NRA-NRC Workshop on Decommissioning of Nuclear Power Plants
April 8, 2015

“Safety Regulations for Decommissioning of Nuclear Power Plants in Japan and Future Challenges”

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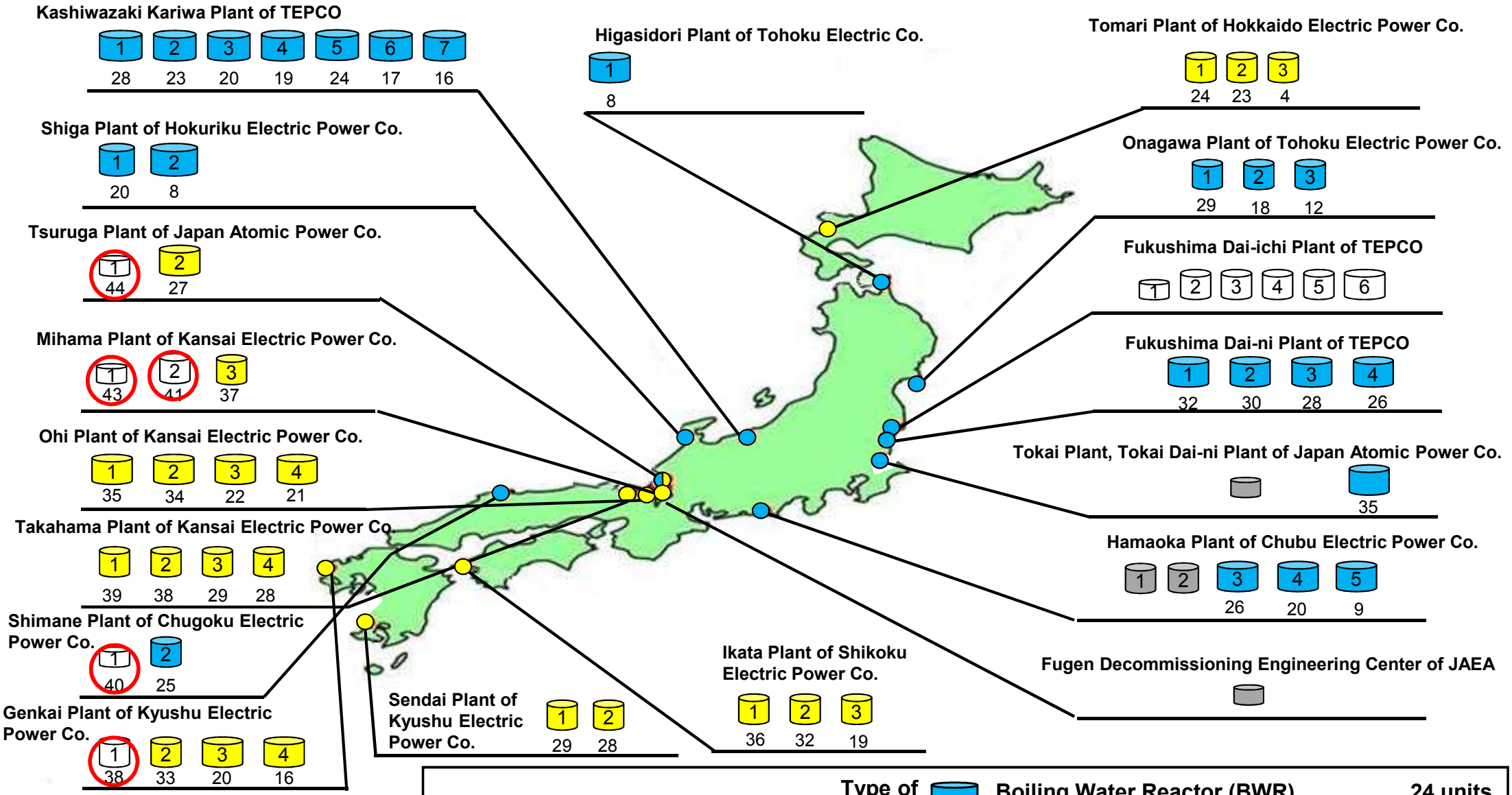
Contents

1. Nuclear Power Plants in Japan

Operating stage and decommissioning stage

As of April 8, 2015



Construction Stage

Monju, fast breeder prototype reactor of JAEA
Unit 3 of Shimane Plant, Chugoku Electric Power Co.
Ohma Plant of J-Power
Unit 1 of Higashidori Plant, TEPCO

Legend

1 ← Unit #
30 ← Years in operation

Power Output Scale

Under 0.5 million kW
Under 1 million kW
Over 1 million kW

Type of Reactor

Boiling Water Reactor (BWR)	24 units
Pressurized Water Reactor (PWR)	24 units
Already service terminated	5 units
Specified nuclear facility	6 units
Reactors undergoing decommissioning	4 units

2. Decommissioning Process

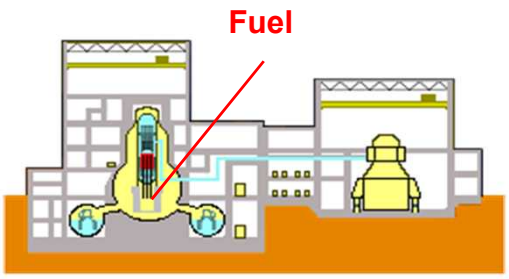
- In decommissioning of nuclear facilities, the following actions are to be taken.
  - Dismantling of nuclear facilities
  - Transfer of nuclear fuel materials
  - Decontamination
  - Treatment of radioactive waste

Ex)
Decommissioning Scene at the Tokai Power Plant

Typical Decommissioning Steps

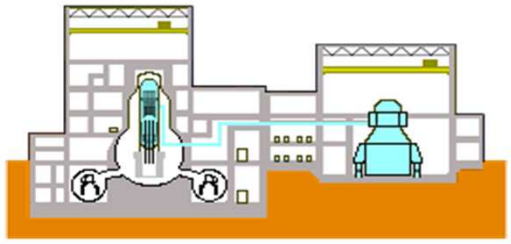
(1) Taking out the spent fuel

Spent fuel shall be taken out from the nuclear power facility. The spent fuel shall then be managed at the place where transferred.



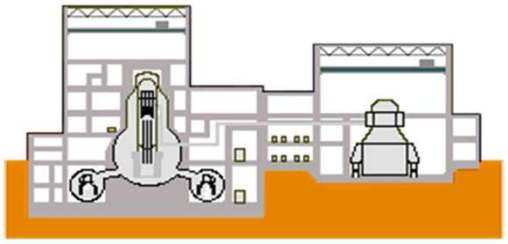
(2) Decontamination of systems

To facilitate the dismantling work, radioactive materials attached to piping and containers shall be removed.



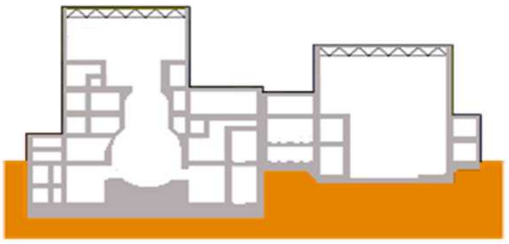
(3) Safety storage

Reactor equipment with relatively high-level radioactivity is stored for 5 to 10 years to wait for amount of radioactive materials to decrease.



(4) Dismantling and removal

Facilities and equipment in the building shall first be dismantled and removed. Then, the building shall be dismantled and removed.



Note: Illustrated image of decommissioning steps

3. Regulations on Decommissioning

In 2005, new regulation (**Approval of decommissioning plan**) has been enforced.

