Policy on Management and Disposal of Radioactive Waste in Japan

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Current Status of Utilization of Nuclear Energy in Japan

- NISA regulates following facilities
  - 53NPPs in operation , 2NPPs under construction and 1NPP at the decommissioning stage
  - 4 Fuel Fabrication Facilities and 2 Uranium Enrichment Facilities
  - 1 Reprocessing Facility (RF) in operation and 1 RF under construction
  - 2 LLW Disposal Facilities in operation
  - 2 Power Reactors on R&D Stage
    (1Power Reactor being prepared for decommissioning)
- MEXT regulates following facilities
  - 16 Research Reactors
  - About 5,000 facilities utilizing various types of radiation sources and generators

Classification and method of disposal for radioactive wastes

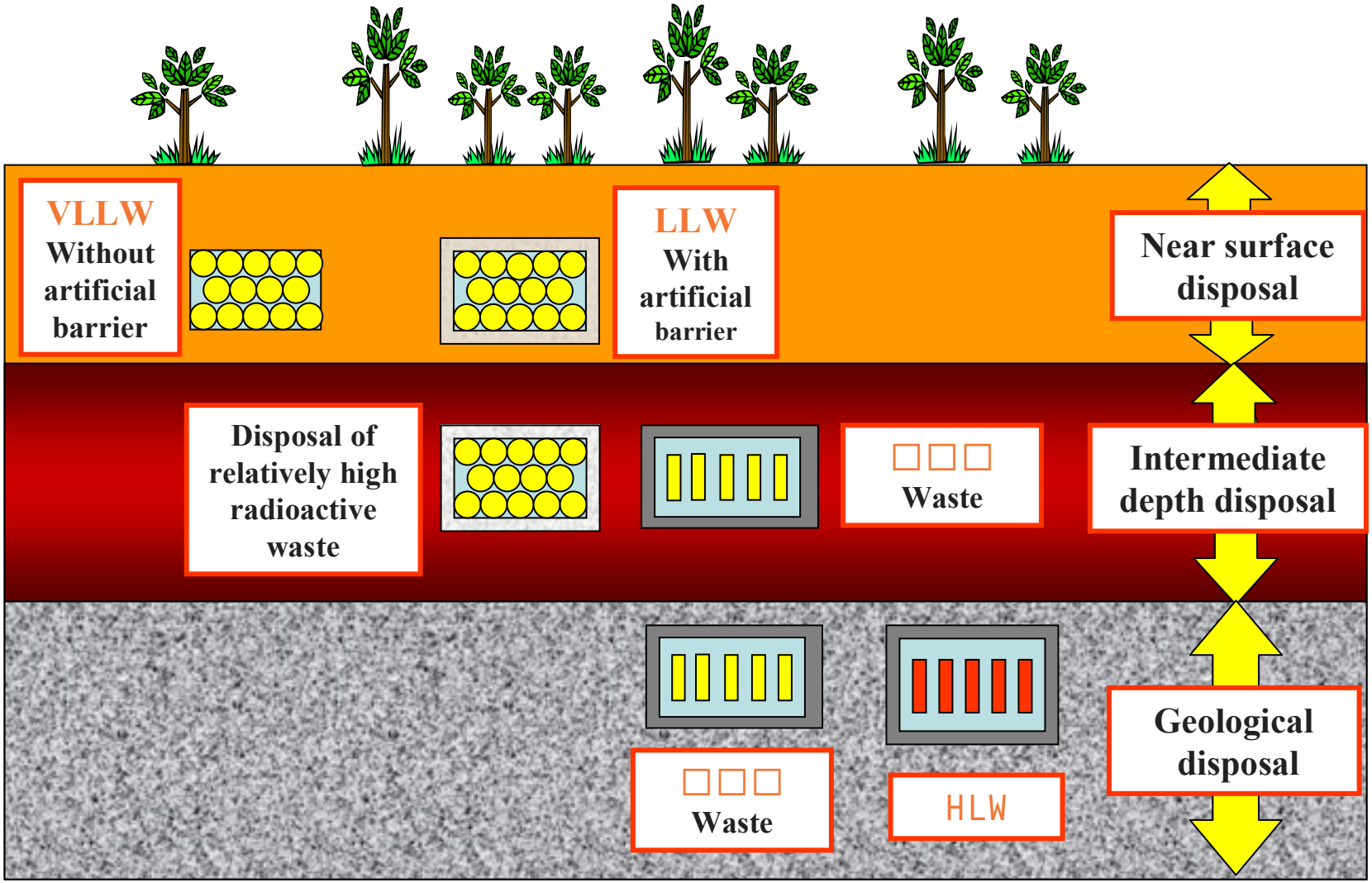
Place of generation	Classification of radioactive wastes			Method of disposal, etc.
Reprocessing plant	High-level radioactive waste			**Geological disposal** (Disposal into geological formations 300 m below the surface or deeper after interim storage for cooling)
MOX fuel fabrication plant	Low-level radioactive waste	TRU waste (waste containing transuranic nuclides) (Note 1)		(Concrete pit disposal, intermediate disposal, or geological disposal are considered according to the concentration of radioactive substances contained.)
Nuclear power station	Low-level radioactive waste	Waste from power station	Waste from reactor core, etc. (tentative name) (Waste of relatively high radioactivity)	**Intermediate disposal** (Disposal at a depth sufficient to safety margin for conventional sub-surface use of land; for example, 50 to 100 m below surface.)
Nuclear power station	Low-level radioactive waste	Waste from power station	Low-level radioactive waste (Waste of relatively low radioactivity)	**Near-surface disposal (concrete pit disposal)** Implemented by Japan Nuclear Fuel Ltd. at Low-level Radioactive Waste Disposal Center (in Rokkasho).
Nuclear power station	Low-level radioactive waste	Waste from power station	Very low-level radioactive waste (Waste of very low radioactivity)	**Near-surface disposal (trench disposal)** Implemented by Tokai Research Establishment of Japan Atomic Energy Research Institute
Uranium enrichment plant and uranium fuel fabrication plant	Low-level radioactive waste	Uranium waste		(Trench disposal, concrete pit disposal, intermediate disposal, or geological disposal are considered according to the concentration of radioactive substances contained.)
Hospital, research laboratory, etc.	RI and waste from research laboratory, etc. (Note 2)			Being managed as waste or waste package stabilized by solidification by melting or using cement, etc.

