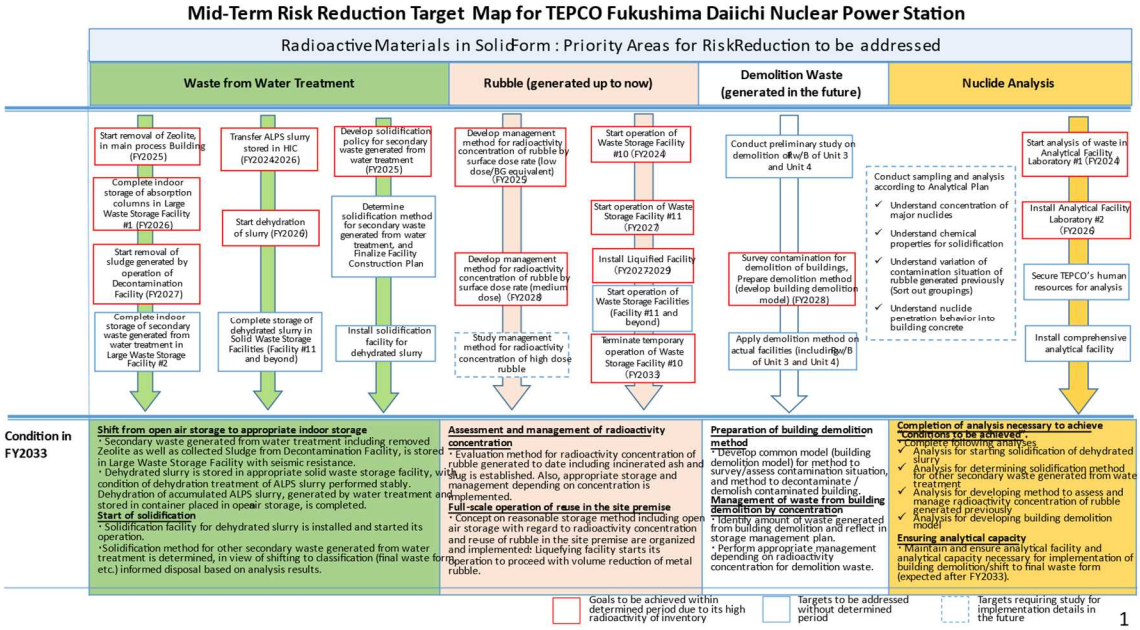
In implementing the disposal project, JAEA has established a "Plan for the Implementation of Disposal for Radioactive Waste" that summarizes the expected types and amounts of radioactive waste to be disposed of, siting criteria and process, , and estimated total project cost, based on the Basic Policy of Japan.

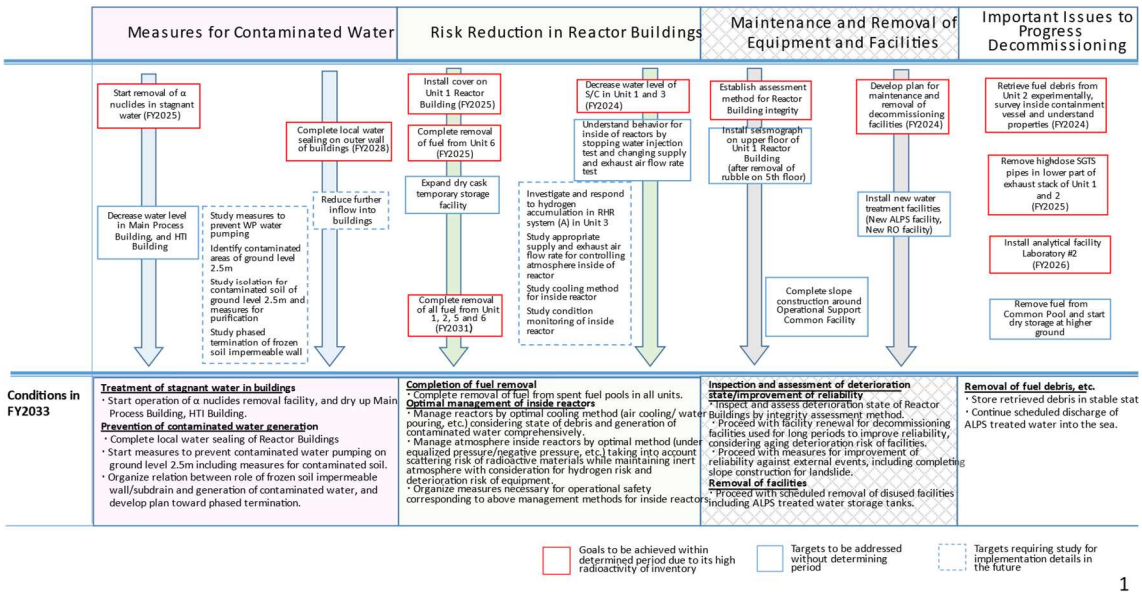
Based on this plan, JAEA is promoting facility siting , technical studies for development of waste acceptance criteria and basic design of the disposal facility, etc., in preparation for the establishment of the disposal facility, and is also promoting understanding in cooperation with related organizations.

