

Current Status and Challenges on Decommissioning in Japan

- Future of Local Communities through
Decommissioning and Clearance system -

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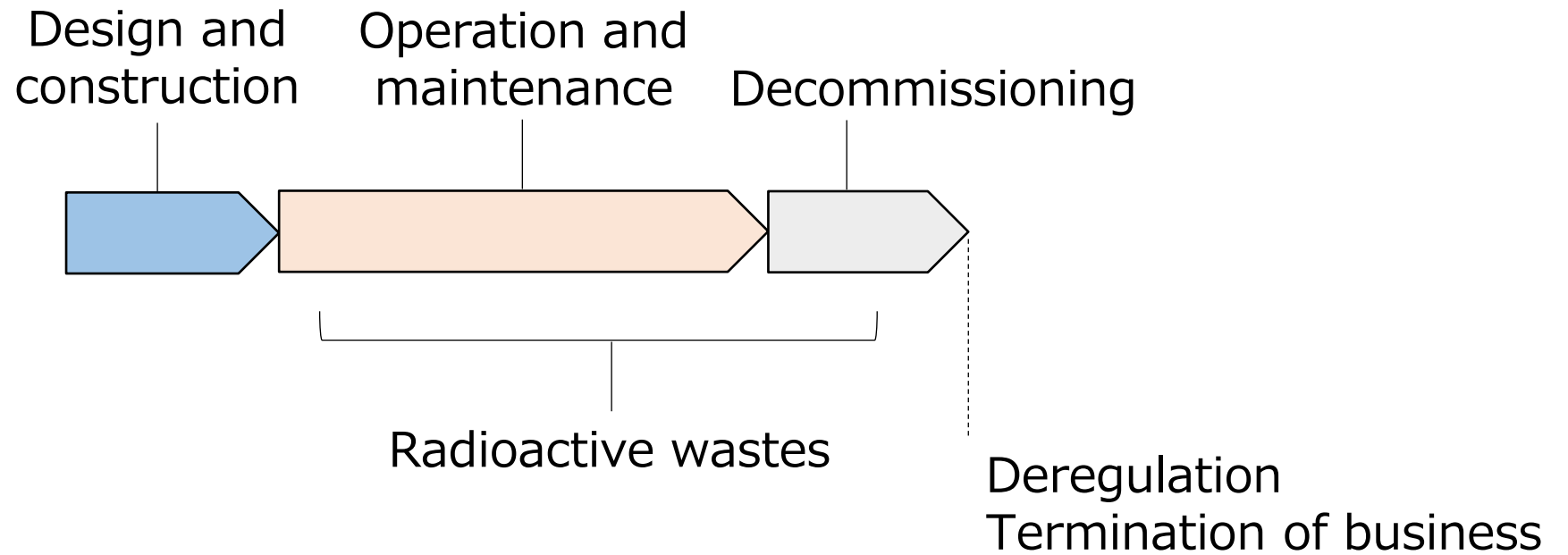
Lecture Contents

- Plant Life Cycle
- Decommissioning Process
- Development of Decommissioning Business

Progress of Nuclear Power Generation in Japan

- 1953 Atoms for Peace
(Beginning of the peaceful use of nuclear energy as advocated by President Eisenhower)
- 1954 Start of research on nuclear power (initial nuclear budget: 235 million yen)
- 1963 Japan's first success of nuclear power generation (Power demonstration reactor JPDR, 12.5 MW)
- 1966 Start of operation at Tokai Nuclear Power Plant (Japan Atomic Power Company's Calder Hall reactor, 125 MW)
- 1970 Tsuruga Nuclear Power Plant Unit 1 (Japan Atomic Power, BWR, 375 MW)
- 1970 Mihama Nuclear Power Plant Unit 1 (Kansai Electric Power, PWR, 340 MW)
- 1971 Fukushima Nuclear Power Plant Unit 1 (Tokyo Electric Power, BWR, 460 MW)
- Followed by a construction rush of larger nuclear power plants: 60 nuclear plants built
 - :
 - : 1992: Start of operation of Rokkasho Low-Level Radioactive Waste Disposal Center
 - : 1993: Decision made to abandon ocean dumping as a disposal option (Atomic Energy Commission)
 - :
 - : 2005: Amendment of the Nuclear Reactor Regulation Law (clearance system)
 - :
- 2011 Accidents at Fukushima Daiichi Nuclear Power Plant Units 1-3
- 2022 Amendment of the Nuclear Reactor Regulation Law regarding the 40-year rule (extension to 60-year operation at maximum)