Act on the regulations of nuclear source material, nuclear fuel material, and reactors

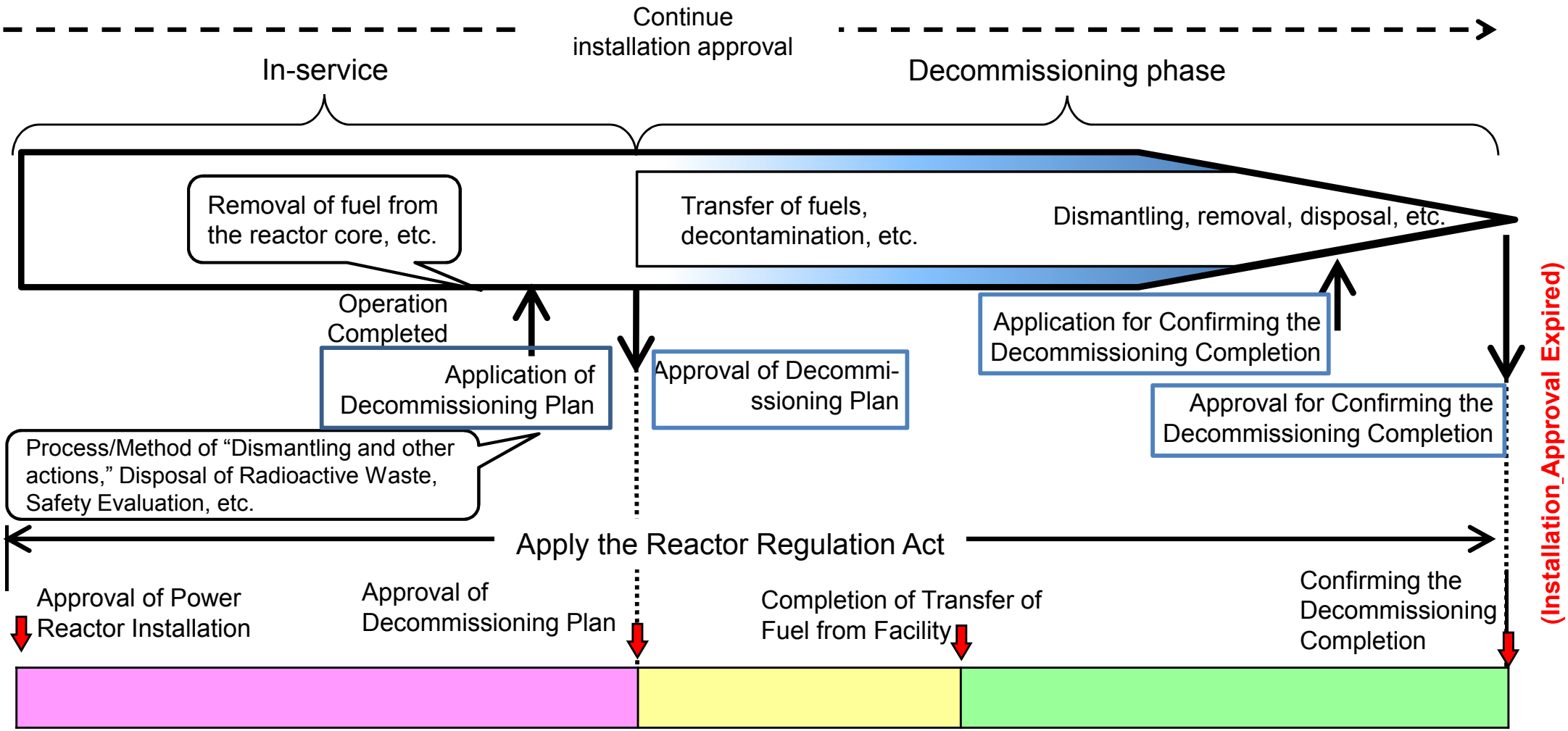
Current Provision**:**
(Measures due to decommissioning of power reactors)
Article 43-3-33

1 When the licensee of power reactor operation intends to abolish his/her power reactor, he/she shall dismantle the power reactor facilities, transfer the nuclear fuel material that he/she processes, eliminate the contamination caused by nuclear fuel material, dispose of material contaminated by nuclear fuel material and take any other measures specified by the Ordinance of the NRA(hereinafter referred to as "decommissioning measures" in this Article and the following Article).

2 When the licensee of power reactor operation intends to take decommissioning measures, he/she shall draw up a plan concerning said decommissioning measures (hereinafter referred to as "**decommissioning plan**" in the following Article) in advance, pursuant to the provisions of the Ordinance of the NAR, and obtain the **approval** of the Nuclear Regulation Authority.

3 (Omitted)

3-1 Safety Regulation Concept



Facility regulation (periodic inspection, etc.), Regulation on outside disposal/outside shipment, Operational safety regulations (Approval of operational safety program, Operational safety inspection), Physical protection regulation

⇒ Implement stepwise regulations according to the safety state of the facility, paying especially close attention to presence of nuclear fuel materials*

*** Example of changing regulations, based on the progress of decommissioning**

For operational safety inspection and periodic inspection:

○ For approval of decommissioning plan: Change in the number of operational safety inspections , Partial exemption of periodic inspection items

For operational safety program:

○ For approval of decommissioning plan: Change of operational safety program

○ When there is no nuclear fuel material within the facility to be decommissioned: Partial exclusion from application of operational safety program

3-2 Stepwise Regulations

- ○ Based on the Reactor Regulation Act, the decommissioning plan shall be approved before starting decommissioning of the reactor facility.
- ○ Regulations for decommissioning are divided into three steps: approval of decommissioning plan, regulation of decommissioning stage, and confirming the completion of decommission; regulations shall be made to ensure safe confinement of radioactive materials through these steps.
- ○ In the decommissioning plan, the following shall be prescribed: (1) an appropriate method for maintaining and managing the reactor facility for operational safety during dismantling, (2) measures to reduce exposure of the general public and persons engaged, (3) appropriateness of the treatment method for radioactive wastes, etc.

Flow of Decommissioning

Note: During decommissioning, safety shall be confirmed through periodic facility inspections, operational safety inspections, etc.

Licensees shall revise the decommissioning plan based on the progress made and shall change the operational safety program accordingly. NRA shall then review it.

Decommissioning

Operation Completed → Approval of Decomm. Plan → Taking out the Fuel / Contamination Check / Decontamination → Dismantling & Removal in Areas other than the Reactor Area / Safe Storage in the Reactor Area → Dismantling & Removal in the Reactor Area → Confirmation of Decommissioning Completion → Usage of the Site

Approval requirements
- Management and transfer of nuclear fuel material
- Contaminated materials shall be appropriately managed or disposed of.

For specifics, stipulated in review standards (bylaws)

To reduce radiation dose and concentrations of radioactive waste during dismantling/removal work, radioactivity shall be attenuated for 5 to 10 years.

For exposure assessment, the annual effective dose outside the Environmental Monitoring Area shall be determined as 1mSv (target 50 μSv) at normal times, and 5mSv at the time of accidents.

This shall be implemented when radioactivity is attenuated through the safe storage period.

Requirements for confirming the completion
- Transfer of nuclear fuel materials is completed
- Management of radioactive waste is completed

For specific items, stipulated in the review standards (bylaws)

3-3 Requirements for Approval of Decommissioning Plan (1)

Under the rules for installing and operating the commercial power reactors, the following standards have been prescribed for approving a decommissioning plan.