Generated during operation or dismantling of nuclear facilities	Materials that do not correspond to radioactive waste. (Waste below clearance levels)	(May be recycled or handled as general industrial waste.)

Note 1: Transuranic nuclides are artificial radioactive ones whose atomic numbers are greater than that of uranium. Many of them have long radioactive half-lives and emit alpha rays.

Note 2: Regulated by the Ministry of Education, Culture, Sports, Science and Technology.

Radioactive Waste Disposal Methodology

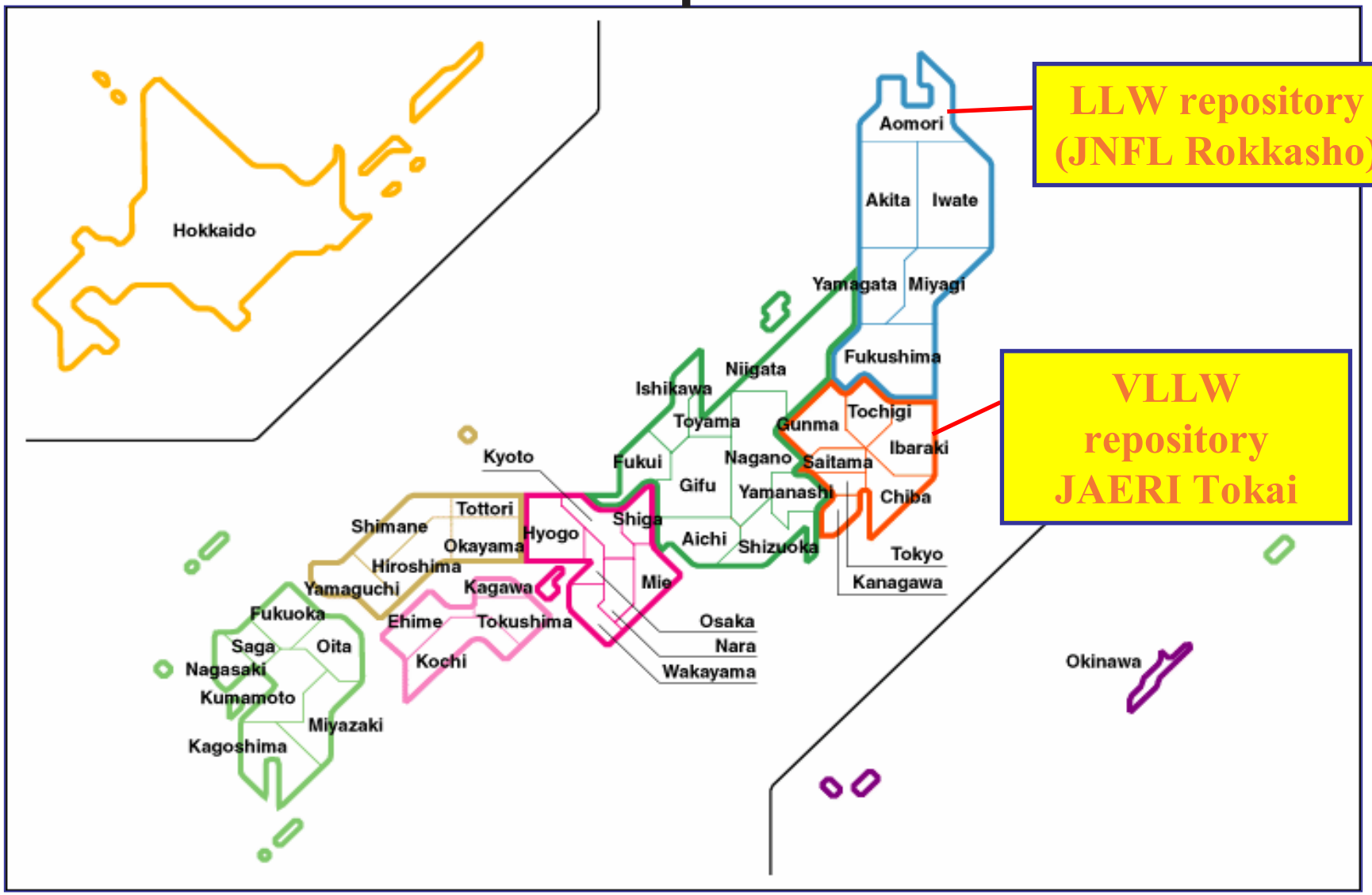


Current status of investigation of the disposal of radioactive waste

Classification of waste			Deliberations by Atomic Energy Commission	Deliberations by Nuclear Safety Commission			Development of relevant statutes
			Policy for disposal	Policy for safety regulations	Restrictions at disposal sites	Method of safety assessment	
High-level radioactive waste			Completed (Aug. 1984,May 1998)	completed [1] (Nov. 2000)	To be deliberated		Deliberation has started.
Low-level radioactive waste	Waste from power station	Waste from reactor core, etc. (tentative name)	Completed (October 1998)	Completed [2] (Sep. 2000)	Completed (Sep.2000)	To be deliberated	Partially uncompleted (December 2000) Further discussions on the depth of disposal, etc. are required.
		Low-level radioactive waste	Completed (August 1984)	Completed (October 1985)	Completed (Feb. 1987, Jun. 1992)	Completed (Mar. 1988, Jan. 1993)	Partially uncompleted [6] (Mar. 1987, Feb. I993)
		Very low-level radioactive waste			Completed (Jun. 1992, Sep. 2000)	Partially completed [5] (Jan. 1993)	Partially uncompleted [7] (September 1992, December 2000)
	TRU waste		Completed (April 2000)	To be deliberated			To be developed