Plant Life Cycle



Current Status of Commercial Nuclear Power Plants in Japan

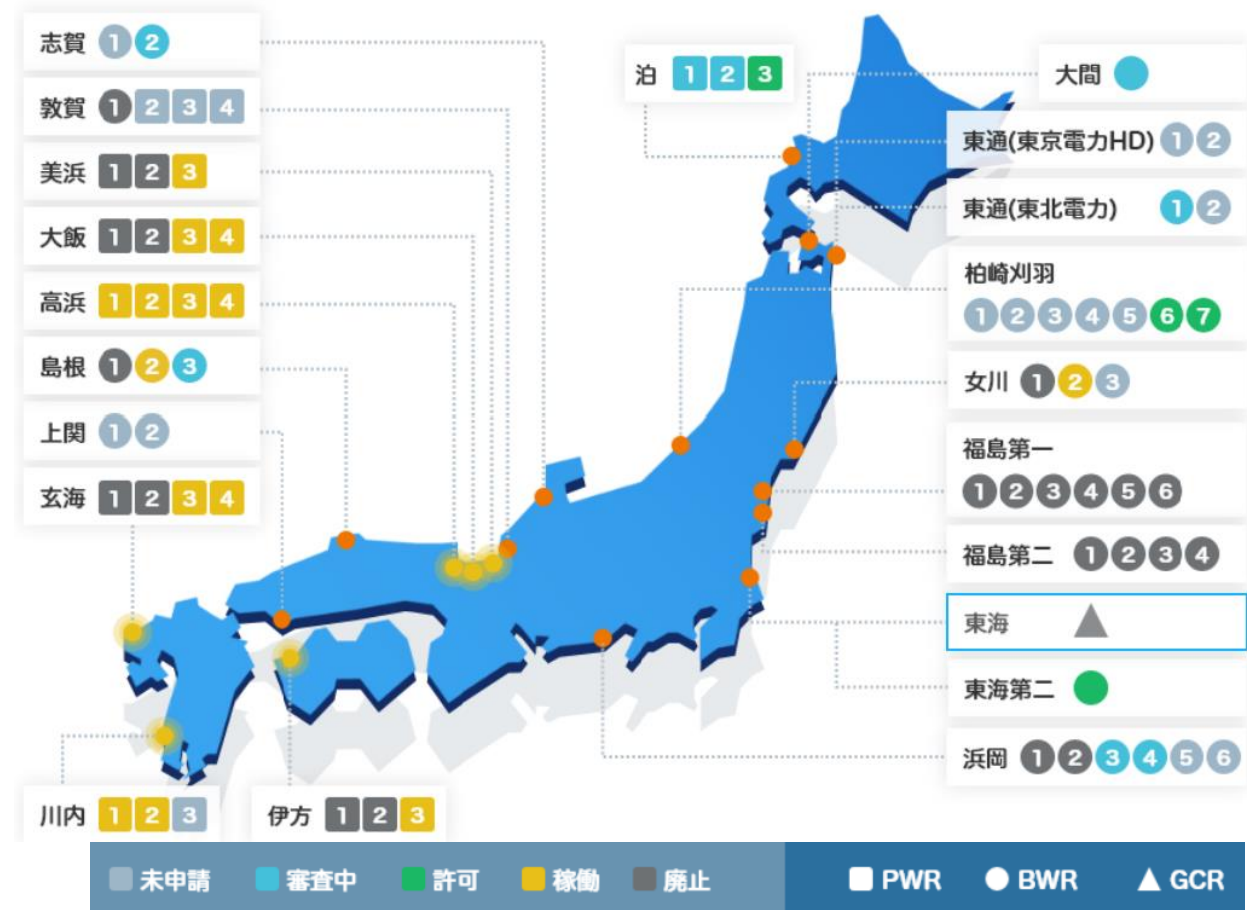
As of August 2025

60 units of commercial nuclear power reactors have been constructed in Japan.

Operating	14
Passed examination	4
Under examination	8
Application pending	10
Subject to decommissioning	24

Including Monju and Fugen owned by JAEA, 26 reactors are currently being decommissioned.

JPDR, the first demonstration nuclear power plant in Japan, has completed its plant cycle (decommissioning).



Website of the Federation of Electric Power Companies of Japan (FEPC) (<https://www.fepec.or.jp/sp/re-operation/>)

Website of the Agency for Natural Resources and Energy (ANRE) (https://www.enecho.meti.go.jp/about/special/johoteikyo/genshi-ryoku_saikado.html)

Decommissioning of the JPDR

Outline of the JPDR

- Reactor type: Boiling Water Reactor (BWR)
- Output: 90 MW (Initially 45 MW)
- Operation: 1963-1976

Dismantling

- Purpose: Verification of dismantling technologies, acquisition of data and experience
- Duration: December 1986 to March 1996
- Expense: Approx. 23 billion yen (including technology development)
- Waste volume: 3,770 tons (radioactive)
- Exposure dose: 306 person-mSv (maximum individual dose: 8.5 mSv)

Waste management

- All radioactive wastes were stored, except for concrete with very low radioactivity.
- Very low radioactive wastes were used for the waste burial field tests.
- Classification of non-radioactive wastes was implemented.

JPDR: Japan Power Demonstration Reactor
Location: Tokai Village, Ibaraki Prefecture
Japan's first power generation by nuclear energy



Nuclear Power Plants in Fukui Prefecture

Decommissioning
phase

No.	Plant name	Type	Output (MWe)	Installation approval (year)	Commercial operation (year)	Permanent shutdown (year)	Decommissioning (year)	Decommissioning period (year)
1	Tsuruga #1	BWR	357	1966	1969	2011	2017	24
2	Mihama #1	PWR	340	1966	1970	2010	2017	40
3	Mihama #2	PWR	500	1968	1972	2011	2017	40
4	Ohi #1	PWR	1175	1972	1977	2011	2019	31
5	Ohi #2	PWR	1175	1972	1978	2011	2019	31
6	Fugen	ATR	165	1970	1978	2003	2008	34
7	Monju	FBR	280	1983	1995	2010	2018	38