K-2-4 Implementation of Solutions for Treatment and Storage of Radioactive Waste in the Site based on the Plan Formulated as Part of the Risk Reduction Program for Management of Radioactive Waste at TEPCO Fukushima Daiichi NPS (Achieving the Planned Risk Reduction Program for TEPCO Fukushima Daiichi NPS)

The NRA formulated the "Mid-term Risk Reduction Target Map for TEPCO Fukushima Daiichi NPS" (Risk Reduction Map) in February 2015 in order to set forth priority issues to be solved for the next three years from a safety point of view. According to the progress of decommissioning work, it has been reviewed periodically and revised 11 times up to year 2023. The revision of the Risk Reduction Map is discussed by the Committee on Oversight and Evaluation of the Specified Nuclear Facilities (Committee), which monitors and evaluates the efforts toward solving issues and oversees the progress. As described in the Risk Reduction Map, a total of 54 targets/goals have been achieved, including treatment of contaminated water accumulated in flange-type tanks which had high risk of leakage, decision of removal policy of spent fuel assemblies stored in spent fuel pools of Unit 1 and Unit 2, closing of all openings of buildings which caused by inflow of tsunami to prevent out-flow of stagnant water from the buildings, commencement of discharge of ALPS Treated Water, commencement of operation of incineration facility for solid waste and volume reduction facility.

The Risk Reduction Map, which had been originally intended to set forth specific targets to be addressed urgently, was revised considerably in March 2024, taking into account a situation where issues to be addressed in mid- and long-term such as issues associated with work under high dose rate and technical difficulties in addition to other situation where risks which could have a significant impact on outside of site have decreased with the progress of decommissioning. In doing so, the NRA revised categorization of risk reduction areas, and presented conditions to be achieved in 10 years by area: resolving open air storage of secondary waste generated by water treatment; commencement of solidification; management of rubble generated through decommissioning work to date depending on its radioactive concentration; development of building demolition method; phased termination of frozen soil impermeable wall and subdrain. The NRA set forth goals to be achieved in 10 years and its paths.





K-2-5 Discharge into the Sea of ALPS Treated Water

The decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station (FDNPS) is a major premise for the reconstruction of Fukushima. However, there are already over 1,000 massive storage tanks on-site, leading to concerns about a lack of space to build the facilities required for future decommissioning work. In addition, the opinions exist that there is a risk of leakage in the event of a disaster, and that the presence of the large

tanks itself is a cause of adverse impacts on reputation. Thus, handling of ALPS treated water and reducing the number of tanks are essential tasks for decommissioning and reconstruction.

The handling of ALPS treated water has been discussed with experts for about 6 years since 2013 and reports have been compiled. In addition, as a result of careful discussions including more than several hundred exchanges of opinions, GoJ published "Basic Policy on handling of ALPS treated water at the Tokyo Electric Power Company Holdings' Fukushima Daiichi Nuclear Power Station." (hereinafter referred as "GoJ's Basic Policy") The method of discharge into the sea was selected due to the findings that discharge into the sea enables safe disposal based on experiences in domestic nuclear facilities, and that monitoring of its impact can be conducted most reliably.

ALPS treated water is the water from which "contaminated water" has been purified to the extent that it meets safety standards for radioactive materials other than tritium. In order to meet safety standards for tritium, the water is significantly diluted with seawater before discharging. When ALPS treated water is discharged into the sea, the tritium concentration is set to be below 1,500 becquerels per litre in the GoJ's Basic Policy. This standard represents 1/40 of the national safety standard (based on internationally common principles) of 60,000 becquerels per litre, and approximately 1/7 of the World Health Organization (WHO) drinking water guideline of 10,000 becquerels per litre. The total amount of tritium in ALPS treated water discharged at FDNPS is below 22 trillion becquerels per year (same as the operational target value prior to the accident) which is a low level compared to the amount discharged from many nuclear power stations in Japan and overseas.

On August 22, 2023, the GoJ held a meeting of the Inter-Ministerial Council and announced that the discharge into the sea is expected to start on August 24, after confirming that it will take all possible measures to ensure safety, to prevent adverse impacts on reputation, and to support continuation of livelihoods, and will take full responsibility for these measures until the discharge of the ALPS treated water is completed. In response, TEPCO started to discharge ALPS treated water into the sea on August 24. Since the start of the discharge, a total of eight batches have been discharged (as of August 2024) and the discharges have been safely conducted as planned.

The concentration of tritium and nuclides other than tritium in the ALPS treated water sampled at the measurement/confirmation facility will be analyzed and the concentration of radionuclides other than tritium has been confirmed to meet the regulatory standard before the discharge into the sea. For the purpose of implementing objective and transparent measurement of radioactive materials, the ALPS treated water before the discharge is also analyzed by JAEA (Japan Atomic Energy Agency) as a third-party organization. In the third-party analysis, the concentration of tritium and nuclides other than tritium in the ALPS treated water before the discharge into the sea will be analyzed to confirm that the nuclides other than tritium meet the regulatory standards.