- Spent fuels shall have been taken out from the reactor core.
  (Paragraph 1 of Article 119 of the Rules)
- Management and transfer of nuclear fuel materials shall be appropriate.
  (Paragraph 2 of Article 119 of the Rules)
- Management, processing and disposal of nuclear fuel materials and radioactive waste shall be appropriate.
  (Paragraph 3 of Article 119 of the Rules)
- Proper protective measures shall be taken against disaster caused by nuclear fuel materials, contaminated materials and nuclear reactor.
  (Paragraph 4 of Article 119 of the Rules)

NRA shall confirm in a safety review that the decommissioning plan applied by the licensee conforms to the standards mentioned above.

3-3 Requirements for Approval of Decommissioning Plan (2)

Matters to be recorded in an application for approval of decommissioning plan (1):

Main text

1. Name or title and address of the applicant, and the representative's name if the applicant is a corporation
2. Name and address of the plant or facilities to be decommissioned
3. Name of the power reactor to be decommissioned
4. Facilities to be decommissioned and their premises
5. From the facilities listed in the preceding item, facilities to be dismantled and the dismantling method
6. Management and transfer of nuclear fuel material
7. Removal of contamination
8. Disposal of contaminated materials
9. Decommissioning procedure

3-3 Requirements for Approval of Decommissioning Plan (3)

Matters to be recorded in an application for approval of decommissioning plan (2)

Appended documents

1. Documents that prove that spent fuel has already been removed from the core of the power reactor
2. A plan of the premises of facilities to be decommissioned and an area map of construction work required for decommissioning
3. A written document regarding the control of radiation exposure involved in decommissioning
4. A written document regarding the type, level, effects, and so on of accidents that are likely to occur in the event of an operational error, a machine or device failure, an earthquake, a fire, or other emergencies during decommissioning
5. A written document regarding the distribution of contamination and its assessment method
6. A written document regarding power reactor facilities whose functions need to be maintained during decommissioning, their performance, and the period during which to maintain their performance
7. A written document regarding the amount of funds required for decommissioning and fund-raising plans
8. A written document regarding the system for implementing decommissioning
9. A written document regarding quality assurance plans
10. In addition to documents listed in the preceding items, documents or drawings considered necessary by the Nuclear Regulation Authority

3-4 Requirements for Confirming the Completion of Decommissioning

The rules provide the following standards for confirming the completion of decommissioning:

- That transfer of nuclear fuel material is completed.
  (Article 121, Item 1)
- That no measures are needed to prevent damage from radiation in regards to the soil and remaining facilities on the premises of facilities to be decommissioned.
  (Article 121, Item 2)
- That management of radioactive wastes is completed.
  (Article 121, Item 3)
- That transfer of radiation management records to the institution designated by the Nuclear Regulation Authority is completed.
  (Article 121, Item 4)

Based on documents and on-site surveys, the Nuclear Regulation Authority verifies that the completion of decommissioning reported by the operator fulfills the above standards.

3-5 Future Challenges

Regulation-related tasks

- It is necessary to keep improving regulations as the decommissioning process progresses.

  ex) Decommissioning in the case where there are multiple reactors in one site.

Related tasks

- Interim storage of spent fuel
- Securing repositories for waste from decommissioning and licensees of waste disposal activity
- Preparation of funds related to decommissioning
- Decommissioning of fuel cycle facilities

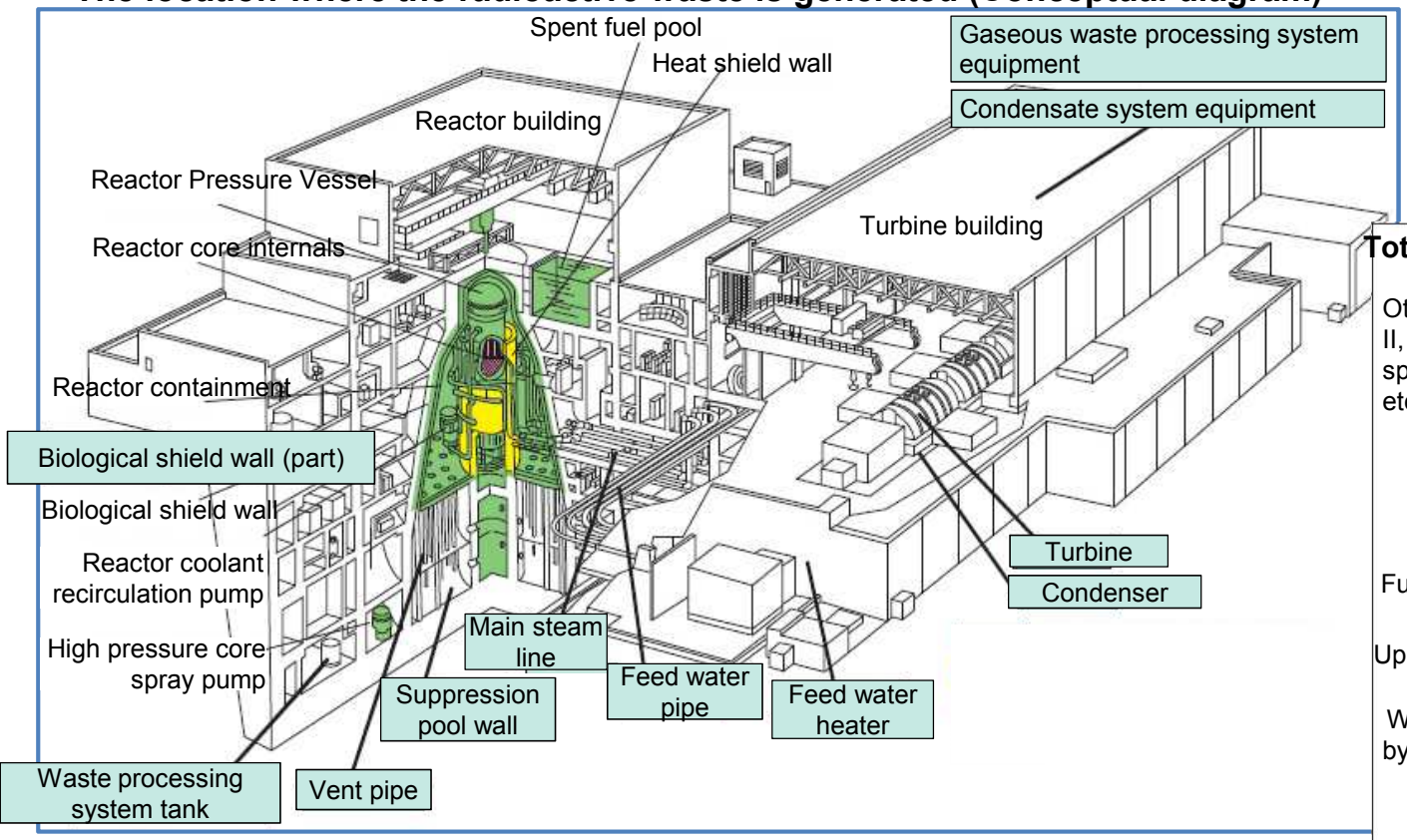
Other tasks

- Regulations concerning disposal of radioactive waste generated by decommissioning