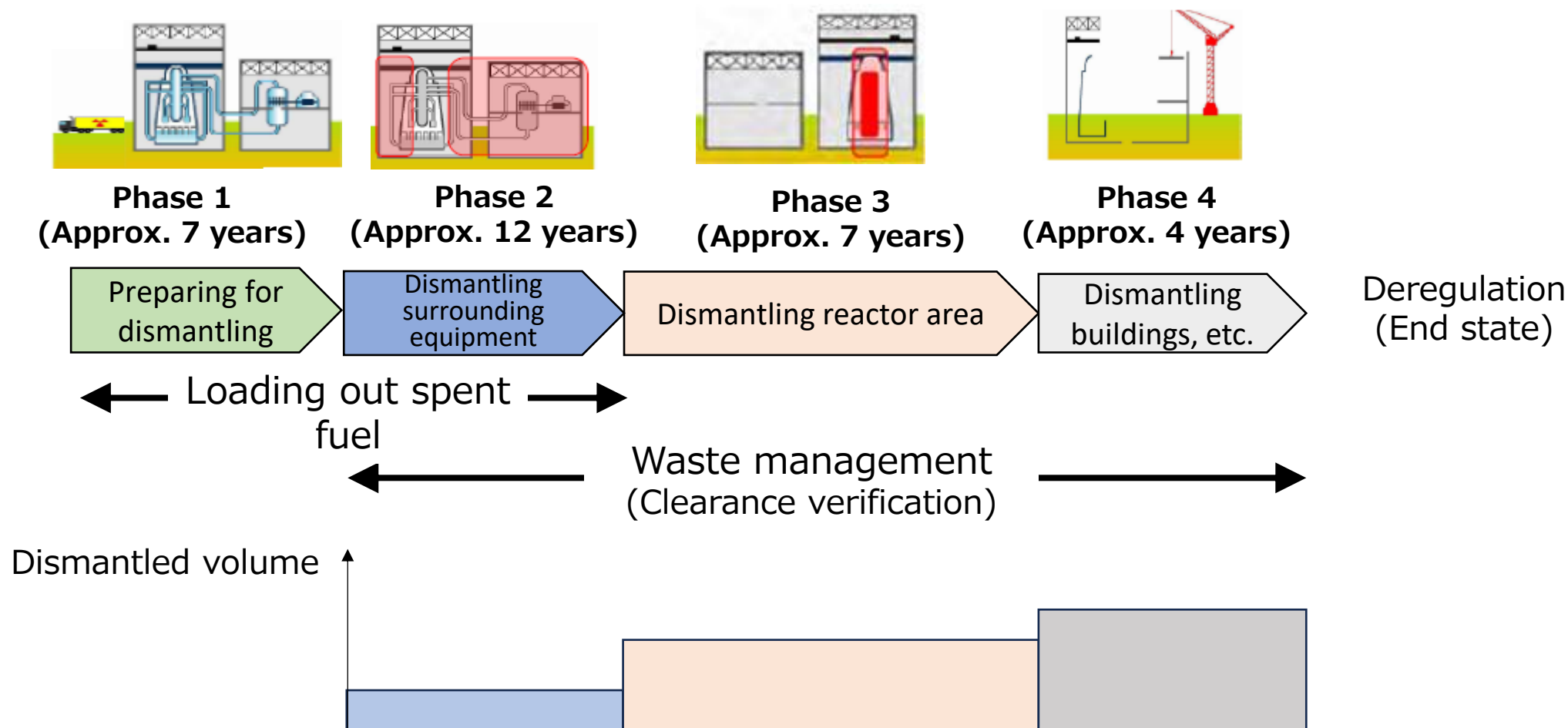
Operation
phase

8	Tsuruga #2	PWR	1160	1982	1987
9	Mihama #3	PWR	826	1972	1976
10	Ohi #3	PWR	1180	1987	1991
11	Ohi #4	PWR	1180	1987	1993
12	Takahama #1	PWR	826	1969	1974
13	Takahama #2	PWR	826	1970	1975
14	Takahama #3	PWR	870	1980	1985
15	Takahama #4	PWR	870	1980	1985