In addition, sea area monitoring is conducted to ensure that there are no significant changes in the concentration of radioactive substances in the sea before and after the start of the discharge. Transparency is ensured for the monitoring by the involvement of third-party organizations such as the IAEA, the presence of local government officials, etc. Monitoring results so far have confirmed that the discharge has been carried out as planned and is safe. The tritium concentration within 3km from the power station in the sea area monitoring is well below the operational index (discharge suspension level: 700 becquerel/litre). Even the results of the monitoring for a wider sea area, in which TEPCO assessed the impact of the discharge into the sea, showed that the area where the assessed tritium concentrations (1-2 becquerel/litre) are above the current tritium concentrations (0.1-1 becquerel/litre) was only limited to 2 to 3 km around the power station.

The Ministry of Economy, Trade and Industry (METI) has published a website that shows the results of monitoring related to ALPS treated water in the form of marks that can be seen at a glance, and TEPCO's Overarching Radiation-monitoring data Browsing System (ORBS) summarizes the tritium measurement data of seawater, fish and other media, which was measured by various organizations (TEPCO, Ministry of the Environment, Fisheries Agency, Fukushima Prefectural Government) on a map. The data are available in multiple languages, such as Japanese, English, Chinese, and Korean. In addition, TEPCO has been working to provide easy-to-understand information on the safety of ALPS treated water, by showing the status of the discharge in real time on the website, disseminating information through SNS and video distribution, and regularly holding briefings for foreign media and visits to the FDNPS.

Furthermore, the IAEA conducts a rigorous review of the discharge of ALPS treated water into the sea. In July 2021, the GoJ and the IAEA has signed the "Terms of Reference (TOR) on Reviews of Safety Aspects of Handling ALPS Treated Water at TEPCO's FDNPS" and based on this TOR, the IAEA conducts 1) Safety Review of the Handling of ALPS Treated Water 2) Regulatory Review, and 3) Independent Sampling, Data Corroboration, and Analysis. On July 4, 2023, the IAEA Director General Rafael Mariano Grossi handed over the "Comprehensive Report" to Prime Minister Kishida and the report was published accordingly. In this report, the IAEA has concluded, that the discharge of the ALPS treated water into the sea, is "consistent with relevant international safety standards" and "will have a negligible radiological impact on people and the environment. In addition, the IAEA will conduct a safety review of the ALPS treated water discharge into the sea for a long period of time, not only before, but also during, and after the treated water discharges occur. In October 2023, the IAEA officials and international experts visited Japan to conduct a review regarding the safety of the discharge of ALPS treated water from TEPCO's FDNPS into the sea, for the first time after the start of the discharge. The report was published in January 2024, concluding that they did not identify anything that is inconsistent with the requirements in the relevant international safety standards. After that, in April 2024, the IAEA officials and international experts visited Japan to conduct a second review after the start of the discharge. The report was published in July 2024, concluding that they did not identify anything that is inconsistent with the requirements in the relevant international safety standards as in the first review mission after the start of the discharge. Additionally, the IAEA conducted the Interlaboratory Comparison (ILC) on the determination of radionuclides in ALPS treated water and marine environment. The result of the ILC on the determination of radionuclides in ALPS treated water was published as the first report in May 2023 and as the second report in January 2024, and it was concluded that TEPCO has the ability to analyze ALPS treated water accurately and precisely. The result of the ILC on the determination of radionuclides in marine environment was published in January 2024 for the first time and concluded that a high level of accuracy and competence on the part of the Japanese laboratories were demonstrated.

The GoJ will continue its efforts to provide transparent information on the safety of discharging ALPS treated water into the sea, both domestically and internationally.

K-2-6 Study on Adoption of the Latest Actual Examples in Decommissioning to Improve Efficiency and Safety in Storage/Disposal of Radioactive Waste (for example, Disposal of Large NPP Parts)

A project to improve efficiency and safety in clearance of waste generated from decommissioning is an example of efforts to improve efficiency and safety in storage/disposal of radioactive waste. The ANRE and Fukui Prefecture are planning the project to manage materials cleared from dismantlement of nuclear power plants in centralised way. The NRA has decided to confirm this project in terms of utilization policy for cleared materials from a viewpoint of safety regulation and to discuss legal and technical issues in meetings which are disclosed to the public. For this purpose, the NRA, the ANRE, Fukui Prefecture, and related nuclear power reactor licensees has held meetings to exchange opinions three times in total (i.e. July and October 2023 and February 2024). After clarifying regulatory and technical issues of the project, the NRA will proceed with detailed discussion.