4. Disposal of Radioactive Waste Generated by Decommissioning

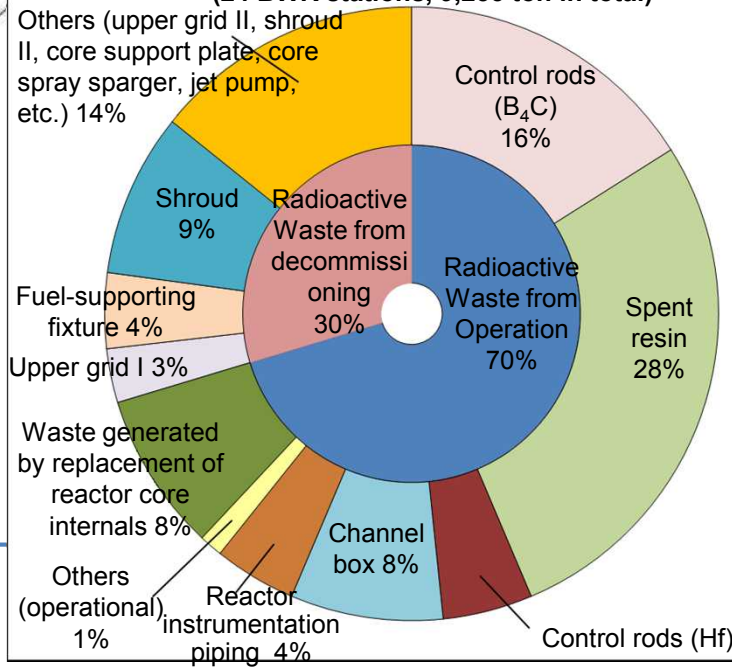
Amount of radioactive waste generated by decommissioning of a nuclear power reactor facility (estimate, example of BWR)

The location where the radioactive waste is generated (Conceptual diagram)

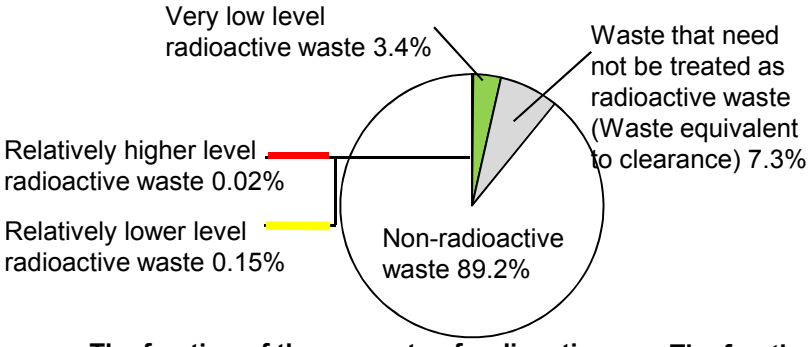


- Relatively higher level radioactive waste
- Relatively Lower level radioactive waste
- Very low level radioactive waste
- Waste that need not to be treated as radioactive waste (clearance, NR)

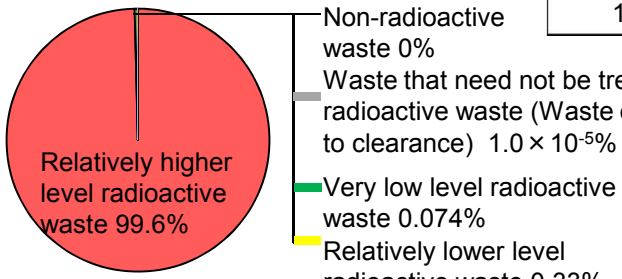
Total amount of Radioactive waste of core structures of BWR
(24 BWR stations, 9,253 ton in total)*



*: Based on "Basic data concerning waste subject to Intermediate depth disposal (partially revised)" by the Federation of Electric Power Companies (Dec. 25, 2014)



The fraction of the amounts of radioactive waste for each classification
(Example of Hamaoka nuclear power station Units 1 and 2, about 520,000 ton in total)



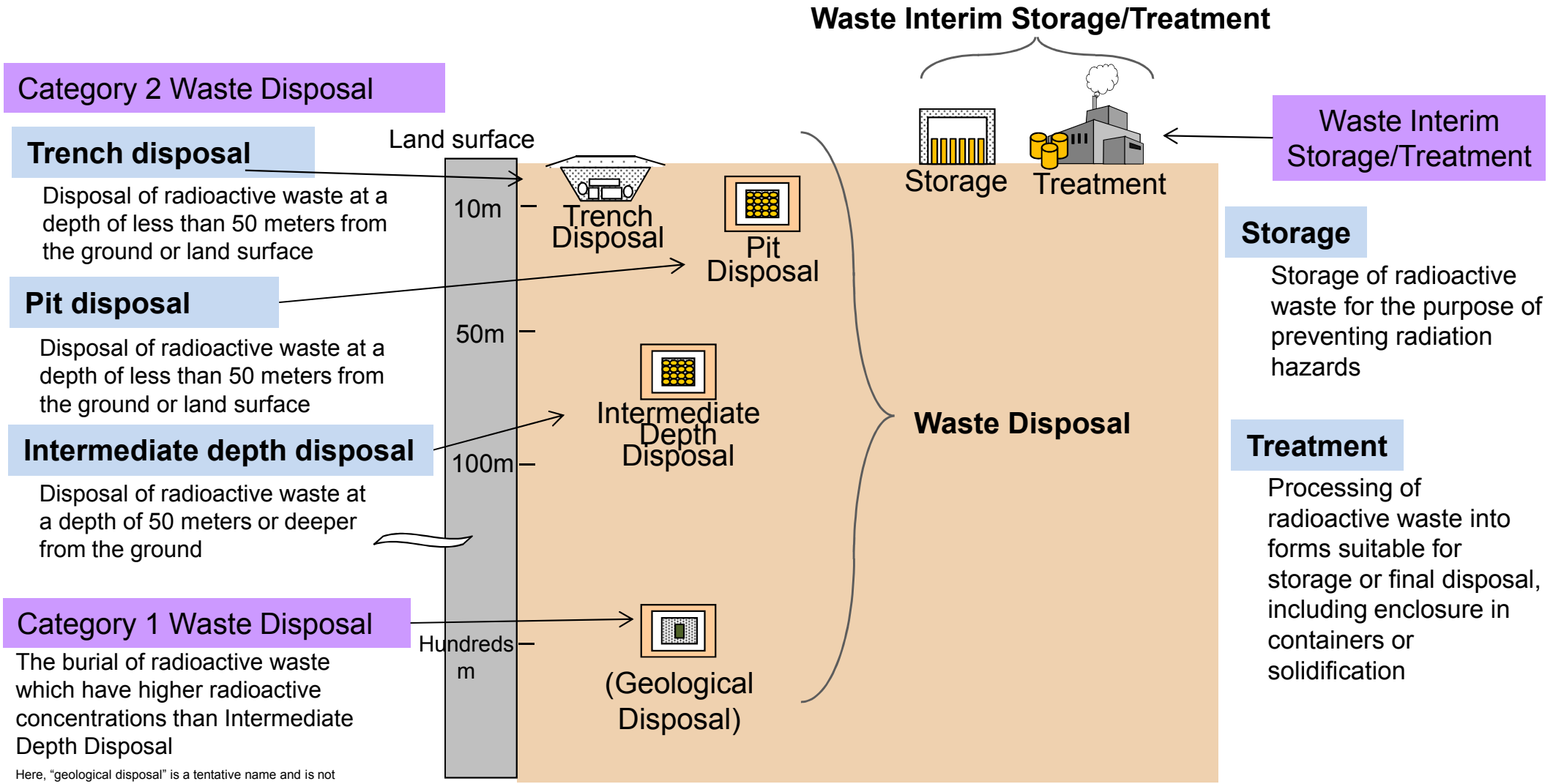
The fraction of radioactivity of radioactive waste for each classification
(Example of Hamaoka nuclear power station Units 1 and 2, about 2.0×10^{16}Bq in total)

Source: Material for the Study Team Meeting on the Regulation of Radioactive Waste in Decommissioning on January 26, 2015

