

Approach to HLW disposal cost estimation

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**IFNEC, RNFSWG
WORKSHOP ON APPROACHES TO FINANCING A MULTINATIONAL
REPOSITORY –
CHALLENGES AND ALTERNATE APPROACHES**

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Paris, France

1. Japanese Programme

2. Costing methods and Results

Chronology of Japanese disposal programme

Historical overview

No specific site and host rock for DGR

R&D Organizations
(JAEA, CRIEPI etc.)

Second Progress Report (1999)
(technical reliability of geological disposal)

First Progress Report (1992)
(technical feasibility of geological disposal)

Start of R&D program for geological disposal

1976

Final Disposal Act (Jun. 2000)

1992

2000

Establishment of NUMO (Oct. 2000)

- Site selection and characterization
- Design, licensing, construction, operation and closure of repository
- Collection of fund

2002

Start of open solicitation of acceptance of geological survey by literature (Dec. 2002)

2005

Amendment to Final Disposal Act for TRU waste (Jun. 2007)

2010

The Great East Japan Earthquake (Mar. 2011)

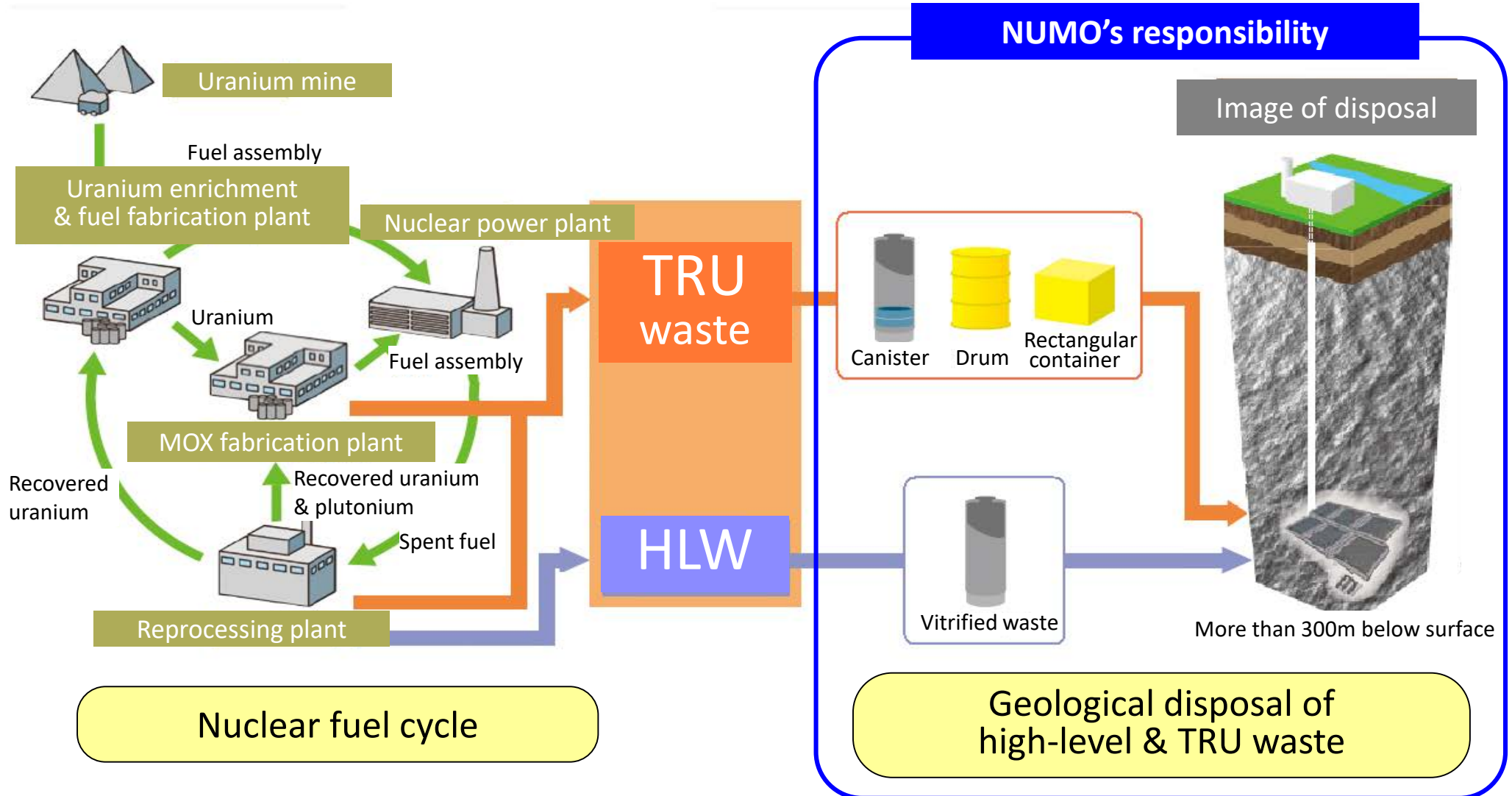
2020

R&D activities by supporting organizations

2030

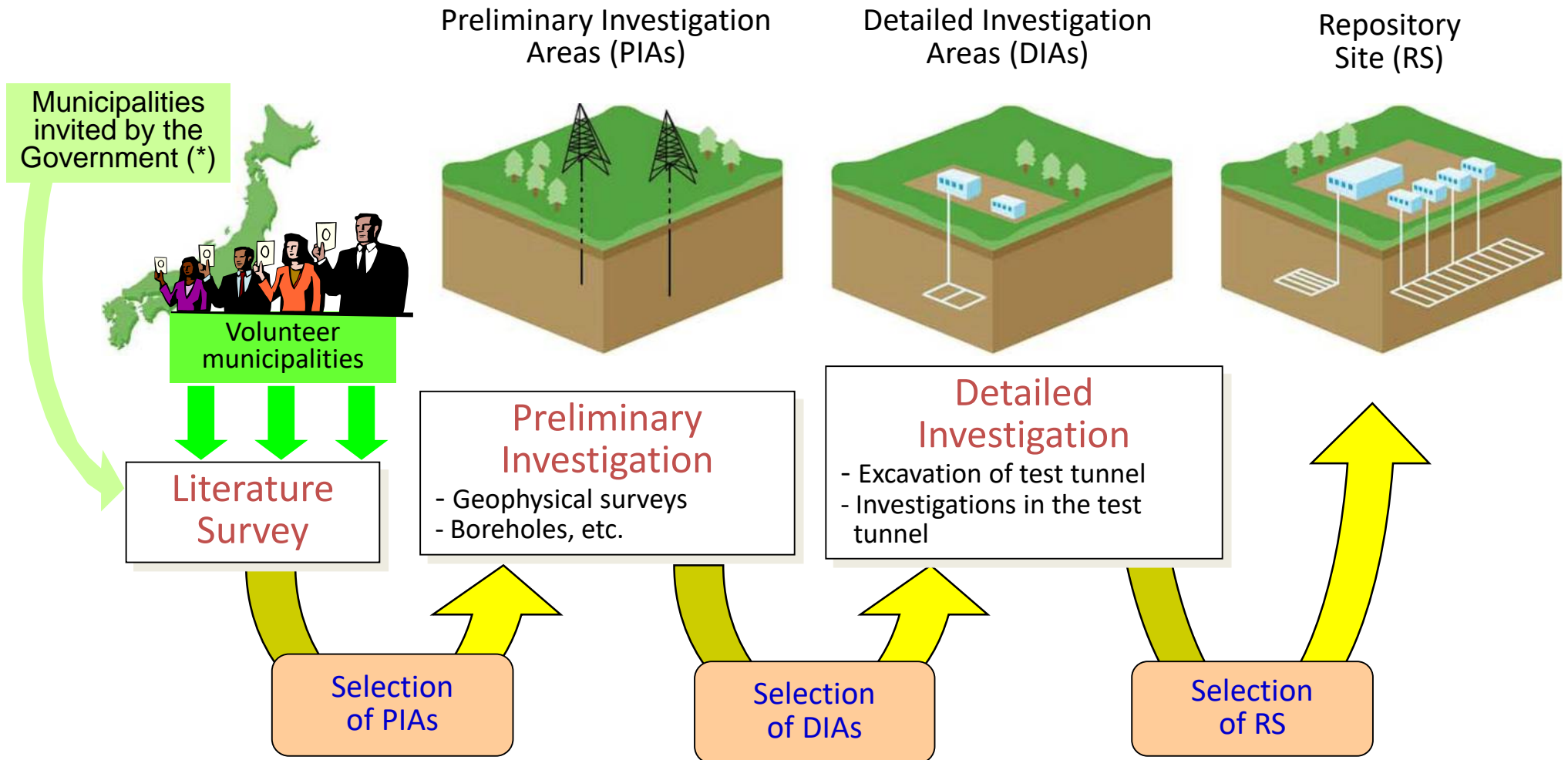
Types of radioactive waste for final Disposal financing

- Nuclear fuel cycle policy
- Reprocessing generates HLW and TRU waste.