	Uranium waste		Completed (December 2000)	To be deliberated			To be developed
RI and waste from research laboratory, etc.			Completed (May 1998)	Partially uncompleted [3] (January 2004)	To be deliberated		To be developed
Waste below clearance levels			Completed (Aug. 1984, Dec. 2000)	Partially uncompleted [4] (Mar. 1999, Jul. 2001, Mar. 2005)			Deliberation has started.

1: First report has been compiled. (November 2000)
2: Matters remain to be investigated and discussed.
3: Deliberation of Disposal of RI has finished.
4: Deliberation of disposal of waste from nuclear reactors has finished.
5: Safety review policy for metallic waste, etc. is to be deliberated in the future.
6: Technical standards for the disposal of large-scale metallic waste need to be established in the future.
7: Technical standards for the disposal of metallic waste, etc. need to be established in the future.

Locations of Radioactive Waste Repositories in Japan



Rokkasho Low Level Waste Disposal Center (Japan Nuclear Fuel Ltd. :JNFL)

- **Company's objective**
- Uranium enrichment
- Spent fuel reprocessing from NPPs
- Temporary storage of recovered fuel materials and radioactive waste
- **LLW disposal**
- Production of MOX fuel
- Transportation of uranium, LLW and spent fuel
- Related services on above items

- **History of the Center**
- Apr. 1988, applied for license
- Nov.1990, approved license, construction started
- Dec.1992, operation started

- **Outline of the Center**
- Location: Rokkasho, Aomori Pref.
- Disposal capacity: 80,000m^3 (as of 2004)
- Construction costs: 160billon yen

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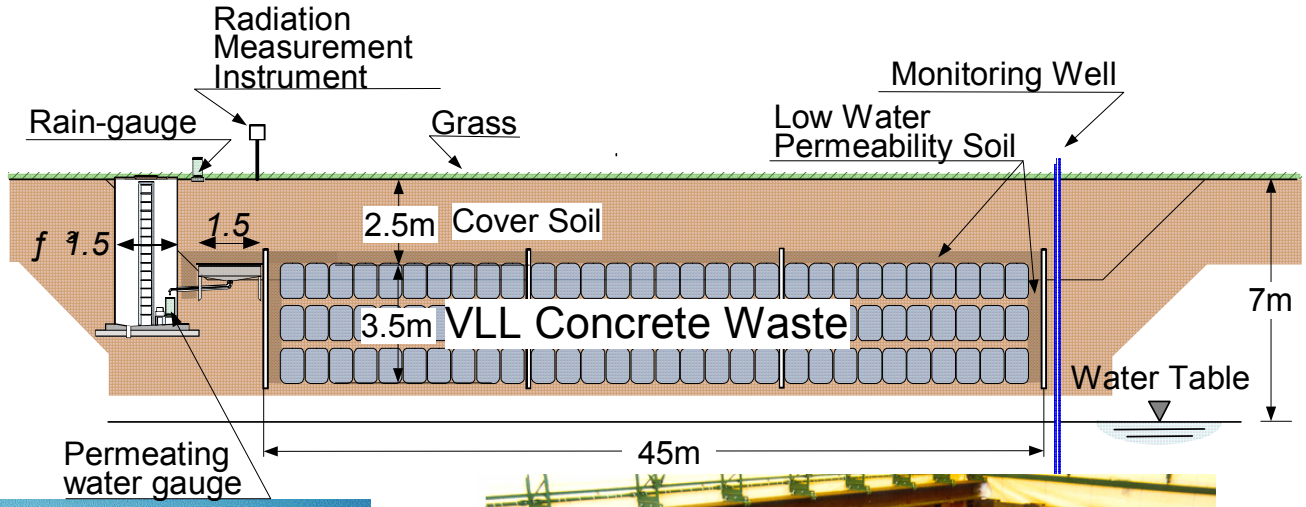
Very Low Level Waste Repository
Japan Atomic Energy Research Institute (JAERI)