K-2-7 Continued and enhanced engagement with transboundary stakeholders regarding discharges of treated water into the sea wherever possible

In terms of bilateral relations with countries that have nuclear power facilities, cooperative relationships have been established at all levels of government and industry in these countries, and there is ongoing information exchange. For example, we have been providing multiple opportunities to explain the current status of measures for decommissioning, contaminated water, and treated water, as well as the progress of measures relating to the discharge of ALPS treated water into the sea, to diplomatic missions in Tokyo and countries and regions that are particularly interested in these issues (as of August 2024, "Video Conference Briefing Session regarding the handling of Advanced Liquid Processing System (ALPS) Treated Water at TEPCO's Fukushima Daiichi Nuclear Power Station" for diplomatic missions and others was held 124 times after the FDNPS accident.) In addition, we have provided explanations at various international conferences, including side events at the IAEA General Conference, and have provided information on the GoJ's website. Furthermore, for countries and regions of particular interest, opportunities for individual presentations have been provided in multiple occasions in addition to information dissemination to the international community. Explanations to the domestic and international press have also been

provided. As a result, there is growing understanding that a wide range of countries and regions have expressed their understanding and support for Japan's and the IAEA's efforts regarding the discharge of ALPS treated water into the sea. The GoJ will continue to provide explanations and information sharing to the international community engaging in good faith and in a highly transparent manner.

K-3 Overarching Issues Identified in the Final Report of the 7th Review Meeting

K-3-1 Capacity and Staff Allocation related to Perspective of Spent Fuel/Radioactive Waste Management

In January 2019, Japan Atomic Energy Commission compiled its "Views on the Decommissioning of R&D Facilities at the Japan Atomic Energy Agency." In this report, it points out the necessity of initiatives such as a comprehensive view of the whole picture of decommissioning, dialogue with regulatory bodies, ensuring reasonable safety, passing on experience and knowledge related to decommissioning, human resource development, and integrated study of waste disposal plans and decommissioning, and follows up on future progress and response status as appropriate.

Regarding development of human resources engaged in regulation, it is reported in Section F2-1-2

K-3-2 Comprehensive Public Involvement in Radioactive Waste Management and Spent Fuel Management Programs

In “Basic Policy on the Final Disposal of Designated Radioactive Wastes”, the GoJ 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 GoJ

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.

To deepen understanding of DGR project among many people, we are conducting dialogue activities, such as holding interactive national information meetings in various parts of Japan, as well as holding information meetings for local governments. In parallel with the preparation of Literature Survey report, a "Place for dialogue" was established in Hokkaido, where the literature survey was conducted in 2021. Facilitated by a neutral facilitator, the dialogue activities are conducted while respecting the participants' intentions and ensuring impartiality and neutrality.

K-3-3 Ageing Management of Transported Packages and Facilities for Radioactive Waste and Spent Fuel, Taking into Account Long Term Storage

As reported in E2-3-1.

K-3-4 Long Term Management of Disused Sealed Sources, including Sustainable Options for Regional and Multilateral Solution

As reported in J2-5.

K-4 Overview on the IRRS Follow-Up Mission

Japan has requested the IAEA to conduct Integrated Regulatory Review Service (IRRS) mission in the second half of FY 2025.

K-5 Progress of Efforts Related to Spent Fuel and Waste at TEPCO Fukushima Daiichi NPS

K-5-1 Efforts of Regulatory Body Related to the Discharge of ALPS Treated Water into the Sea

Regarding ALPS treated water stored at the site, the amendment to the implementation plan regarding the installation of facilities related to the discharge of ALPS treated water was approved in July 2022, followed by the amendment to the implementation plan for the operation of the facilities in May 2023. After the completion of the pre-service inspection of the facilities, its certificate of completion was issued in July 2023. Since the discharge started on 24 August 2023, four discharges were conducted in FY 2023. The NRA visited local governments that had requested and explained the results of the NRA regulatory reviews on the discharge and inspections. In addition, the NRA has continuously confirmed through inspections that the facilities have the necessary functions after the start of operation and that the operation of the facilities is being conducted consistently in compliance with the approved implementation plan.

Moreover, the NRA received the IAEA regulatory reviews on the discharge of ALPS treated water in March 2022 and January 2023. "IAEA Comprehensive Report on the Safety Review of the ALPS-Treated Water at the Fukushima Daiichi Nuclear Power Station" was published in July 2023, which expressed the view that the discharge-related activities of the NRA were consistent with the relevant international safety standards and concluded that the planned discharge of ALPS treated water would have negligible radiological impacts on people and the environment. In October 2023, the IAEA review was conducted to confirm the safety of the discharge once again after the start of the discharge.

K-5-2 Handling of Radioactive Liquid Waste

Buildings where circulation cooling continue and covered with water achieved to keep the floor surface of the lowermost basement exposed to by continuous effort of lowering water level of buildings in December 2020. In order to achieve further lowering of the water level in reactor buildings, it is necessary to establish a method to remove α nuclides in the stagnant water. Therefore, it is planned to remove them by adding filters

to the existing Caesium adsorption apparatuses. Also, recovery work of zeolite sandbags found at the basement floor of the Main Process Building and High-temperature Incinerator Building is being studied in order to clean the floor of the buildings.