Summary of Japanese disposal programme①

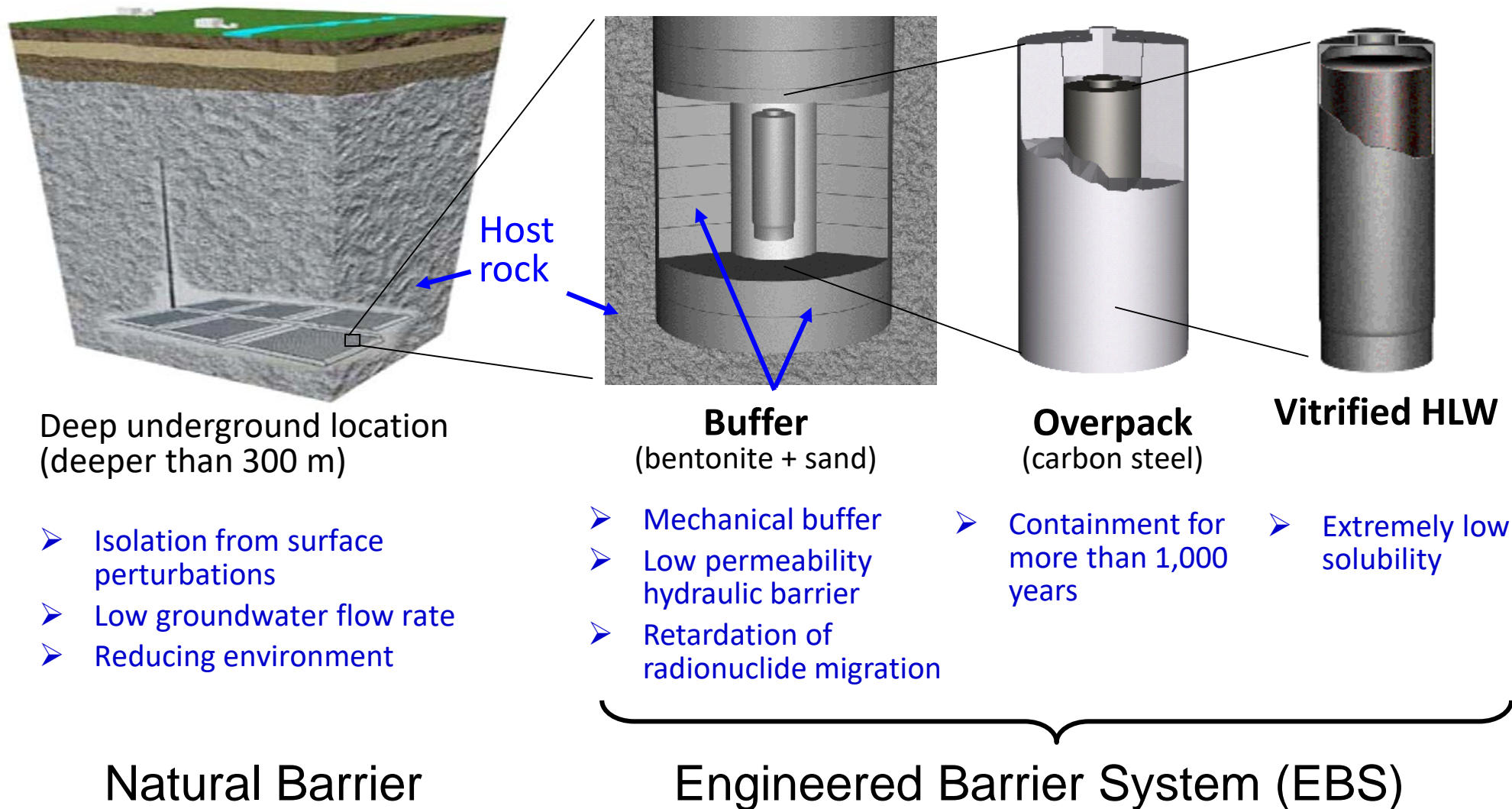
Site characterization



(*) This procedure was added in 2007 after Toyo town case

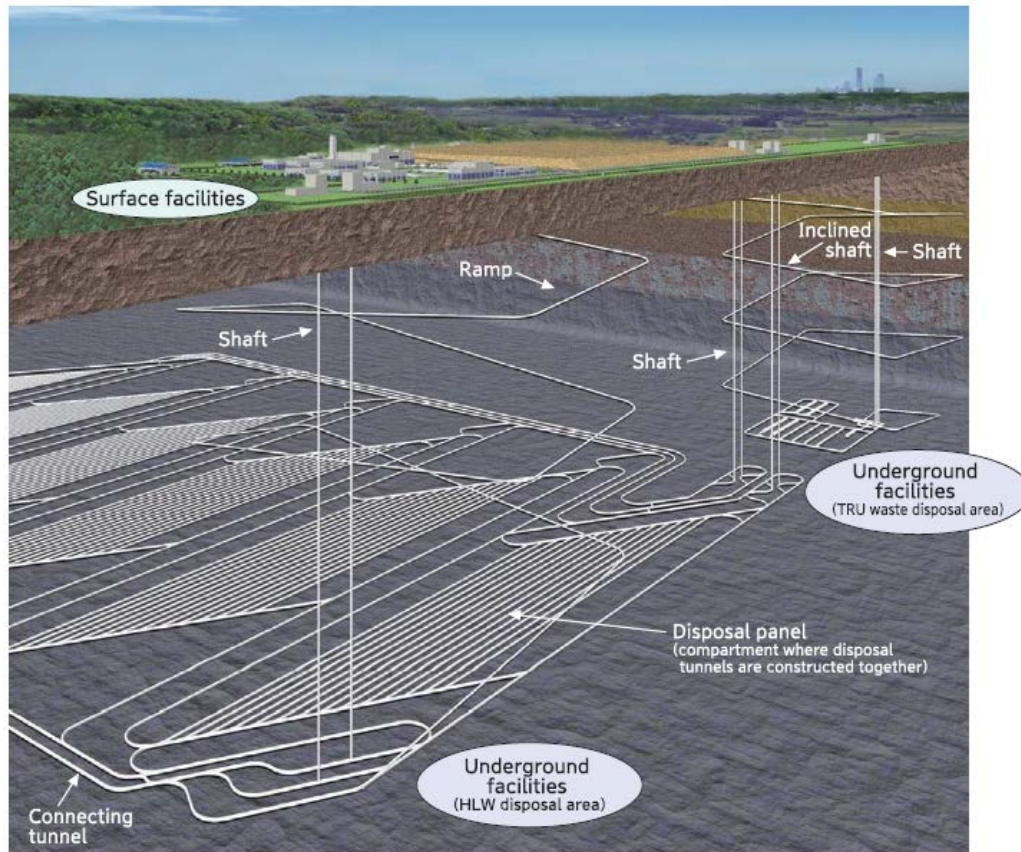
Summary of Japanese disposal programme②

Multi barrier system



Summary of Japanese disposal programme③

Image of underground facilities



Scale of facilities

Underground facilities : around 3km by 2km

Image of surface facilities



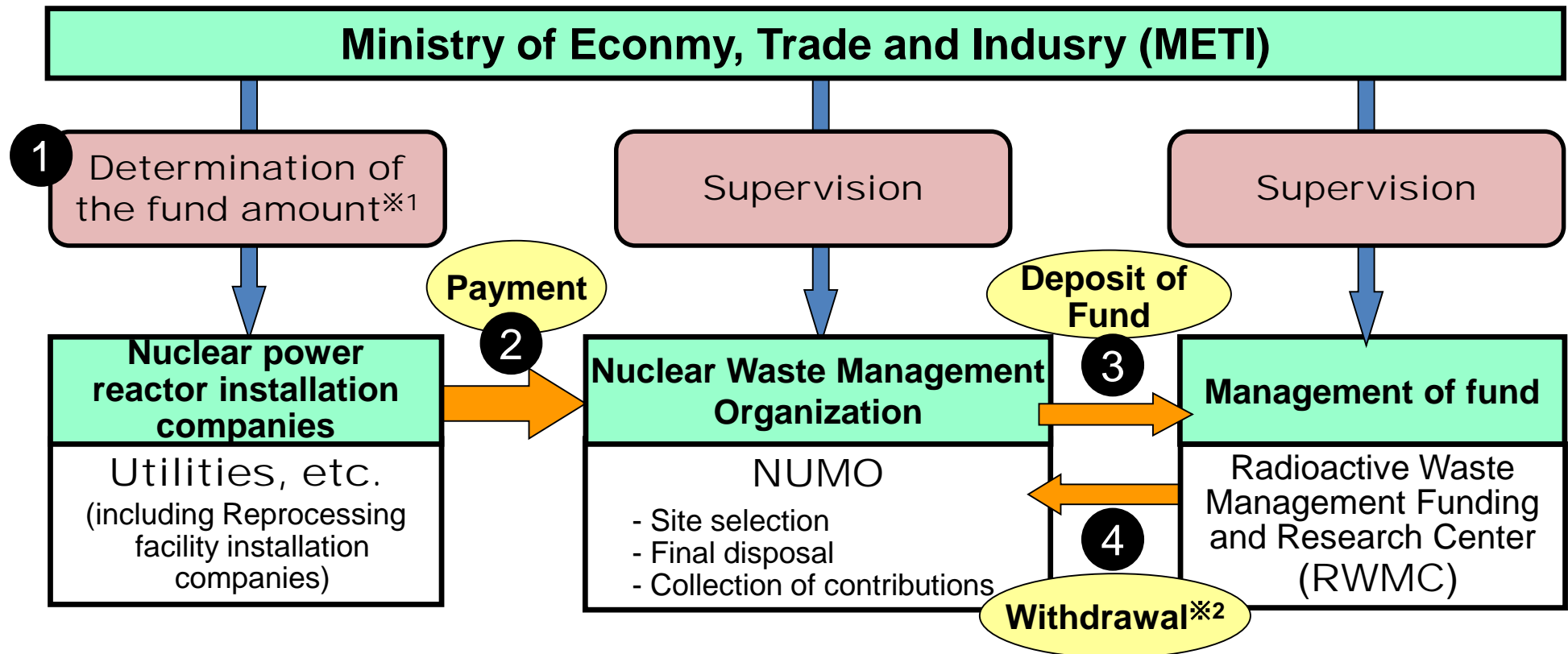
Surface facilities : around 1-2km²

1. Japanese Programme

2. Costing methods and Results

Framework of financing for the HLW final Disposal in Japan