Application pending

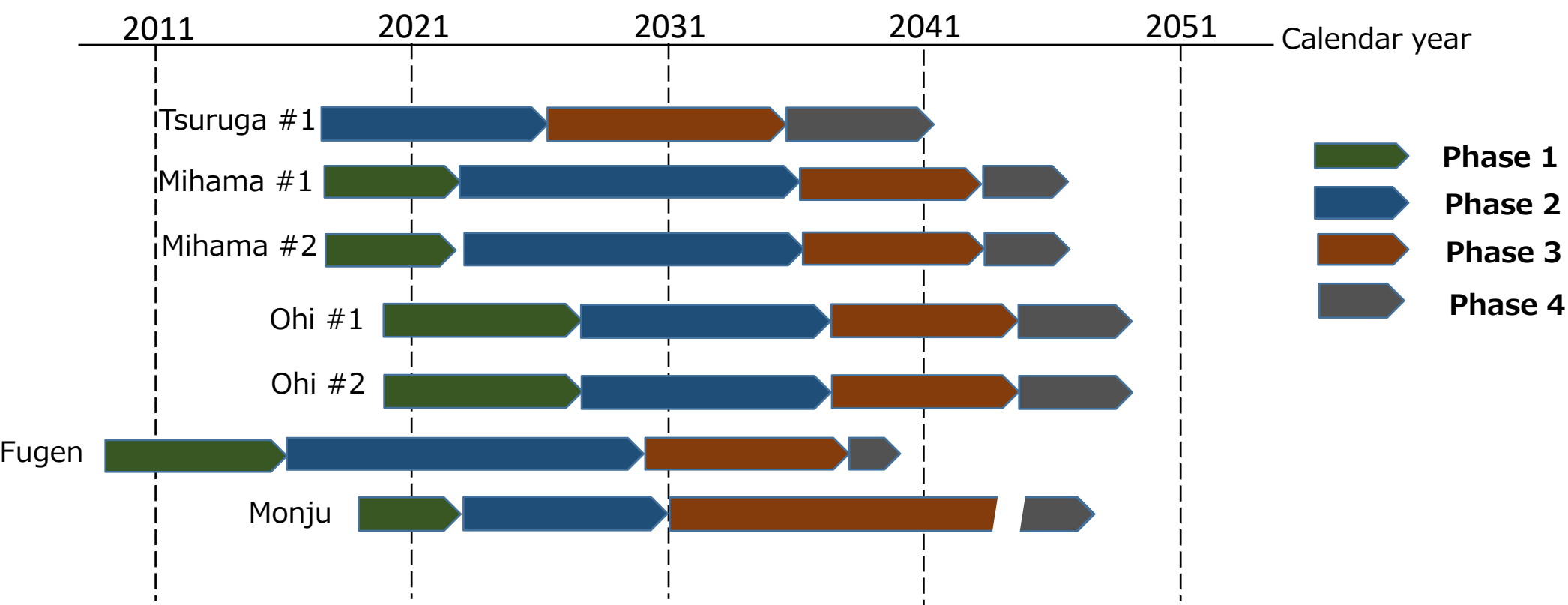
Operating

Main Processes in Decommissioning



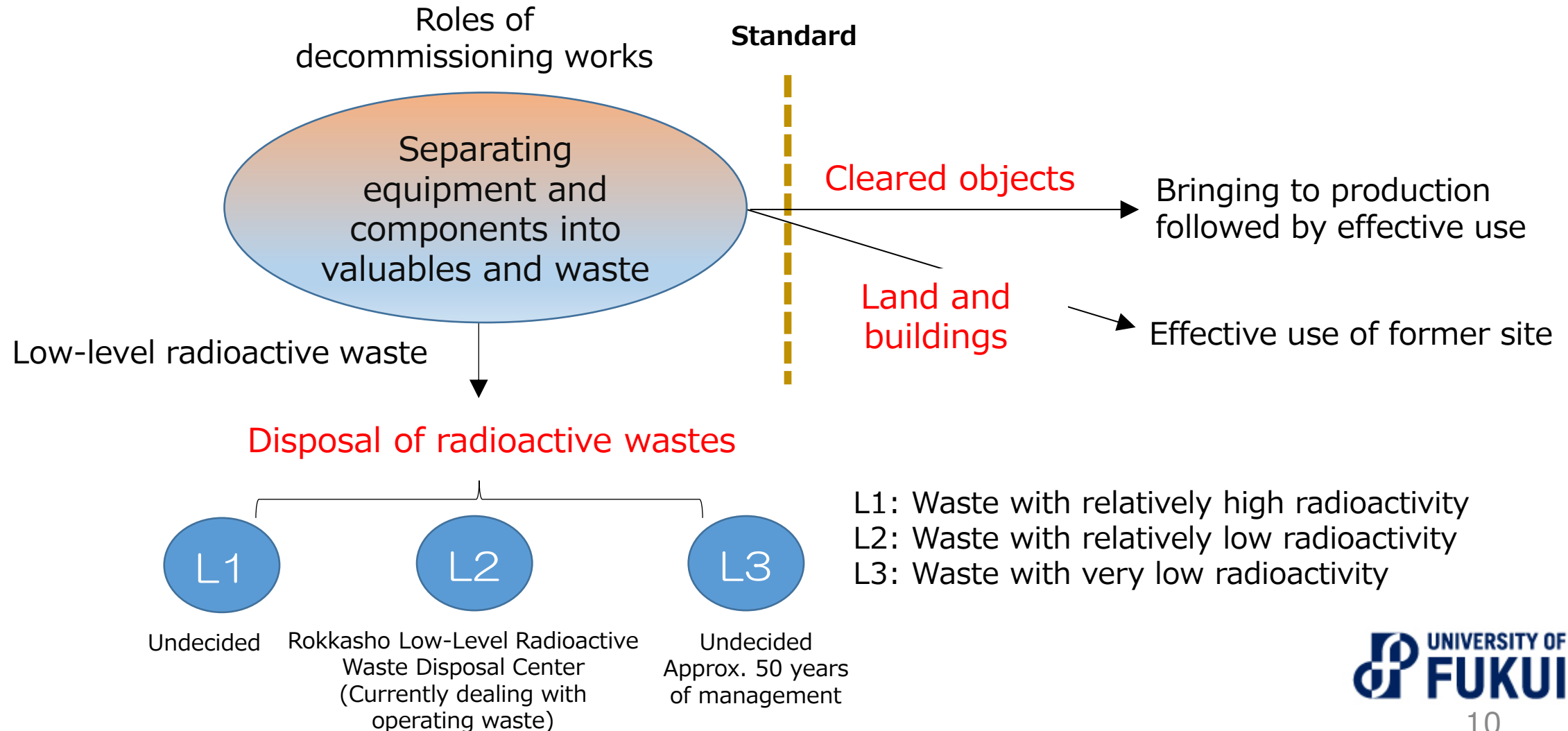
"Current effort for radioactive waste measures," the Nuclear Energy Subcommittee, ANRE, October 16, 2024

Decommissioning Process for Nuclear Power Plants in Fukui Prefecture



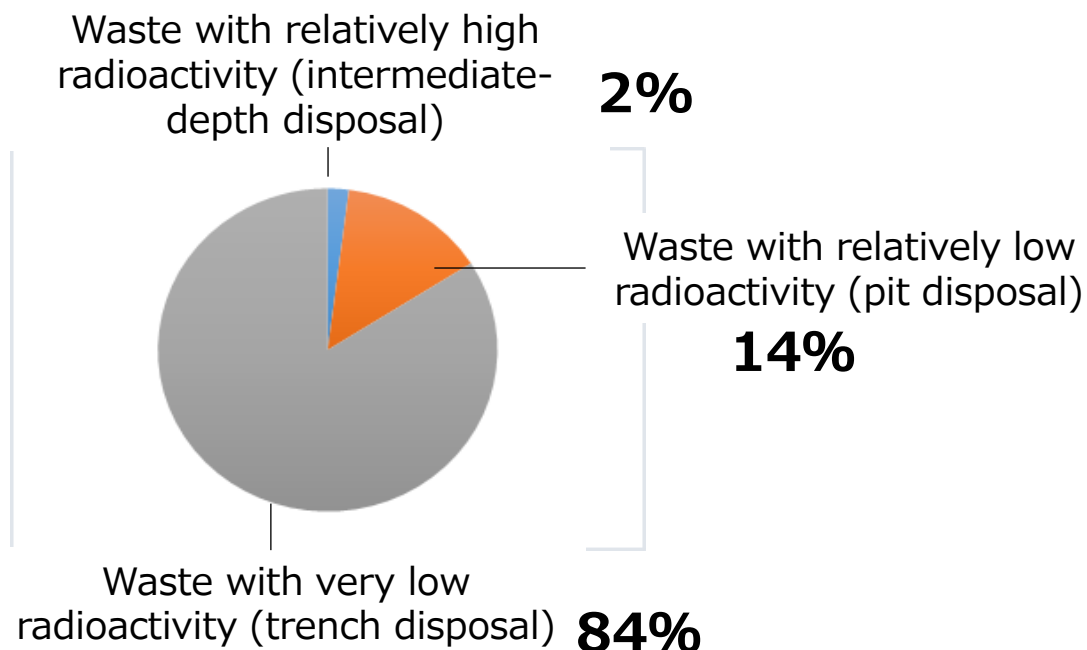
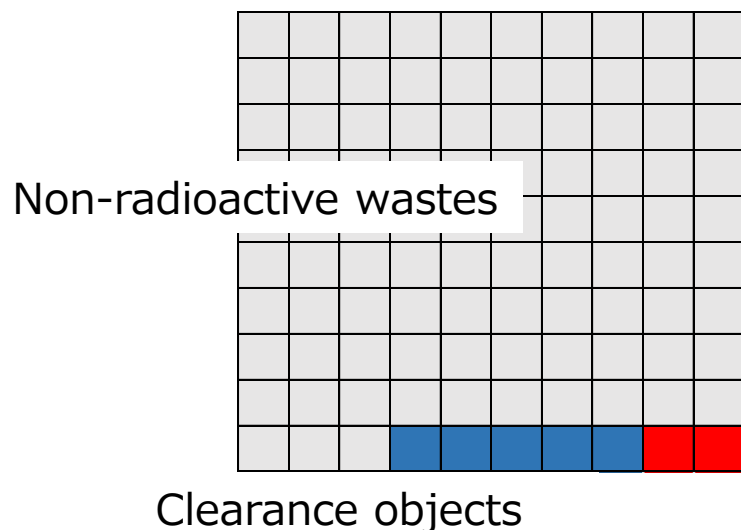
From the Decommissioning Policy (Website of the Nuclear Regulatory Agency)