K-5-3 Removal of Spent Fuel

Work on removal of fuel from the spent fuel pool of Unit 3 continued, and the removal of all fuel including ones affected by the accident was achieved in February 2021. As for the removal of fuel from the spent fuel pools of Unit 1, a policy to install a large cover covering entire reactor building, to remove large rubble from operational floor, and then to install fuel handling equipment, etc. to remove fuel was announced. Also, as for the removal of fuel from the spent fuel pools of Unit 2, a policy to install a gantry for the removal of fuel on south side of the reactor building and remove fuel through an opening on the outer wall was presented. The work necessary to start the removal has been started for Unit 1 and Unit 2. Actual removal of fuel from spent fuel pool of Unit 6 has been started since August 2022. In parallel, to secure the available capacity of common pool for storing removed fuel, spent fuel stored in the common pool was transferred to dry casks which then be transported to temporary cask storage facility.

K-5-4 Solid Radioactive Waste

Although radioactive waste in solid form generated during decommissioning work at Fukushima Daiichi NPS is stored in a temporary storage area in principle, they were stored in a temporary collection site. It became the norm to store solid waste in the temporary collection site whose size therefore was increasing. The NRA instructed the early resolution of the situation and confirmed that the temporary collection site was appropriately minimized by increasing the capacity of the temporary storage area in accordance with the approved implementation plan.

Regarding ALPS slurry generated in pre-treatment of ALPS, high integrity container (HIC) made by polyethylene is used to contain ALPS slurry for storage. It is a concern that β rays emitted from ALPS slurry to cause degradation of HIC in use. Therefore, studies are underway a stabilization treatment facility, in which ALPS slurry is treated to dehydrate and solidify at an early stage and to store the ALPS slurry in a more stable condition. To secure confinement function of the facility, a policy to install a filter press machine to dehydrate ALPS slurry in a cell and to operate it by remote control was

presented in October 2023. The NRA has requested to transfer the slurry from HIC, which has accumulated absorbed dose of more than 5,000 kGy and led to maintenance of its integrity in concern. The NRA is also continuously checking the progress of the transfer.

For a large amount of rubble and secondary waste from water treatment stored in the premises of the Fukushima Daiichi NPS, efforts to transfer to indoor storage are being continued. For ALPS slurry, which is expected to be continuously generated by water treatment and has a problem with its storage capacity, a policy to prioritise cement solidification and to develop a solidification treatment policy including other secondary waste from water treatment by FY 2025 was presented. For existing rubble from decommissioning work, a policy to establish a method to evaluate radioactivity concentration by surface dose rate of the storage container by FY 2028 was presented. In March 2023, an analysis plan for solid waste was developed for decommissioning of TEPCO Fukushima Daiichi NPS. Although the plan is being reviewed in March 2024, the NRA will confirm that handling of solid radioactive waste in Fukushima Daiichi NPS will be transferred to appropriate storage and management depending on its concentration and properties with implementation of necessary analyses.

K-5-5 Measures for Natural Hazard

In April 2022, a geological map of a vicinity of the Fukushima Daiichi NPS revealed a possibility of landslides in surrounding areas, which is the same structure as a ground level 33 m platform of the NPS. Therefore, the possibility of landslides at the NPS was examined. As a result, it was confirmed that a weathered area directly under terrace deposits was spreading over the entire site. The NRA instructed a study on stability of the slopes around seismic resistant important facilities considering the existence of the weathered area.

Based on this study, a policy on necessity of measures for the slopes around the facilities was announced in December 2023. Specifically, from a viewpoint of decreasing overall risk of the NPS at an early stage, it was indicated that setback constructions should be carried out to dig down the slope behind the operational support common facility (common pool building), which will be in service for a relatively long time. The NRA requests that the setback constructions, which are expected to take the duration of approximately ten years, to be started and completed as soon as possible.

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
Hokkaido Electric Power Co., Inc.	Tomari Power Station	400	Uranium oxide fuel
Tohoku Electric Power Co., Inc.	Onagawa NPS	480	
	Higashidori NPS	100	
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	500	Uranium oxide fuel, MOX fuel
	Takahama Power Station	1,440	
	Ohi Power Station	1,870	Uranium oxide fuel
The Chugoku Electric Power Co., Inc.	Shimane NPS	460	
Shikoku Electric Power Co., Inc.	Ikata Power Station	750	Uranium oxide fuel MOX fuel
Kyushu Electric Power Co., Inc.	Genkai NPS	1,180	
	Sendai NPS	1,100	Uranium oxide fuel
JAPCO	Tsuruga NPS	630	
	Tokai Daini NPS	370	
Total		16,710	

* Data is provided by licensees

Facility		Inventory (item)	Type of spent Fuel
JAEA	Reactor Decommissioning R&D Centre*2	466	Uranium oxide fuel, MOX fuel
	FBR Research and Development Centre*2	465	MOX fuel Uranium oxide fuel
	Reprocessing Facility of the Nuclear Fuel Cycle Engineering Laboratories, Tokai Research and Development Centre*2	265	Uranium oxide fuel, MOX fuel
	Nuclear Science Research Institute*2*3	112,740	Uranium oxide fuel
	Oarai Research and Development Institute*2*4	920	Uranium oxide fuel, MOX fuel
JNFL	Rokkasho Reprocessing Facility*2	12,069	Uranium oxide fuel
Total		126,925	