- In order to implement final disposal of HLW systematically and reliably, nuclear power reactor installation companies and Reprocessing facility installation companies have to pay the necessary expenses (contributions) to NUMO by **March 1st every year**, in accordance with the "Act on Final Disposal of Specified Radioactive Waste". Note. NUMO, the Nuclear Waste Management Organization of Japan



※1 Updating major of unit price using publication data every year

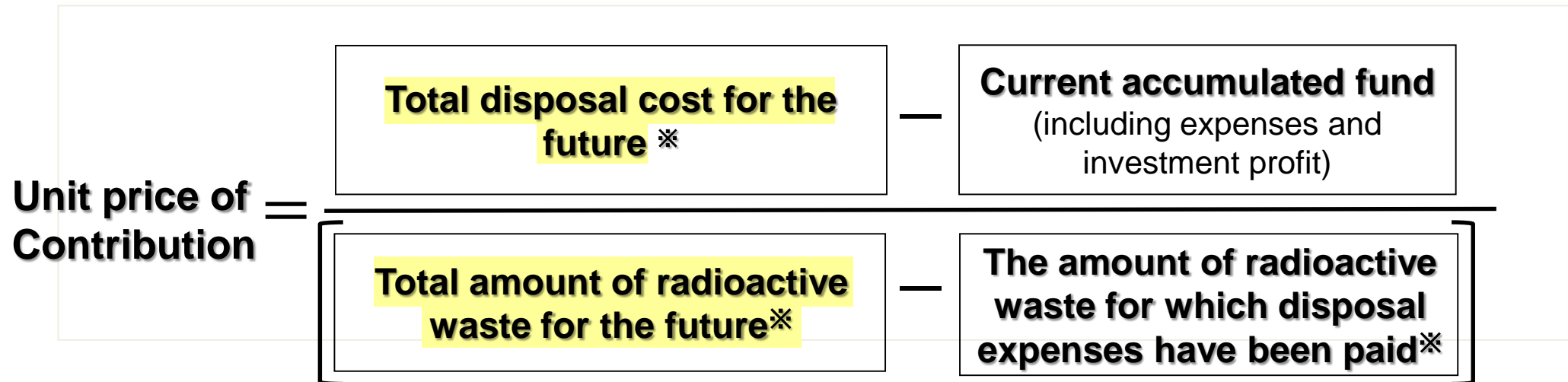
※2 Required Approval of METI

➡ Procedure of Funding

Estimation of Major of Unit Price for funding

Costing methods of total cost of the final disposal

- ① Based on the idea accepted at the nuclear energy subcommittee of September 2000 and February 2008.
- ② Unit price of contributions is calculated by the following method.
 - Dividing the cost, subtracting "Current accumulated fund " from "Total disposal cost for the future“, by the amount of waste, subtracting "The amount of radioactive waste for which disposal expenses have been paid“ from "Total amount of radioactive waste for the future"



Note: Each cost for the future must be reduced present discounted value.