“Waste Management” defined in the Reactor Regulation Act

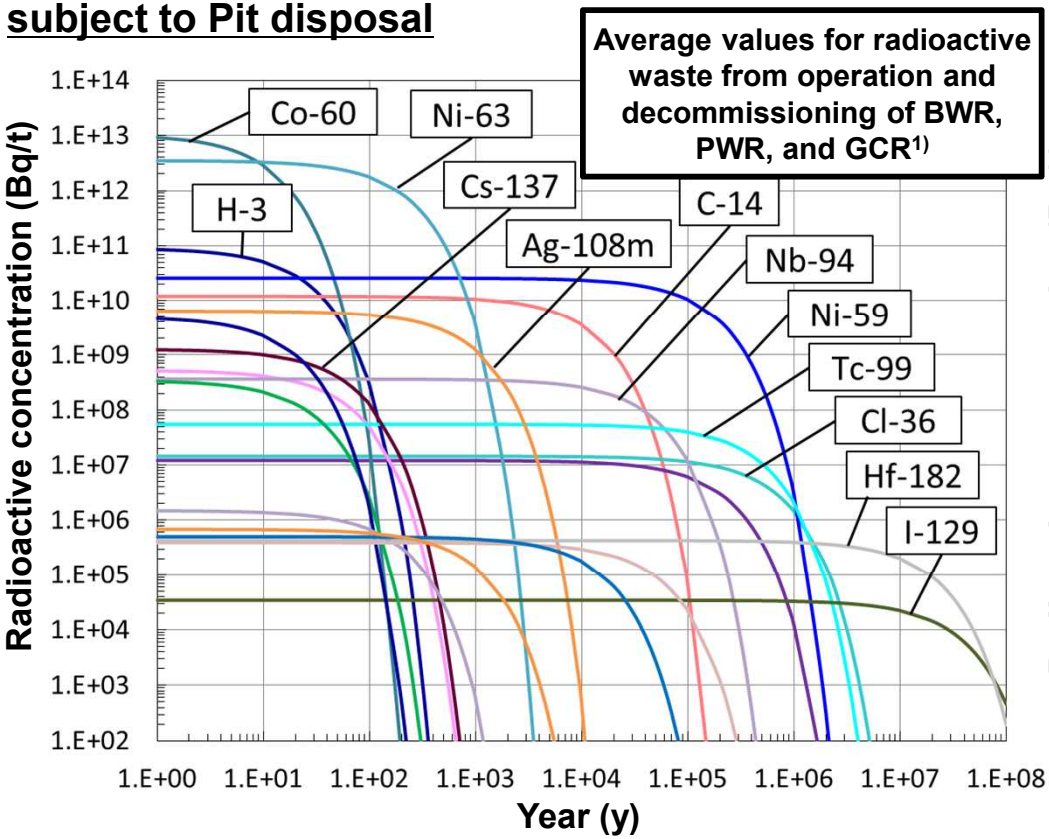
The Reactor Regulation Act stipulates **“Waste Management”**, regulations concerning the disposal of radioactive waste through the burial method, categorizing these as **“Category 1 Waste Disposal”** and **“Category 2 Waste Disposal”** according to the radioactive concentration of waste to be disposed of.

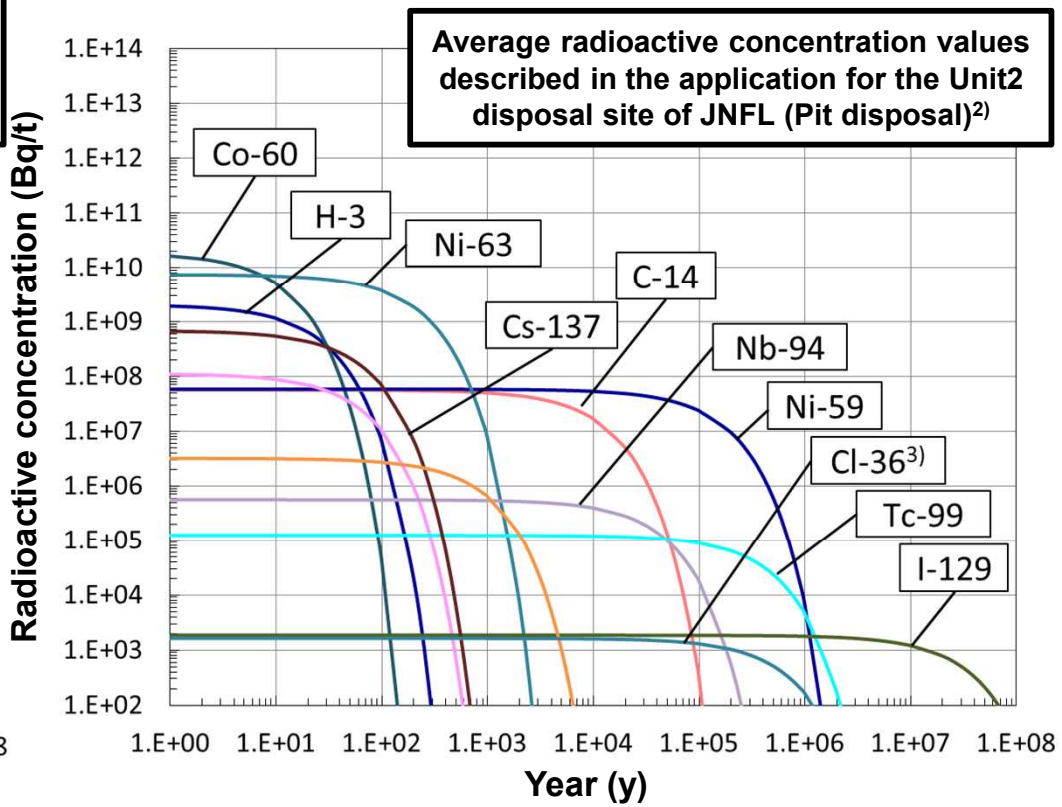
In addition, said act defines the storing radioactive waste outside of plants or processing radioactive waste into forms suitable for storage or final disposal until the commencement of final disposal through the burial method or other methods as **“Waste Interim Storage/Treatment”** .



Characteristics of Radioactive Waste of Core Structures* (1/2)

Decay of the major radionuclides contained in radioactive waste of core structures and radioactive waste subject to Pit disposal





1): Based on "Basic data concerning waste subject to Intermediate depth disposal (partially revised)" by the Federation of Electric Power Companies (Dec. 25, 2014)
2): Based on "Application for Modification of Waste Disposal, Rokkasho Low-Level Radioactive Waste Disposal Center" by Japan Nuclear Fuel Limited (JNFL) (Jan. 1997)
3): Based on "Dose assessment of low level radioactive waste at JNFL Rokkasho Low-Level Radioactive Waste Disposal Center and Future Activity" by JNFL (Aug. 31, 2011)

- Although the radioactive waste of core structures contains radionuclides that are similar to those contained in Pit disposal, it also contains nuclides generated in control rods, such as Ag-108m or Hf-182.
- In addition, since the radioactive concentrations of the nuclides in radioactive waste of core structures, including long-lived radionuclides, are high overall, radioactive waste of core structures has a higher radioactivity than that of Pit disposal in the initial stage, and requires a longer period of time for radioactivity decay.
- On the other hand, concentrations of alpha-emitting nuclides, which are mainly contained in fuel, are lower than those in high-level radioactive waste or TRU waste.