Decommissioning and Radioactive Waste



Generated Amount of Radioactive Waste (by Decommissioning)

Waste and valuables generated by decommissioning



Nuclear Power Plants
in Fukui Prefecture
(Decommissioning
phase)

unit: ton

Level	Tsuruga #1	Mihama #1	Mihama #2	Ohi #1	Ohi #2	Fugen	Monju*
L1	80	80	80	200	200	500	
L2	760	620	790	1,420	1,430	4,400	
L3	5,530	2,380	2,510	10,080	10,160	5,200	
CL	9,710	6,400	7,500	6,600	6,600	40,800	
NR	130,620	15,750	15,750	319,000	319,000	138,500	
Total	146,700	25,230	26,630	337,300	337,390	189,400	

*not open

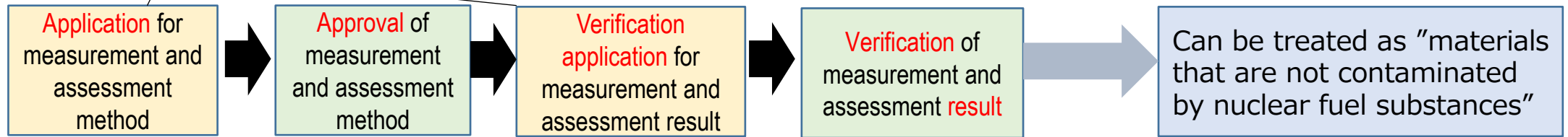
Clearance System

What is clearance?

Materials with very low levels of radioactivity that pose negligible impact on the human body, and that have been approved and confirmed by the Nuclear Regulation Authority, shall be treated as "**materials that are not contaminated by nuclear fuel materials**" and **be allowed to be reused** (introduced by the 2005 amendment to the Nuclear Reactor Regulation Law).

Verification of clearance

Regulatory authorities conduct approval and verification in the following two stages (clearance verification).



Government's effort to establish social acceptance of the clearance system

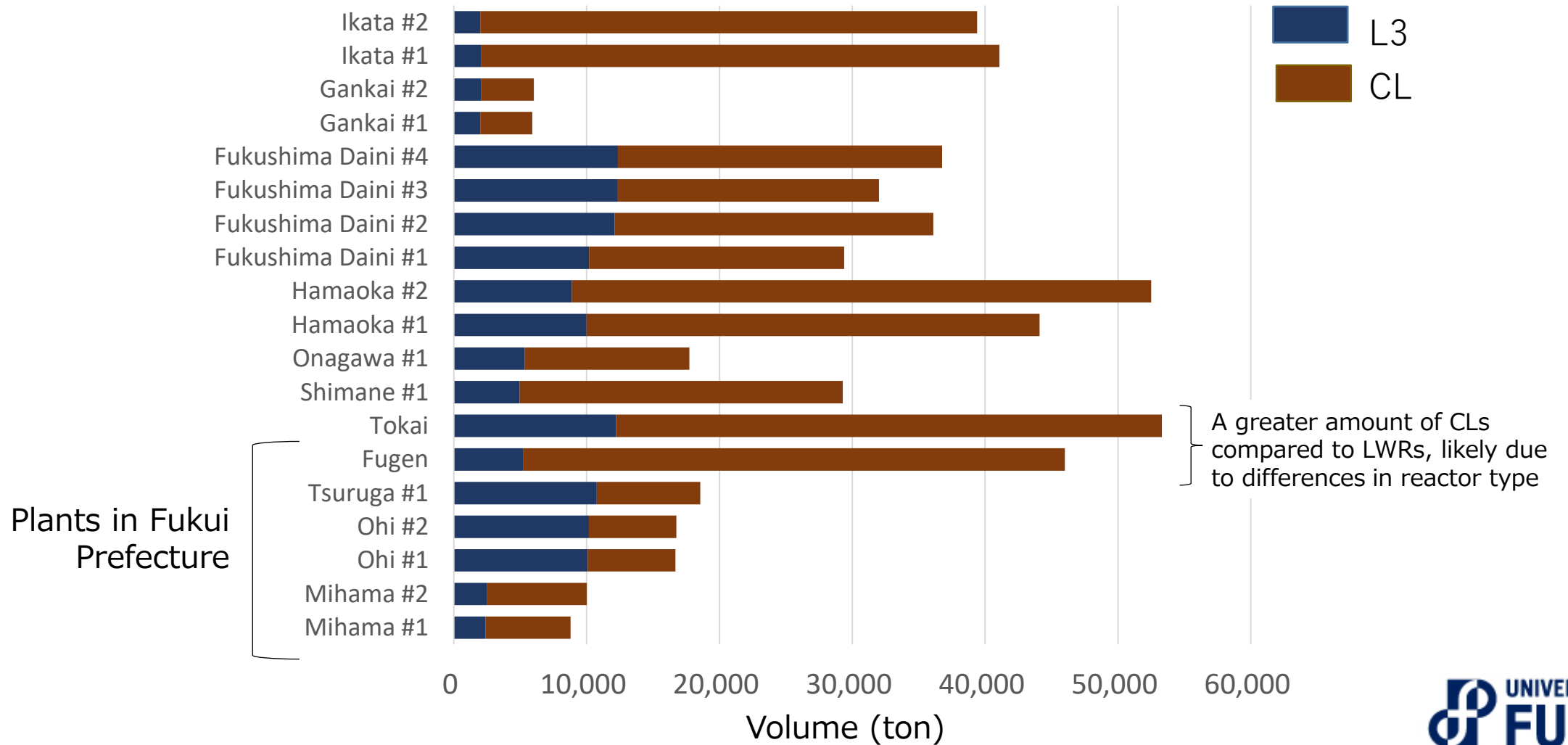
- Phase 1: Reuse of non-consumable products in supportive communities
- Phase 2: Reuse of non-consumable products / lifting ban on non-consumable products
- Phase 3: Free release / lifting ban on all products