Cross section of the repository



Trench for waste disposal and weather protection

Filling of cover soil (intermediate layer)

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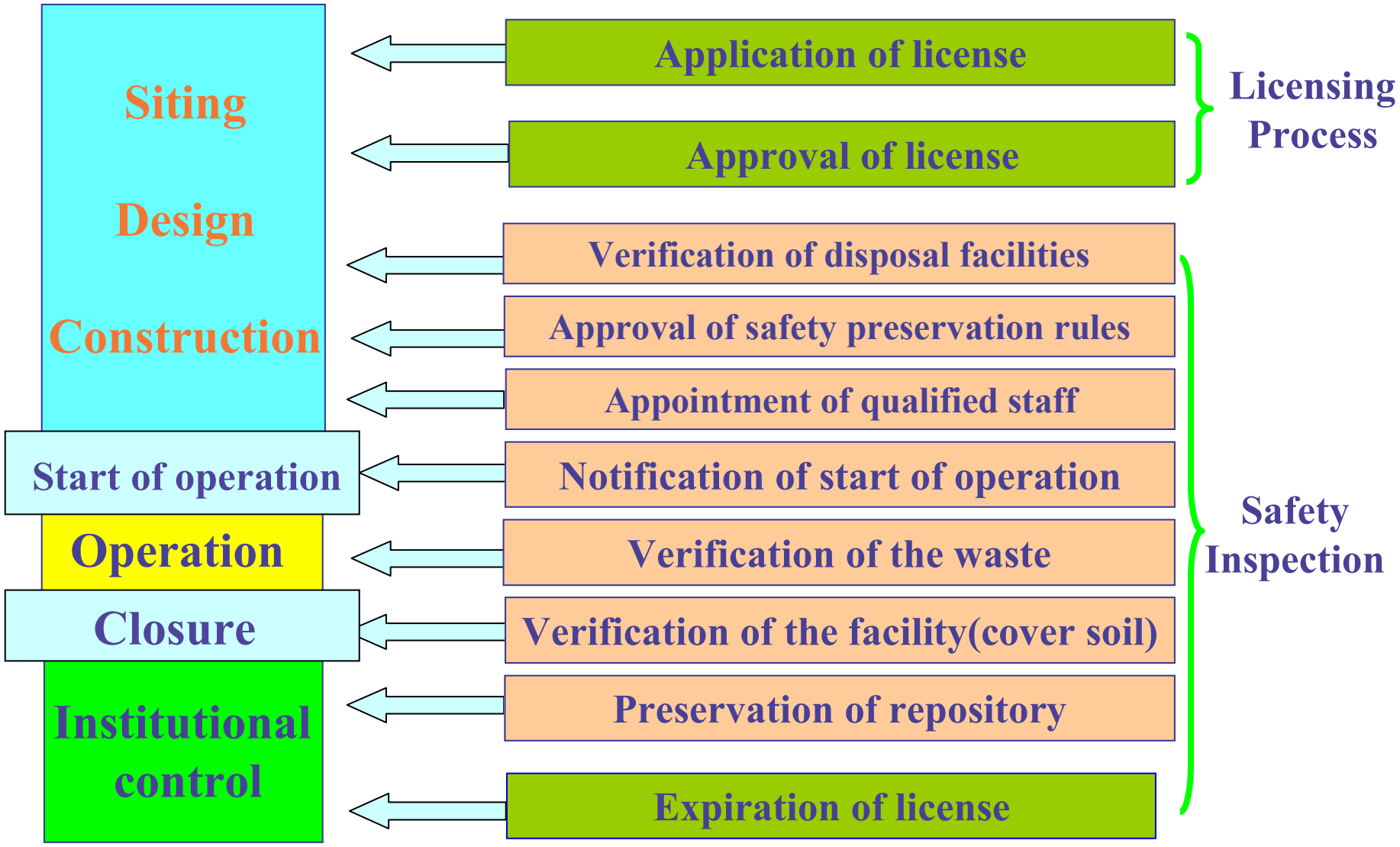
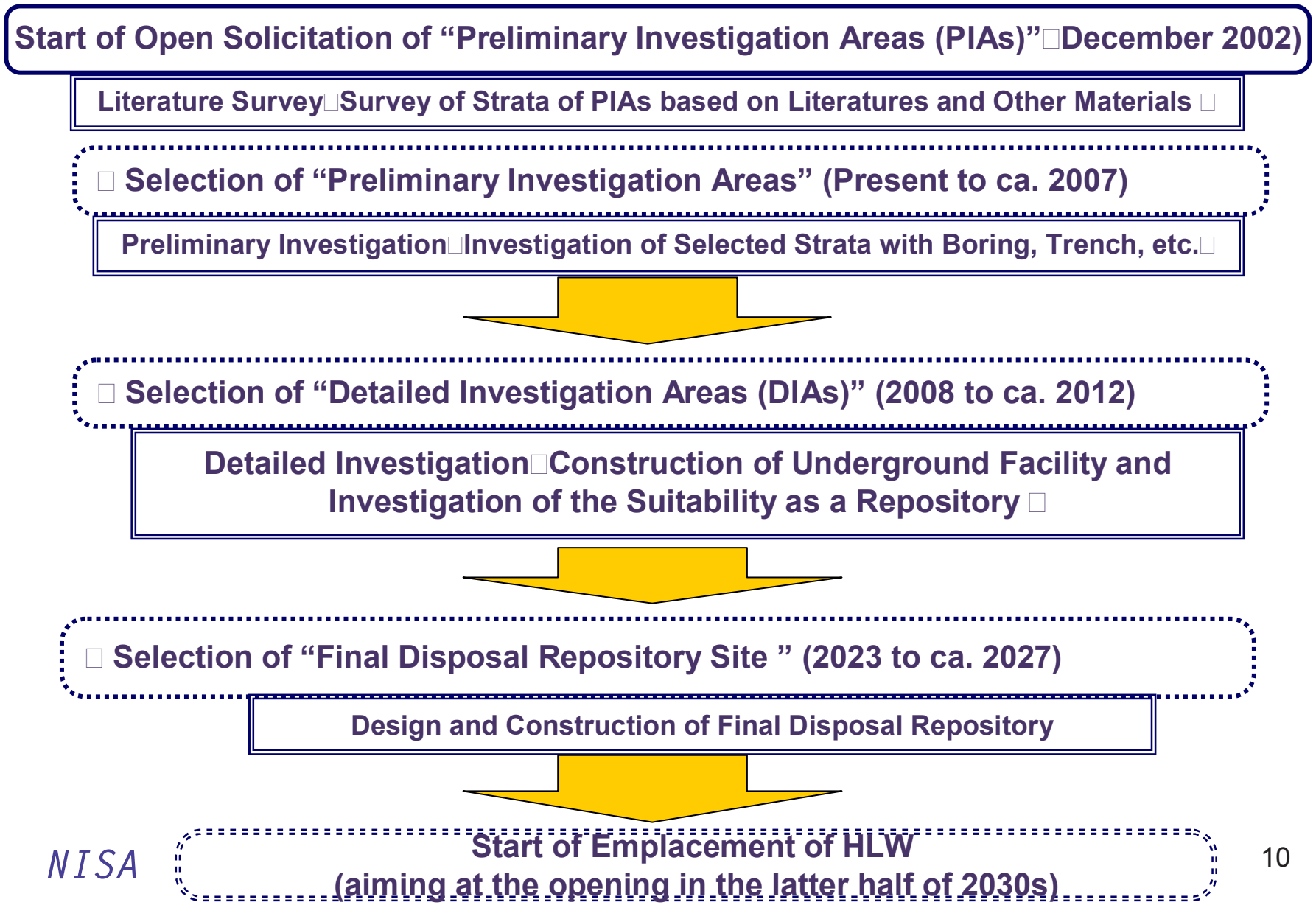
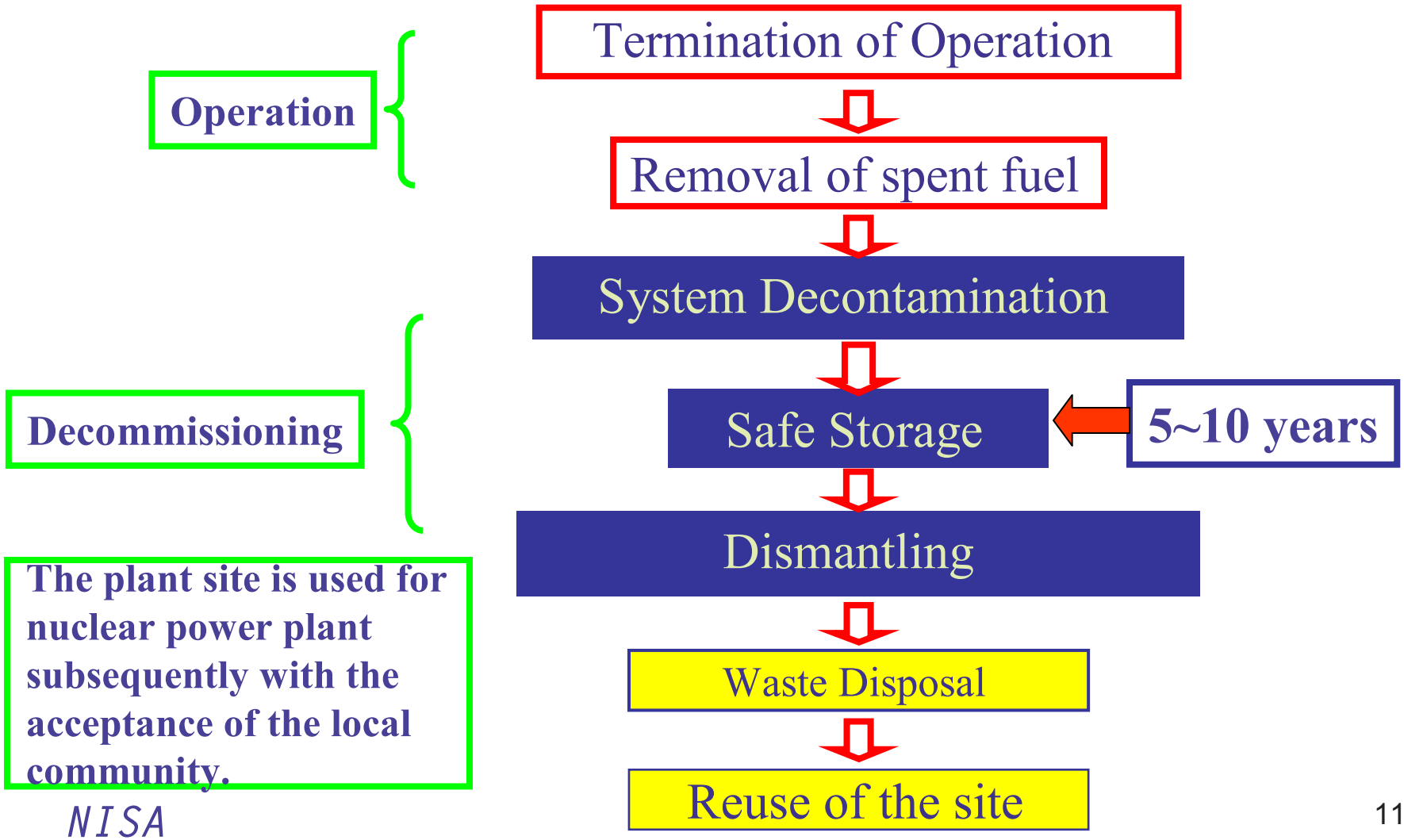
Regulatory Procedures on LLW disposal