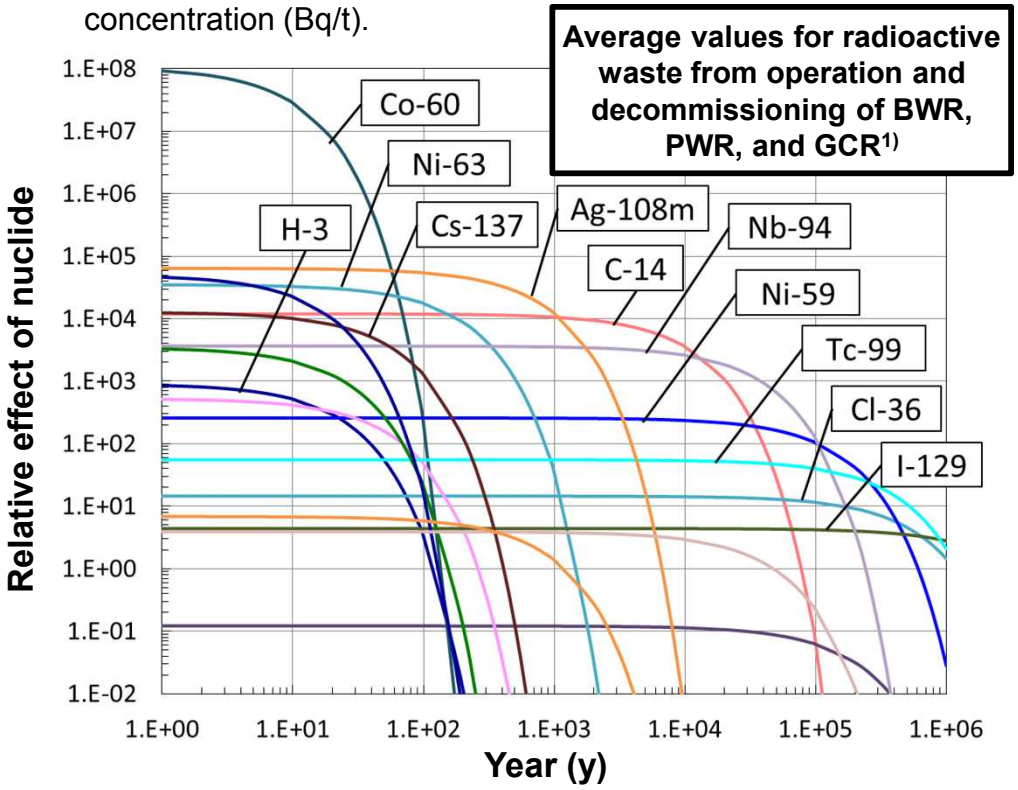
* Radioactive waste of core structures, in which radioactive concentrations have become relatively high due to activation under high radiation accompanying decommissioning and operation of nuclear power facilities or the like.

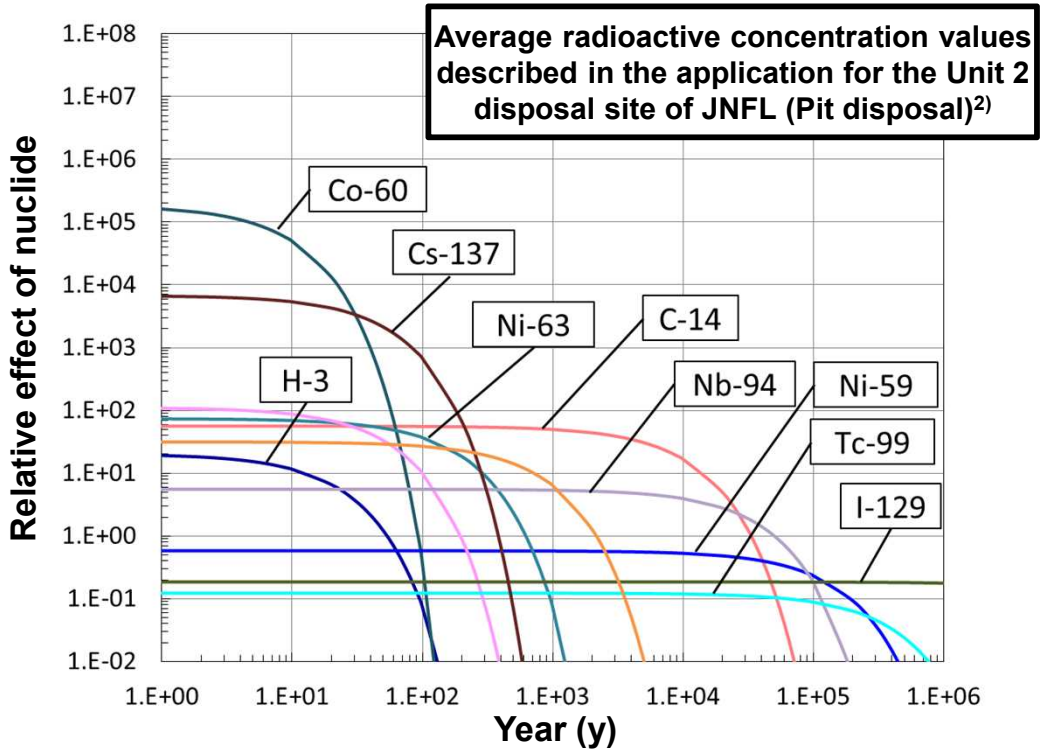
Source: Material for the Study Team Meeting on the Regulation of Radioactive Waste in Decommissioning on March 18, 2015

Characteristics of Radioactive Waste of Core Structures (2/2)

Relative effects of the major radionuclides contained in radioactive waste of core structures and radioactive waste for Pit disposal (Relative effect of nuclide = nuclide concentration/clearance level)

- Creation method: the concentration of each nuclide was normalized with reference to the clearance level (concentration equivalent to 10 μSv/y).
- This makes it possible to consider each nuclide taking into consideration the degree of its effect, not simply based on its radioactive concentration (Bq/t).





1): Based on "Basic data concerning waste subject to Intermediate depth disposal (partially revised)" by the Federation of Electric Power Companies (Dec. 25, 2014)
2): Based on "Application for Modification of Waste Disposal, Rokkasho Low-Level Radioactive Waste Disposal Center" by Japan Nuclear Fuel Limited (JNFL) (Jan. 1997)

- Short-lived nuclides (e.g., Co-60, Cs-137, etc.) mostly decay after several hundred years.
- Many other nuclides decay mostly after several thousand to 100,000 years.
- Although some nuclides (e.g., Ni-59, Tc-99, Cl-36, etc.) maintain relatively high radioactive concentrations even after 100,000 years, these are beta-emitting nuclides and the impact of external exposure is small.
- Although concentrations of long-lived nuclides, such as I-129, are relatively low, they do not decay significantly in 100,000 years.

Source: Material for the Study Team Meeting on the Regulation of Radioactive Waste in Decommissioning on March 18, 2015

Regulatory Requirements for Implementing Measures to Ensure Safety (Under Consideration) (1/2)

The ad-hoc team began to discuss for the safety regulations of Intermediate Depth Disposal. The 1st meeting was held on 26 January 2015.

I. Design requirements (1/2)

(1) Location of waste disposal site
- ① Ensuring of depth
- ② Disposal in the ground with a high migration retardation function
- ③ Disposal in stable ground
- ④ Consideration of natural resources etc.