Activities to gain understanding in Fukui Prefecture

Estimated Generation of L3 Wastes and Clearance Objects

Plants in the decommissioning phase



Recycling Confirmation Tests of Clearance Objects

Procurement

10 tons of clearance metals
procured from Tokai plant and
Fugen



Upper: Procurement
Lower: Transport

Pretreatment, temporary storage



Before
cutting



Cutting



After
cutting

Primary processing and storage

102 ingots (FC300) (100kg each) manufactured
from clearance metal (carbon steel: SS400)



Top left: Melting Top center: Tapping Top right: Pouring
Middle left: Casting Middle center: Unmolding Middle right: After
shot blasting
Bottom left: Storage



Main activities: Ensuring traceability, sorting and management, safety confirmation including dose-rate measurement, and providing explanations to local governments and surrounding areas to promote understanding

Recycling of Clearance Objects in Fukui Prefecture



Initiatives in Fukui Prefecture – Reinan E-Coast

Basic Strategy I: Promotion of nuclear-related research and development of human resources

Basic Strategy II: Cultivation of decommissioning business

Basic Strategy III: Regional development through the utilization of diverse energy sources

Basic Strategy IV: Promotion of diverse local industries

Promoting participation of local companies in decommissioning and related projects, and expansion of products and technology supply

- Aiming to utilize the new test reactor, conduct publicity campaigns to identify needs and support its use

Promotion of the reuse of demolition waste and its commercialization

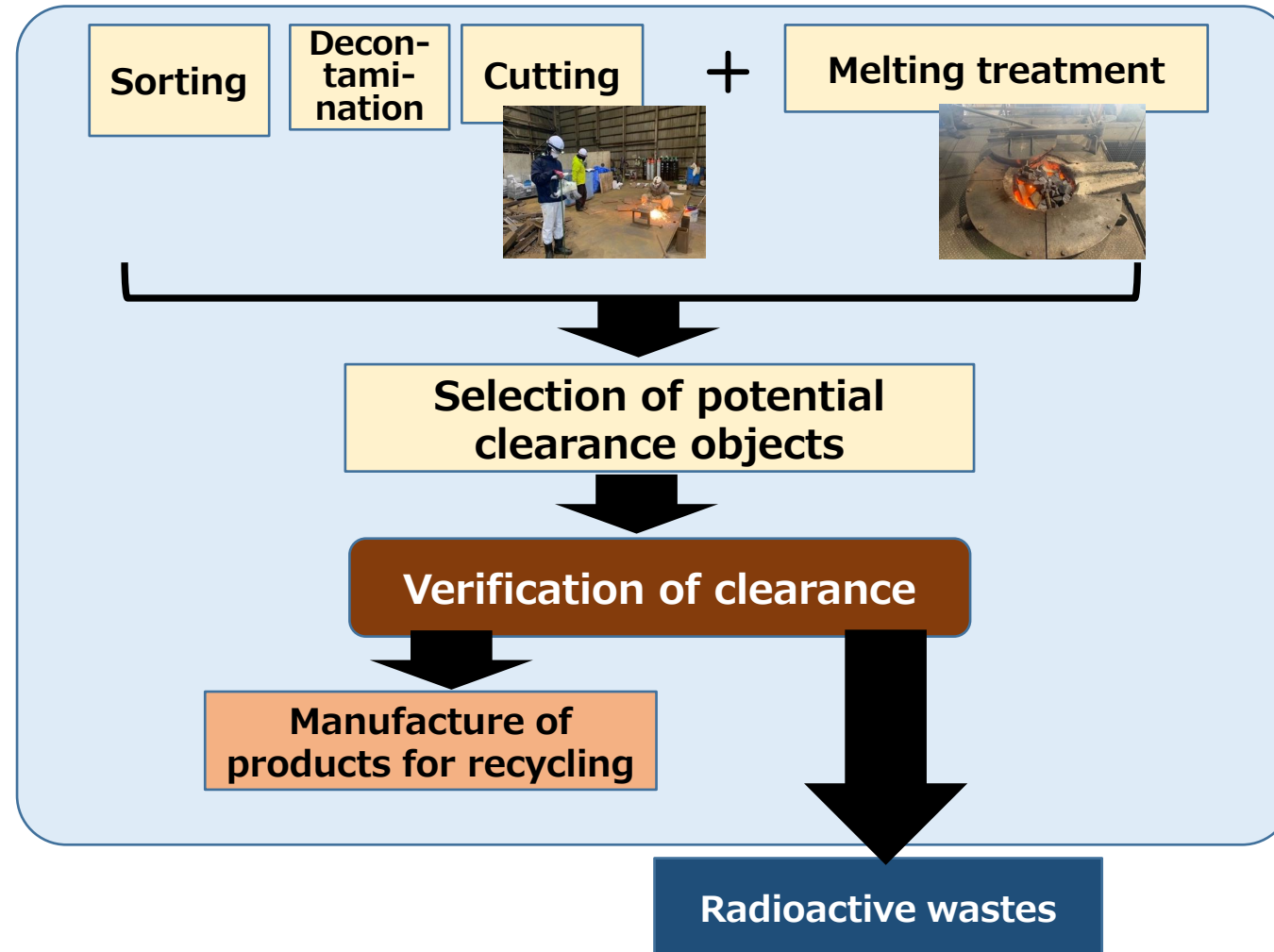
- To establish a business model for reusing materials below the clearance level, encourage reuse and understanding among governments and businesses

Development of Decommissioning Business – Centralized Treatment Facility

Decommissioning
work at a nuclear
power plant



Centralized treatment facility



Realization of a Recycling-Oriented Society

What is a recycling-oriented society?