Schedule of HLW Disposal Project



Standard Process for Decommissioning of Commercial Nuclear Power Plants in Japan



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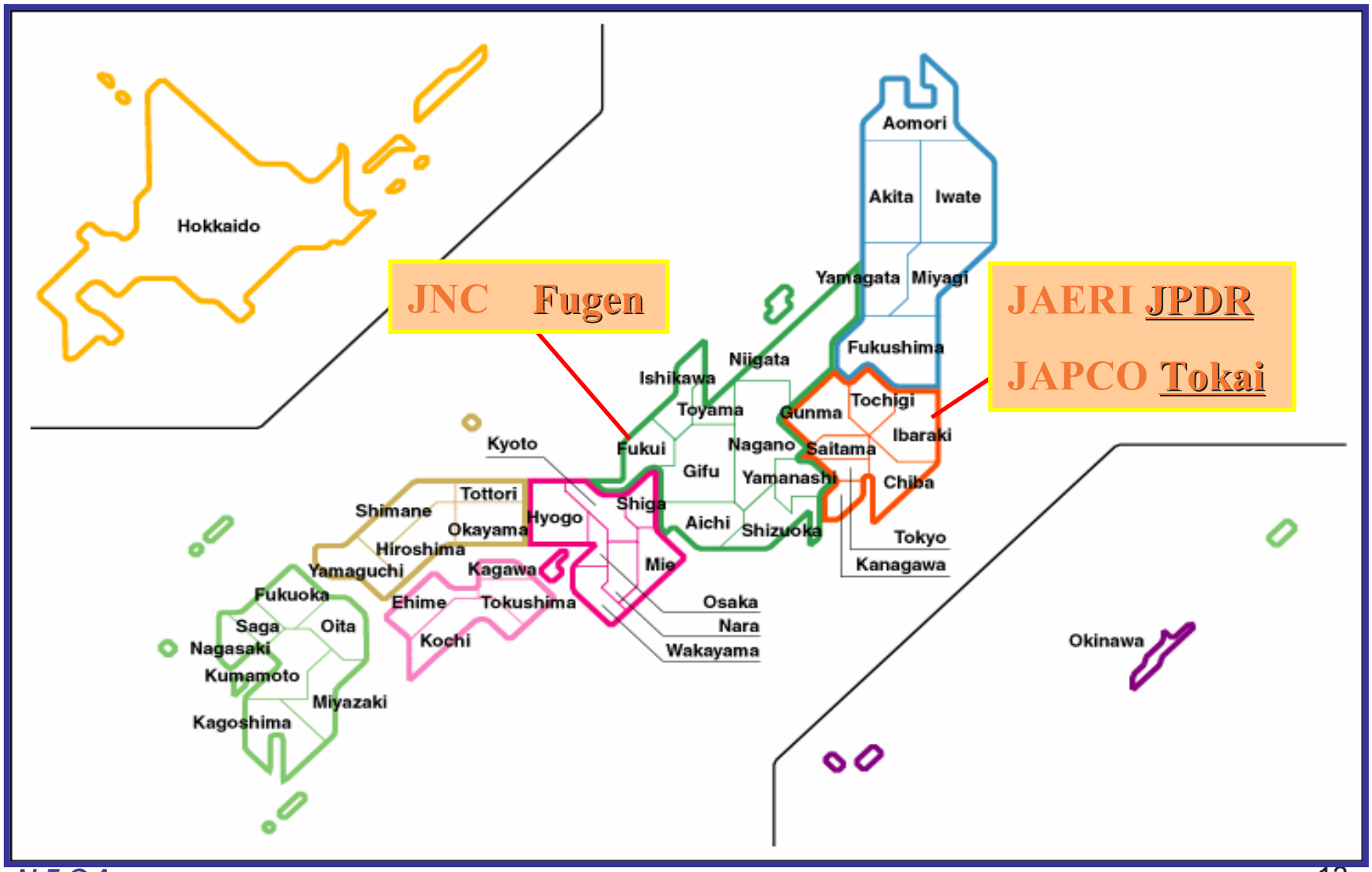
Present Status on Decommissioning of NPPs in Japan