*2 Amount of spent fuel, etc. described in the second half radiation control report FY2023, etc., are listed.
*3 In addition, 5 units of STACY solution fuel, 728 units of compact uranium-graphite mixed fuel, and 32 units of disk-type uranium-graphite mixed fuel
*4 117 cans returned from the irradiation test facility in Joyo

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	354	372m^3*3
JNFL	Reprocessing facility	346	244m^3*3
	Waste storage facility	1,830	—
Total		2,530	616 m^3

*1 Amount of liquid and solid waste described in the second half radiation control report FY2023, etc., are listed.
*2 Unit: JAEA: 120-litre container, JNFL (reprocessing facility): 160-litre container; JNFL (waste storage facility): 170-litre 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	1,233	1,233
	Tokai No. 2 Power Station	242	838	62,794	63,874
	Tsuruga Power Station	2,669	3,114	59,347	65,130
Hokkaido Electric Power Co., Inc.	Tomari Power Station	1,239	0	11,735	12,974
Tohoku Electric Power Co., Inc.	Onagawa Nuclear Power Station	1,996	448	38,880	41,364
	Higashidori Nuclear Power Station	108	0	15,256	15,364
TEPCO	Fukushima Daiichi NPS	14,947	2,925	173,454	191,326*2
	Fukushima Daini Nuclear Power Station	702	1,717	19,689	22,108
	Kashiwazaki-Kariwa Nuclear Power Station	655	2,879	26,149	29,683
Chubu Electric Power Co., Inc.	Hamaoka Nuclear Power Station	3,389	1,432	28,477	33,298
Hokuriku Electric Power Co., Inc.	Shika Nuclear Power Station	8	1,457	4,592	6,057
The Kansai Electric Power Co., Inc.	Mihama Power Station	2,342	316	25,190	27,848
	Takahama Power Station	4,879	0	36,581	41,460
	Ohi Power Station	4,142	1,453	21,004	26,599
The Chugoku Electric Power Co., Inc.	Shimane Nuclear Power Station	318	1,799	36,075	38,192
Shikoku Electric Power Co., Inc.	Ikata Power Station	1,685	1,076	21,348	24,109
Kyushu Electric Power Co., Inc.	Genkai Nuclear Power Station	4,687	1,285	32,961	38,933
	Sendai Nuclear	2,345	0	25,235	27,580

	Power Station				
JAEA	Reactor Decommissioning R&D Centre*3	2,000	0	17,793	19,793
	Fast Breeder Reactor Monju, Research and Development Centre*3	21	0	8,144	8,165
Total		48,374	20,779	665,937	735,090

*1 Data is provided by licensees. The storage unit is 200litre drums (including 200 litre drums conversion for miscellaneous solids).

*2 Rubble, trimmed trees, disused-protective clothing generated after accident, etc. [total 345,300m3], and secondary waste from contaminated water treatment [3,586 caesium absorption apparatus and absorption vessel etc. and Sludge 597m3] have been temporarily stored.

*3 Amount of solid waste described in the second half radiation control report FY2023, etc., are listed.

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	18	895
	Tsuruga Power Station (Unit 1)	173	2,158	49	850
	Tsuruga Power Station (Unit 2)	63	290	0	97
Hokkaido Electric Power Co., Inc.	Tomari Power Station	312	0	0	108

Power station		Control rod (number)*2	Channel box (number)	Others (m^3)	Resin, (m^3)
Tohoku Electric Power Co., Inc.	Onagawa Nuclear Power Station	231	3,521	1	527
	Higashidori Nuclear Power Station	67	644	0	140
TEPCO	Fukushima Daiichi NPS	1,460	20,581	193	3,550
	Fukushima Daini Nuclear Power Station	699	12,289	43	5,289
	Kashiwazaki-Kariwa Nuclear Power Station	800	13,552	0	2,694
Chubu Electric Power Co., Inc.	Hamaoka Nuclear Power Station	774	11,276	35	2.737
Hokuriku Electric Power Co., Inc.	Shika Nuclear Power Station	69	1,094	0	160
The Kansai Electric Power Co., Inc.	Mihama Power Station	996	0	0	160
	Takahama Power Station	1,402	0	0	128
	Ohi Power Station	1,602	0	0	133
The Chugoku Electric Power Co., Inc.	Shimane Nuclear Power Station	285	4,909	56	803
Shikoku Electric Power Co., Inc.	Ikata Power Station	886	0	0	201
Kyushu Electric Power Co., Inc.	Genkai Nuclear Power Station	928	0	0	206
	Sendai Nuclear Power Station	521	0	0	193
Subtotal		11,574 +(91 m^3)	73,935	(1,684m^3)	(16,146 m^3)
		Control rod (number)	Neutron detector (number)	Others (number*4)	Resin, etc. (m^3)
JAEA	Reactor Decommissioning	54	128	622	220.36

Power station		Control rod (number)*2	Channel box (number)	Others (m^3)	Resin, (m^3)
	R&D Centre*3				