A society in which finite resources are used efficiently and reproduced while circulating them in a sustainable manner.

Major issues facing modern society

- Environmental issue
- Population growth and decline
- Depletion of resources
- Waste generation
- Final disposal sites

Basic Act for the Promotion of the Recycling-Oriented Society: Established on June 2, 2000.

This law provides the basic framework for promoting the development of a recycling-oriented society. Its objective is to establish a foundation of waste and recycle policies.



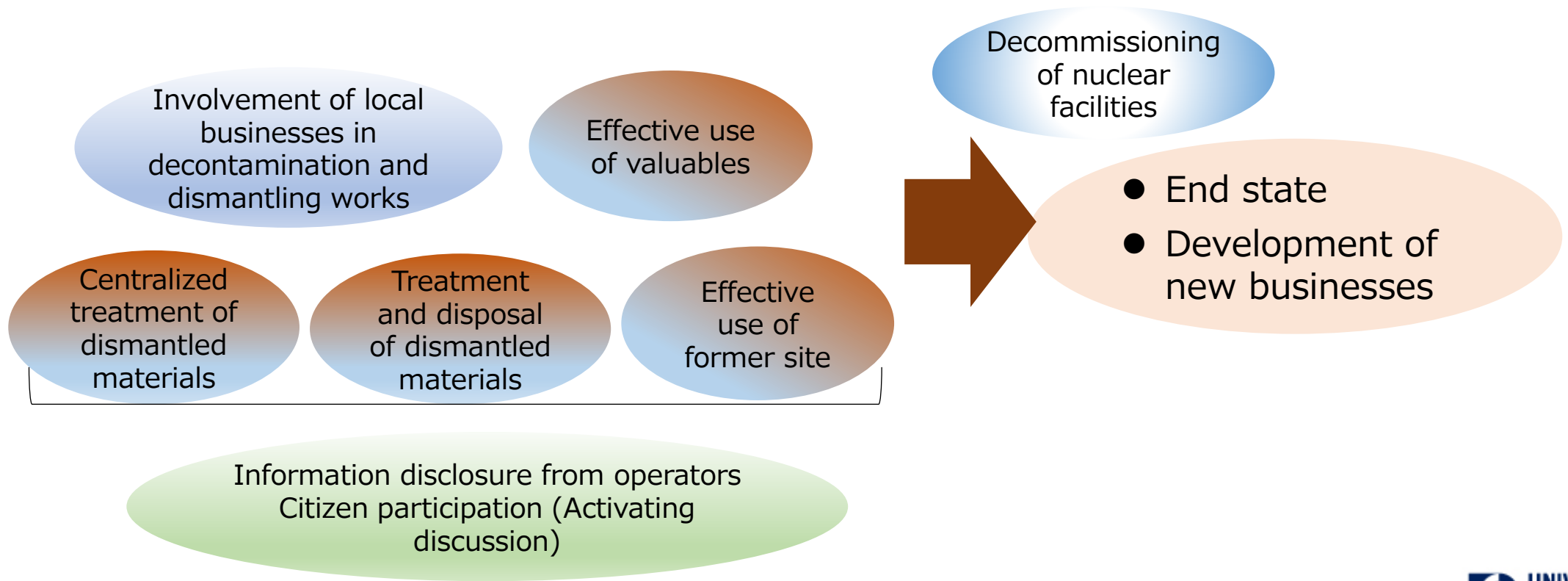
Waste hierarchy (IAEA)

- 1) IAEA, Management of Project Risks in Decommissioning, IAEA Safety Series No.97, 2019
- 2) IAEA, Nuclear Decommissioning, IAEA Bulletin, April 2023