	JPDR JAERI	Tokai JAPCO	Fugen JNC
Location	Tokai-mura Ibaraki Pref	Tokai-mura Ibaraki Pref	Tsuruga Fukui Pref
Situations	completed	Under decommissioning	Preparation for decommissioning
Reactor type	BWR	GCR	Advanced Thermal Reactor(ATR)
Electrical output	12.5 MWe	166 MWe	165 MWe
Operating period	1963 - 1976	July 25,1966 - March 31,1998	March 20,1979 - March 29, 2003

Locations of NPPs in decommissioning Stage in Japan



The Status of Tokai NPP Decommissioning

- **History**
  - First commercial NPP in Japan
  - Construction started Jan.1960
  - Operated from Jun.1966 to Mar.1998
  - Nuclear fuel removed Jan.2001
  - Decommissioning started Dec. 2001

- **Estimated amount of radioactive waste**
  - Reactor internals: 1,600 ton
  - LLW: 8,500 ton
  - VLLW: 11,800 ton
  - Below clearance level: 41,800 ton
  - Non radioactive waste: 129,000 ton

The Status of Tokai NPP Decommissioning

Turbine/generator, before dismantling

Turbine/generator, under dismantling

Turbine building, After dismantling

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The Status of Fugen NPP

Fugen NPP is an Advanced Thermal Reactor (ATR) and it was developed by mostly Japanese technology to demonstrate full scale utilization of plutonium

- **History**
- **Construction started Dec. 1970**
- **Operation from Mar.1979 to Mar.2003**
- **Nuclear fuel removed Aug. 2003**
- **Spent fuel will be removed from fuel pool in 2014**

- **Estimated amount of radioactive waste**
- **Reactor internals: 200 ton**
- **LLW: 1,000 ton**
- **VLLW: 3,000 ton**
- **Below clearance level waste: 34,000 ton**
- **Non radioactive waste: 330,000 ton**

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Radioactive Wastes from Decommissioning and its Disposal

Wastes and amount	Contents	Disposal
Reactor internals 100ton	•Reactor internals •Spent control rod •Channel boxes •Burnable poison rod •Graphite brocks(GCR)	Intermediate depth disposal (Dispose at 50~100m from the surface)
LLW 900 ton	•Metals, concrete (structures around primary circuit of reactor)	Near surface disposal (with artificial barrier)
VLLW 12,000 ton	• Metals, concrete (structures apart from RPV)	Near surface disposal (without artificial barrier)
Below clearance level 28,000 ton	•Metals, concrete	Recycle and reuse Municipal landfills
Non-radioactive waste 495,000 ton	•Metals, concrete	Recycle and reuse Municipal landfills

NISA Waste amount is based on an estimation of decommissioning of BWR(1,100MWe)

Amendment of Reactor Regulation Law*

Introduction of the clearance system

- Introduction of the clearance system for materials, such as metal and concrete, which were used in the nuclear installations;
- Clearance level stipulated in the IAEA Safety Guide RS-G-1.7 is applied.

Development of rules for safety regulation on decommissioning

- Obligation for approval of the plan before decommissioning;
- On completion of decommissioning, confirmation by the government is required.

Intensification of the physical protection measures

- Introduction of the "physical protection inspection" system in accordance with the protective measures described in the IAEA Information Circular (INFCIRC-225 Rev. 4); and
- Obligation for licensee's physical protection staff, etc. to keep secret.

Other matters to be amended

- Abolition of authority transfer in the government ordinance to gather reports;
- Stipulation of reporting obligation of incidents; etc.