		Control rod (number)	Neutron detector (number)	Others (m^3)
JAEA	Fast Breeder Reactor Research and Development Centre (Monju) *3	17	4	1.15

＊1 Data is provided by licensees.
＊2 Figures of the Tokai Power Station are not included.
＊3 Amount of solid waste described in the second half radiation control report FY2023, etc., are listed
＊4 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)	Other waste (drums)	Total (drums)
JAEA	Reprocessing facility	63,116	13,617	76,733
JNFL	Reprocessing facility	21,144	35,914	57,058
	waste storage facility	—	1,148	1,148
Subtotal		84,260	50,679	134,939

		Sheared cladding (drums)	Spent filter (drums)	Sample bottle (drums)	Total (drums)
JAEA	Reprocessing facility	5,213	319	1,395	6,927
JNFL	Reprocessing facility	221*2	—	—	221

		Low-level concentrated liquid waste (m^3)	Sludge (m^3)	Waste solvent (m^3)
JAEA	Reprocessing facility	3,121	1,162	107

(Note) Unit: 200-litre drum, including values equivalent to 200 litres per drum.
＊1 Amount of solid waste described in the second half radiation control report FY2023, etc., are listed.
＊2 Unit for a piece of sheared cladding: 1,000-litre drum

L2-4 Uranium Waste*

		Drum (number)	Other waste (drums)	Total (drums)	Low-level liquid waste (m^3)
Global Nuclear Fuel-Japan Co., Ltd.		17,007	2,530	19,537	0.15
Mitsubishi Nuclear Fuel Co., Ltd.		15,299	615	15,914	1.6
Nuclear Fuel Industries, Ltd.	Tokai Works	5,990	439.8	6,429.8	5.6
	Kumatori Works	10,147	30	9,525	13.8
JAEA	Prototype Uranium Enrichment Plant	595	56	638	0.141
JNFL	Enrichment and Disposal Office	10,664	4,684	15,348	2.77
Total		59,702	8,354.8	67,391.8	24.061

(Note) Unit: 200-litre drum, including values equivalent to 200 litres per drum.

* Amount of solid waste described in the second half radiation control report FY2023, etc., are listed

L2-5 Waste Stored in Research Facilities[*1]

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[*2])	Liquid waste (m^3)	Remarks
JAEA	Nuclear Science Research Institute	118,664	—	Sum of values for reactor facilities and those for facilities using nuclear fuel materials
	Nuclear Fuel Cycle Engineering Laboratories	69,165	32.4	Facility using nuclear fuel materials
	Oarai Research and Development Institute (North Area)	1,478	—	Sum of values for reactor facilities and those for facilities using nuclear fuel materials
		31,636	—	Waste storage facility
	Oarai Research and Development Institute (South Area)	7	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 Centre	15,431	11.3	Facility using nuclear fuel materials
	Mutsu Office, Aomori Research and Development Centre, JAEA	1,055*3	23.00	Nuclear facility
Nuclear Professional School, School of Engineering, the University of Tokyo		22.5	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		204	0	The values refer to the sum of reactor facilities and for facilities using nuclear fuel materials
Nuclear Material Control Centre	Tokai Safeguards Centre	550	—	Facility using nuclear fuel materials
	Rokkasho Safeguards Analytical Laboratory	—*4	—*4	Facility using nuclear fuel materials
Institute for Atomic Energy, Rikkyo University		167.7	—	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.*5		442	16.9	Facility using nuclear fuel materials
Nuclear Development Corporation		2,723*6	—	Facility using nuclear fuel materials
Toshiba Energy Systems	Research Reactor Centre	76.1	—	Nuclear facility
	Nuclear Engineering Lab.	1,611.1	0.74	For solid wastes, the values refer to the sum of reactor

& Solutions Corporation				facilities and facilities using nuclear fuel materials*5. For liquid wastes, the values refer to facilities using nuclear fuel materials
Hitach Cooperation Ozenji Centre		965	—	Reactor facility
Total		243,877.51	87.37	

(Note) The data in this table includes those of long half-life low heat generating radioactive waste and uranium waste generated in the facilities.

＊1 Amount of solid waste described in the second half radiation control report FY2023, etc., are listed.
＊2 Unit: 200-litre drum, including values equivalent to 200 litres per drum.
＊3 Other large equipment, etc., 48+1 units (reactor room removals)
＊4 Transfer or shipment to JNFL Reprocessing Facility
＊5 Article 41 of the Cabinet Order relevant facilities are described
＊6 Including solid waste other than nuclear fuel material users (materials falling under Article 41 of the Cabinet Order)

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	7,065	
	Ichihara Office	40,527	
	Kansai Waste Relay Station	504	
Vesta Co., Ltd.		61,140	
JAEA	Nuclear Science Research Institute	96,222	
	Oarai Research and Development Institute	37,567	
T. N. Technos Co., Ltd. Tsukuba Research Institute		373	
Total		242,894	

＊：Unit: 200-litre

L2-6 Amount of Disposed Radioactive Waste[*1]

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	156,627[*3]
	Unit 2	Co-60、Ni-63、Cs-137、Sr-90、C-14	200,872[*3]
	Total	—	357,499[*3]
Nuclear Science Research Institute JAEA[*2]	Waste disposal facilities	Co-60, Ni-63, Cs-137, Sr-90, Ca-41, C-14, Eu-152, H-3	1,670 tons

＊1 Amount of disposed waste described in the second half radiation control report FY2023, etc., are listed.