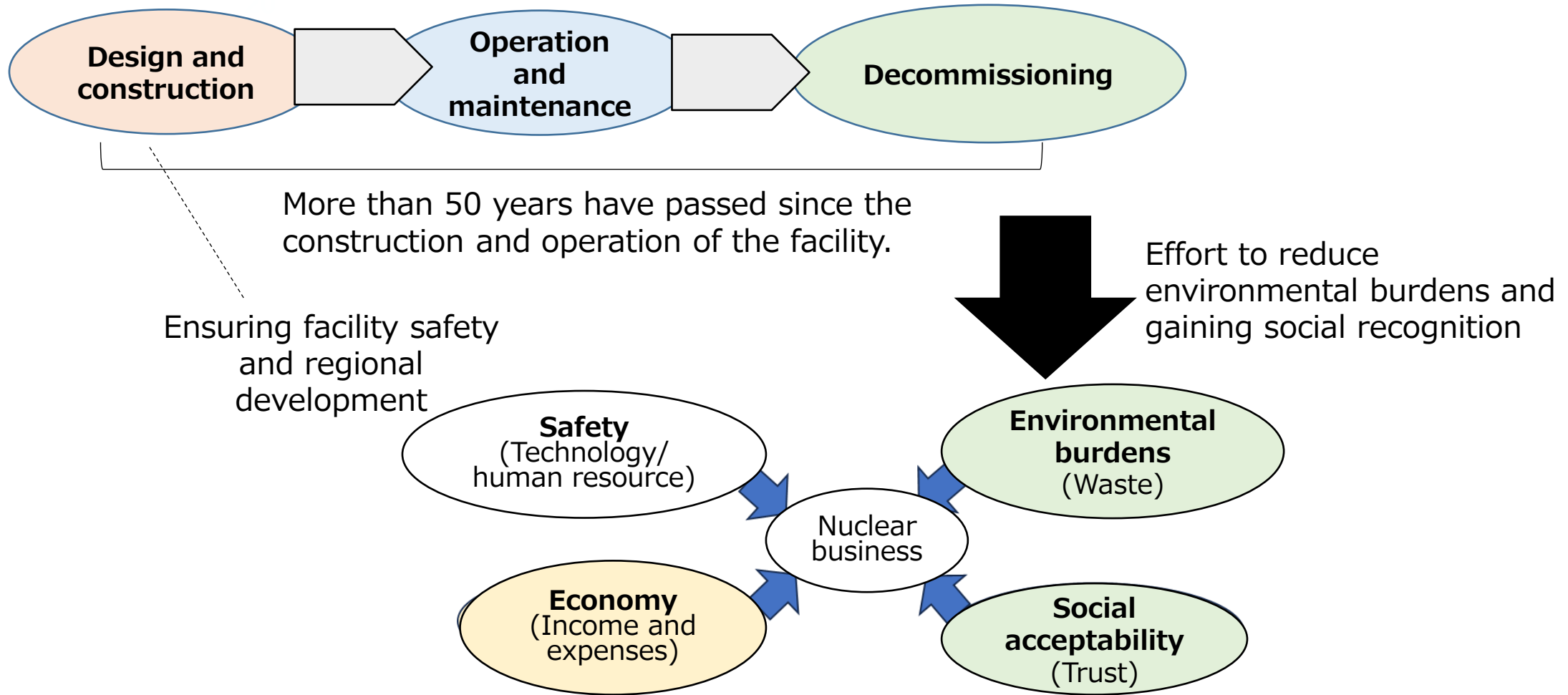
Efforts to Revitalize Local Communities

Key perspectives (lessons learned from decommissioning and environmental remediation activities)

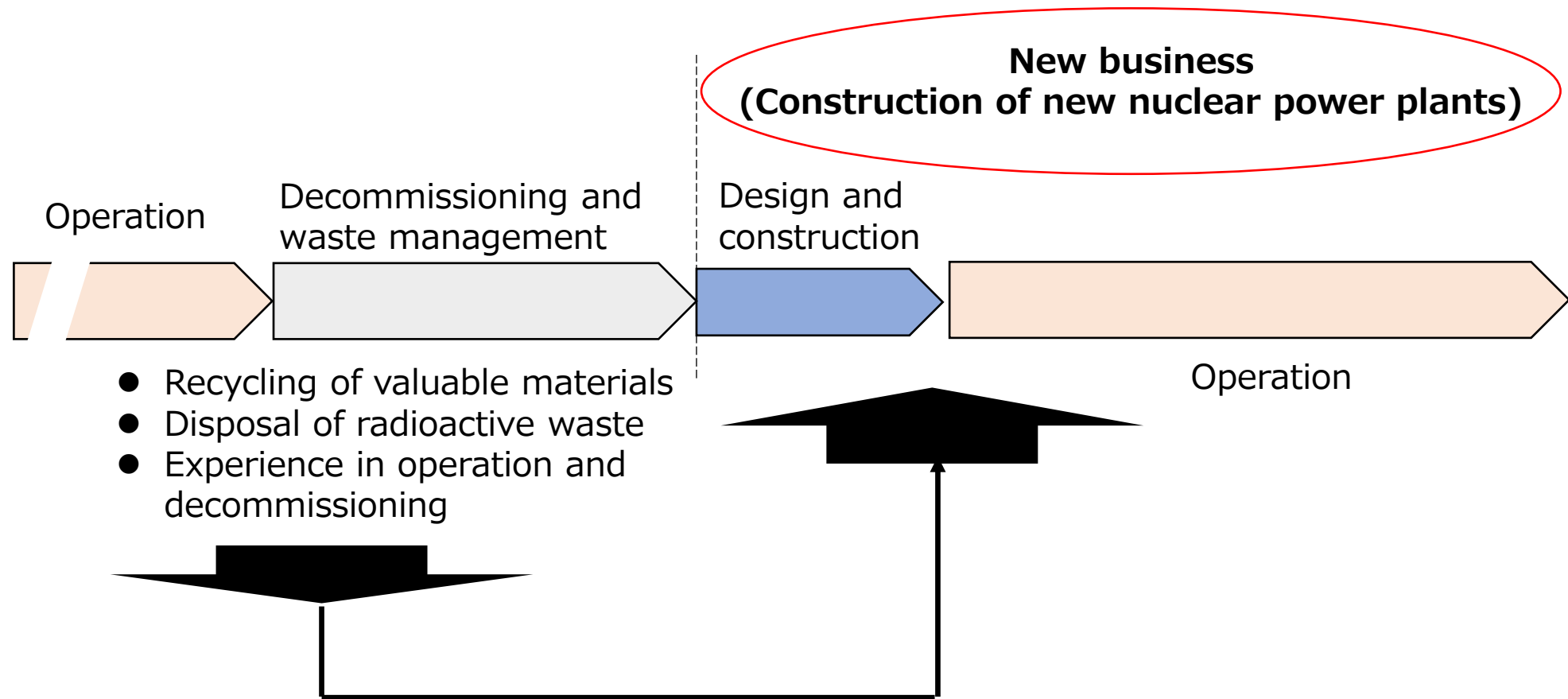
- Information disclosure
- Citizen involvement and cooperation



Key Perspectives to Consider in Nuclear Business



Development of New Businesses



Conclusion

- Half a century after the start of nuclear businesses, there is an urgent need for decommissioning and waste management.
- Effective use of the clearance system is of great social significance, closely linked to the SDGs.
- Recycling of clearance materials during decommissioning is a business priority.
- Information disclosure, discussion and cooperation among various people, as well as accountability to future generations, are essential.
- Creating a new culture and business model represents the first step toward future advancement (business) of nuclear technology.
- Fukui Prefecture's efforts will pave the way for the future of Japan's nuclear business.