(2) Concentration limit for long-lived nuclides
- ⑤ Concentration limit for long-lived nuclides

(3) Engineering measures for waste disposal sites
- ⑥ Suppression of leakage of radioactive nuclides through engineered barriers
- ⑦ Physical resistance of engineered barriers

(4) Shielding for waste disposal facilities
- ⑧ Ensuring of safety during operation

Source: Material for the Study Team Meeting on the Regulation of Radioactive Waste in Decommissioning on March 18, 2015

Regulatory Requirements for Implementing Measures to Ensure Safety (Under Consideration) (2/2)

I. Design requirements (2/2)

(5) Evaluation of impacts under normal conditions, at accidents, and at abnormal events during operation

⑨ Radiation doses to the general public during normal operation

⑩ Radiation doses to the general public at accidents or abnormal events during operation

(6) Evaluation of the impacts of natural processes and inadvertent human intrusion after the termination of activity

⑪ Radiation doses due to natural processes

⑫ Radiation doses caused by inadvertent human intrusion

II. Control requirements

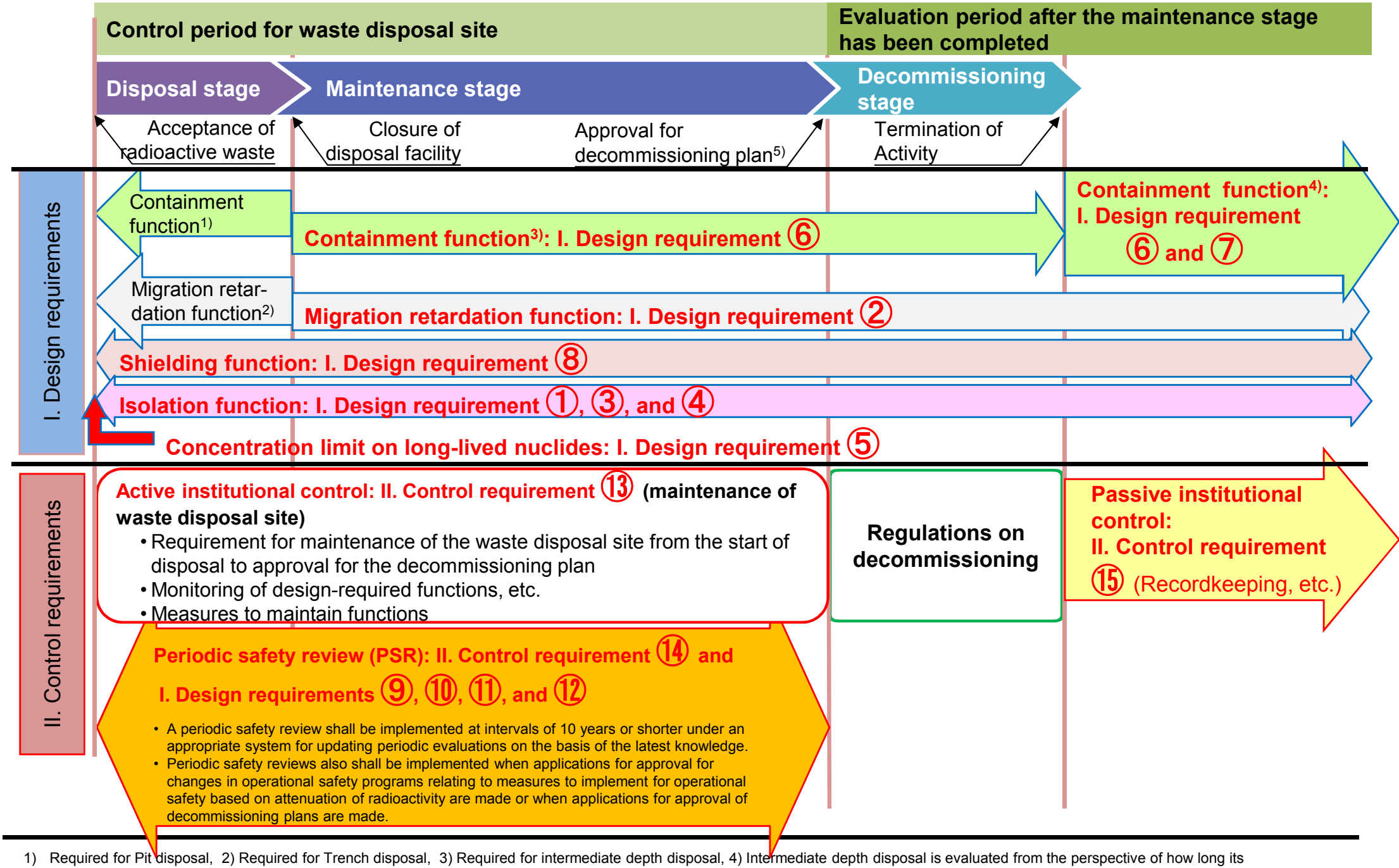
⑬ Active institutional control

⑭ Periodic safety review (PSR)

⑮ Passive institutional control

Source: Material for the Study Team Meeting on the Regulation of Radioactive Waste in Decommissioning on March 18, 2015

Major Design Requirements and Control Requirements and Their Implementation Periods



1) Required for Pit disposal, 2) Required for Trench disposal, 3) Required for intermediate depth disposal, 4) Intermediate depth disposal is evaluated from the perspective of how long its containment function can be maintained after control based on the best technologies has been completed., 5) Approval criteria require that "the waste disposal site be in condition in which maintaining the site requires no additional measures."

Source: Material for the Study Team Meeting on the Regulation of Radioactive Waste in Decommissioning on March 18, 2015

Main issue (tentative)

- Design Requirements
  - ✓ Maintained period of intermediate depth
  - ✓ Screening of long-lived radionuclides
  - ✓ Technical criteria of disposal facility and radioactive waste
  - ✓ Function and maintained period of engineered barrier
  - ✓ Human intrusion scenario
  - ✓ Relation with IAEA international standards
- Control Requirements
  - ✓ Monitoring, surveillance (active control)
  - ✓ Retaining period and contents of the records (passive institutional control)
- Dose Criteria and Scenario for the safety assessment
  - ✓ Dose Criteria
  - ✓ Human events and rare natural events
  - ✓ Control after decommissioning
  - ✓ Long-term assessment

Reference

Safety Assurance Measures Based on Characteristics of Radioactive Waste of Core Structures (Under Consideration)(1/2)

- Compared to radioactive waste subject to Pit disposal, radioactive waste of core structures has a higher radioactivity at the initial stage and requires a longer time period for decay.
- Based on these characteristics, potential measures to prevent the occurrence or to decrease effects of events in which radioactive effects might occur by human access to or contact with radioactive waste or leakage of nuclides contained in radioactive waste are organized in the following.

* Corresponds items in the regulatory requirements for achieving safety assurance measures (p. 24–p. 27).

Stage	Event requiring taking of measures	Related radionuclide	Measures considered important	Category of the measure*
Disposal	External exposure of the workers or the residents in the vicinity with handling of the radioactive waste	Gamma-emitting nuclides such as Co-60, Cs-137, or Nb-94	• Safety assurance during operation (Reinforcement of the shielding function of disposal facilities) • Prevention of leakage of radionuclides from engineered barriers	I. Design requirement ⑧ I. Design requirement ⑥
			• Active institutional control (monitoring of the shielding function and containment function)	II. Control requirement ⑬
Mainte-nance	Leakage of radionuclides	H-3, C-14, Cl-36, Tc-99, I-129, etc.	• Prevention of leakage of radionuclides from engineered barriers	I. Design requirement ⑥
			• Active institutional control (Monitoring of the shielding function, containment function, migration retardation function and isolation function)	II. Control requirement ⑬
	Exposure due to human intrusion	Gamma-emitting nuclides such as Co-60, Cs-137, Nb-94	• Active institutional control (Prohibition of specified activities, etc. and monitoring of the isolation function)	II. Control requirement ⑬

Standards and assessment for judging adequacy of the above measures:

- Radiation doses to the general public during normal operation I. Design requirement ⑨
- Radiation doses to the general public at accidents or abnormal events during operation I. Design requirement ⑩
- Periodic safety review (PSR) II. Control requirement ⑭

Source: Material for the Study Team Meeting on the Regulation of Radioactive Waste in Decommissioning on March 18, 2015