* • Law for the Regulations of Nuclear Source Material, Nuclear Fuel Material and Reactors
• [redacted]

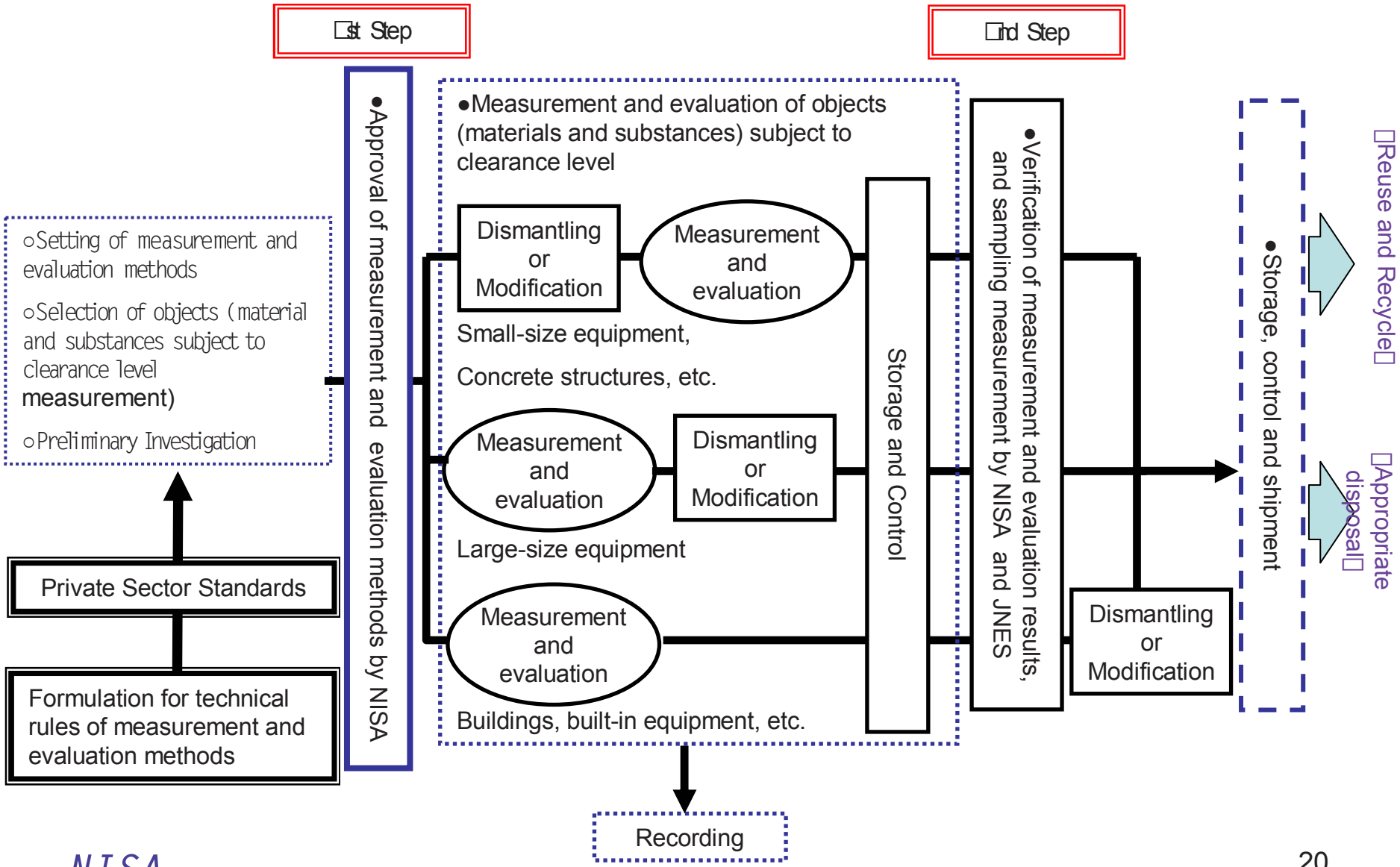
Clearance Systems

- **Establishment of Clearance Level**
  - Nuclear Safety Commission (NSC) established clearance level for metals and concrete generating from NPP decommissioning and operation referring IAEA Tecdoc-855
  - Since RG-S-1.7 “Application of the Concepts of Exclusion, Exemption and Clearance” was issued by IAEA, NSC discussed the necessity of reviewing the NSC clearance level.
  - Clearance level stipulated in the IAEA Safety Guide RS-G-1.7 is applied.

- **The Monitoring for Compliance with Clearance Level**
  - Operators generating radioactive waste shall ensure that radioactivity concentration of materials should be equal to or below clearance level.
  - The role of the regulatory authority is as follows;
    - Review of appropriateness of the method of measurement of the objects and evaluation of its result, provided by the operator.
    - Verification that the radioactivity concentration of the objects are below clearance level from the result of measurement, and sampling inspection
  - After the verification, materials can be treated as non-radioactive materials

- **Voluntary measures for PA for the Meantime**
  - To demonstrate the credibility of clearance system, nuclear industry announced to take following measures voluntarily until the system takes root in the society.
    - To promote recycling released materials mainly within nuclear industry and to reduce the volume of waste to be disposed of at municipal’s landfills
    - To keep the record of first destination of shipment of released materials

Procedures for Verification of Clearance



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