＊2 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.

＊3 Unit: 200-litre 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 Daini 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	Ibaraki	Treating and storing uranium waste	Storing waste after reducing the volume by compressing or

	materials			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 Centre, 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 of JAEA of National	Waste disposal facility	Ibaraki	Treating low-level radioactive waste materials	Trench disposal of concrete waste

Research and Development Agency	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 Centre, 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 Centre, 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	Storing waste from storage facilities that accept spent fuel materials (a

			containing trans uranium	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, 2 and 3[*4]
	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 Centre, 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 Centre 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 Centre	Facility using nuclear fuel materials	Aomori	Treating and storing waste from facilities using nuclear fuel materials	Storing waste
Tokai Safeguards Centre, Nuclear Material Control Centre	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 Centre, 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	Facility using nuclear fuel	Kanagawa	Storing waste from research and test	Storing waste

Corporation	materials, research and test reactor facility		reactor facilities and facilities using nuclear fuel materials	
Ozenji Centre, 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.

＊4 Unit 3 is under construction.

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
TEPCO	Fukuchima Daini Units 1-4	Reactor type: BWR Power output: 1100MW	April, 2021	FY2064
Tohoku Electric Power Co., Inc.	Unit 1 Onagawa Nuclear Power Station	Reactor type: BWR Power output: 524MW	March, 2020	FY2053
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	FY2048
Shikoku Electric Power Co., Inc.	Unit 1 and 2, Ikata Power Station	Reactor type：PWR Power output：566MW	Unit 1: June 2017 Unit 2: Oct., 2020	Unit 1: FY2056 Unit 2: FY2059
Chugoku Electric Power Co., Inc.	Unit 1, Shimane Nuclear Power Station	Reactor type：BWR Power output：460MW	April, 2017	FY2049
The Kansai Electric Power Co., Inc.	Units 1 and 2, Mihama Power Station	Reactor type：PWR Power output ： Unit 1：340MW Unit 2：500MW	April, 2017	FY2045
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: April 2017 Unit 2: March, 2020	Unit 1: FY2054 Unit 2: FY2054
JAPCO	Unit 1, Tsuruga Power Station	Reactor type：BWR Power output：357MW	April, 2017	FY2040
Chubu Electric Power Co., Inc.	Units 1 and 2, Hamaoka Nuclear Power Station,	Reactor type：BWR Power output： Unit 1: 540MW Unit 2: 840MW	Nov., 2009	FY2036
JAPCO	Tokai Power	Reactor type： GCR	June, 2006	FY2035

Name of facilities		Type	Approval date of decommissioning plan	Scheduled completion date of decommissioning
	Station	Power output：166MW		
JAEA	Advanced Thermal Reactor *Fagen*	Reactor type： ATR Power output：165MW	Feb., 2008	FY2040
JAEA	Reactor facility of Prototype Fast Breeder Reactor *Monju*	Nuclear reactor type: Sodium-cooled Fast Breeder Neutron Reactor Power output: 28MW	March, 2018	FY2047

＊ Data is provided by licensees.

L4-2 Major Research Reactors under Decommissioning

Name of facilities		Type	Approval date of decommissioning plan
JAEA	FCA	Reactor type： Fast Reactor Critical Facility Thermal Output：2kW	September, 2021
Toshiba Energy Systems & Solutions Corporation	NCA	Reactor type：Critical Facility (Light-Water-Moderated, Heterogeneous) Thermal Output: 200W	April, 2021
JAEA	JMTR	Materials Testing Reactor Thermal Output：5MW	March, 2021
JAEA	TCA	Reactor Type：Light-water Critical Facility Thermal：200W	March, 2021
JAEA	TRACY	Reactor type：Transient Experiment Critical Facility Thermal output：10kW（in static operation） 5000MW（in transient operation）	June, 2017

Name of facilities		Type	Approval date of decommissioning plan
JAEA	JRR-4	Reactor type：Light water moderated and cooled, swimming pool-type reactor with low-enriched uranium Thermal output：3,500kW	June, 2017
the University of Tokyo	YAYOI	Reactor type：Air cooling fast reactor using uranium as fuel Thermal output：2kW	Aug, 2012
Hitachi, Co., Ltd.	HTR	Reactor type：Light-water moderated and cooled reactor Thermal output：100kW	Apr, 2007
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
JAEA	JRR-2	Reactor type：Heavy-water-moderated cooling tank reactor Thermal output：10MW	Nov, 2006
JAEA	First Nuclear Ship Mutsu	Reactor type：PWR Thermal output：36MW	Oct, 2006
JAEA	DCA	Reactor type：Heavy-water moderated reactor Thermal output：10MW	Oct, 2006