Safety Assurance Measures Based on Characteristics of Radioactive Waste of Core Structures (Under Consideration) (2/2)

Stage	Event requiring taking of measures	Related radionuclide	Measures considered important	Category of the measure
After the termination of activity (after the end of active control)	Migration of long-lived nuclides to out of disposal sites	Long-lived nuclides such as C-14, Cl-36, Tc-99, or I-129	<u>Reduction of risks associated with contact between radionuclides leaked into groundwater and human</u> • Prevention of leakage of radionuclides from engineered barriers • Disposal under the ground with a high migration retardation function • Limiting concentration of long-lived nuclides	I. Design requirement ⑥ ② ⑤
			<u>Reduction of risks associated with natural phenomena having a significant impact on disposal sites</u> • Disposal under stable ground	I. Design requirement ③
	External and internal exposure due to human intrusion	• Gamma-emitting nuclides such as Nb-94 • Nuclides such as C-14 having an impact on internal exposure • Long-lived nuclides such as Cl-36, Tc-99, I-129	<u>Reduction of possibility of human intrusion</u> • Securing depths that are unaffected by general underground building • Consideration of natural resources in disposal sites • Physical resistance of engineered barriers	I. Design requirement ① ④ ⑦
			• Passive institutional control	II. Control requirement ⑮
			<u>Reduction of radiation effects caused by human intrusion</u> • Limiting concentration of long-lived nuclides	I. Design requirement ⑤

<u>Standards and assessment for judging the adequacy of the above measures:</u>

- Radiation doses due to natural processes I. Design requirement ⑪
- Radiation doses caused by inadvertent human intrusion I. Design requirement ⑫
- Periodic safety review (PSR) II. Control requirement ⑭

Source: Material for the Study Team Meeting on the Regulation of Radioactive Waste in Decommissioning on March 18, 2015

Regulatory Requirements for Implementing Measures to Ensure Safety (Under Consideration) (1/4)

The following are regulatory requirements that are necessary for implementing measures to eliminate or reduce the impact of radiation brought about by human access to or contact with radioactive waste, and/or nuclides leaking from radioactive waste, etc.

I. Design requirements

(1) Location of waste disposal site

① Ensuring of depth

To prevent human access to disposal sites, sufficient depths shall be ensured so that underground building will not reach the sites for a specific period of time even in the case that the depths are decreased due to uplift, erosion, etc. (reference: IAEA SSR-5 3.46., A.9., and 1.10.)

② Disposal in the ground with a high migration retardation function

To reduce the impact of radioactive nuclides leaking into groundwater, radioactive waste shall be disposed of at sites that sufficiently retard the migration of radioactive nuclides via groundwater (reference: IAEA SSR-5 1.10., 3.35., and Requirement 8).

③ Disposal in stable ground

There shall be no possibility of occurrence of natural phenomena that significantly affect waste disposal sites such as faults and volcanic activities (reference: IAEA SSR-5 4.27.).

④ Consideration of natural resources etc.

There shall be no useful natural resources at the candidate disposal site, and there shall be no possibility of development (reference: IAEA SSR-5 3.20. and 3.45.).

Source: Material for the Study Team Meeting on the Regulation of Radioactive Waste in Decommissioning on March 18, 2015

Regulatory Requirements for Implementing Measures to Ensure Safety (Under Consideration) (2/4)

(2) Concentration limit for long-lived nuclides

⑤ Concentration limit for long-lived nuclides

Waste of core structures includes wastes containing high-concentration long-lived nuclides. The concentrations of long-lived nuclides contained in target radioactive wastes shall therefore be limited in advance so that radiation will not render excessive impacts even in the case that human access to or contact with such radioactive waste occurs when depths are decreased by uplift, erosion, etc. (reference: IAEA SSR-5 2.15.(d)).

(3) Engineering measures for waste disposal sites

The possibility of human contact with radioactive waste shall be kept sufficiently low even after active institutional control has been completed.

⑥ Suppression of leakage of radioactive nuclides through engineered barriers

As measures to reduce the impact that radioactive nuclides which leaked into groundwater gives to human, measures to reduce leakage of nuclides from waste disposal sites into groundwater shall be implemented by using the best available techniques (BATs) (reference: IAEA SSR-5 3.35., and Requirement 8).

⑦ Physical resistance of engineered barriers

As measures to reduce the human intrusion such as boring and other activities, physical resistance shall be imparted to engineered barriers for waste packages etc. (reference: IAEA SSG-23 6.64.)

(4) Shielding for waste disposal facilities

⑧ Ensuring of safety during operation

Measures to reduce the impact of radiation on workers and the general public in the vicinity shall be implemented for activity such as acceptance and burial of radioactive waste (reference: IAEA SSR-5 Requirement 18).

Source: Material for the Study Team Meeting on the Regulation of Radioactive Waste in Decommissioning on March 18, 2015

Regulatory Requirements for Implementing Measures to Ensure Safety (Under Consideration) (3/4)

(5) Evaluation of impacts under normal conditions, at accidents, and at abnormal events during operation

⑨ Radiation doses to the general public during normal operation

Radiation doses to the general public from waste disposal facilities during normal operation shall not exceed the legal dose limit. Such radiation doses include radiation doses to the general public from radioactive material leaked and migrated from waste disposal repositories and that released from waste disposal facilities into the environment. In addition, the radiation doses shall be as low as reasonably achievable in accordance with the concept of ALARA (As Low As Reasonably Achievable).

⑩ Radiation doses to the general public at accidents or abnormal events during operation

Radiation hazards shall not cause damage to the general public in the vicinity of sites in cases where an accident or an abnormal event has occurred at waste disposal facilities.

(6) Evaluation of the impacts of natural processes and inadvertent human intrusion after the termination of activity

⑪ Radiation doses due to natural processes

With a sufficient depth ensured and with engineering measures implemented, the retardation of the migration of radioactive nuclides via groundwater in natural processes shall be evaluated. The migration shall not cause excess exposure to the general public (reference: IAEA SSG-23 5.38. and 5.39.).

- Basic scenario: The high scientific probability that the living environment will be affected at only a negligibly slight level shall be indicated by evaluation based on a scientifically-probable scenario.
- Variation scenario: The living environment shall be affected only at a limited level in cases where variable factors are considered in the basic scenario.

⑫ Radiation doses caused by inadvertent human intrusion

Excess exposure to the general public shall not occur in the case of inadvertent human intrusion such as boring performed regardless of the depths, even though sufficient disposal depths have been ensured so that the general public will not come into contact with radioactive waste (reference: IAEA SSG-23 6.57.).

Source: Material for the Study Team Meeting on the Regulation of Radioactive Waste in Decommissioning on March 18, 2015

Regulatory Requirements for Implementing Measures to ensure Safety (Under Consideration) (4/4)

II. Control requirements

⑬ Active institutional control

At the disposal and maintenance stages, active institutional control, such as monitoring of leakage of radioactive nuclides from disposal sites and prohibition of specified activities, etc., shall be implemented (hoping for decay of short-half-life nuclides) (reference: IAEA SSR-5 5.9.).

⑭ Periodic safety review (PSR)

In exposure control evaluation implemented every 10 years, the changes in future social environments, technologies, etc. shall be considered appropriately on the basis of the latest knowledge (reference: IAEA SSR-5 Requirement 11 and 4.5.).

⑮ Passive institutional control

After active institutional control has been finished, measures such as marking and recordkeeping, shall be implemented to reduce the risk of future human intrusion (reference: IAEA SSR-5 Requirement 22 and 5.13.).

Source: Material for the Study Team Meeting on the Regulation of Radioactive Waste in Decommissioning on March 18, 2015