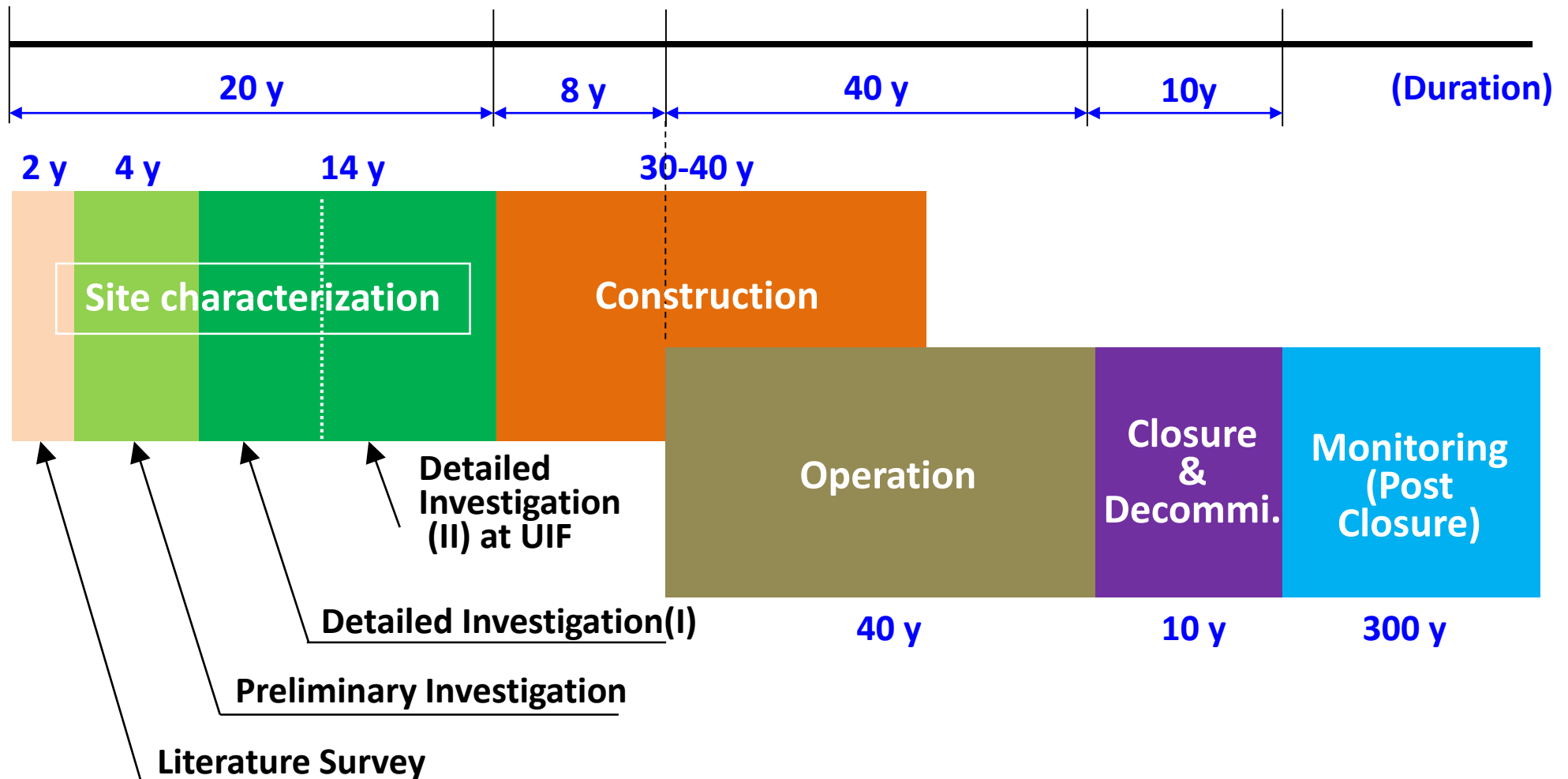
Reference cases/scenarios

Terms and conditions for the cost estimation

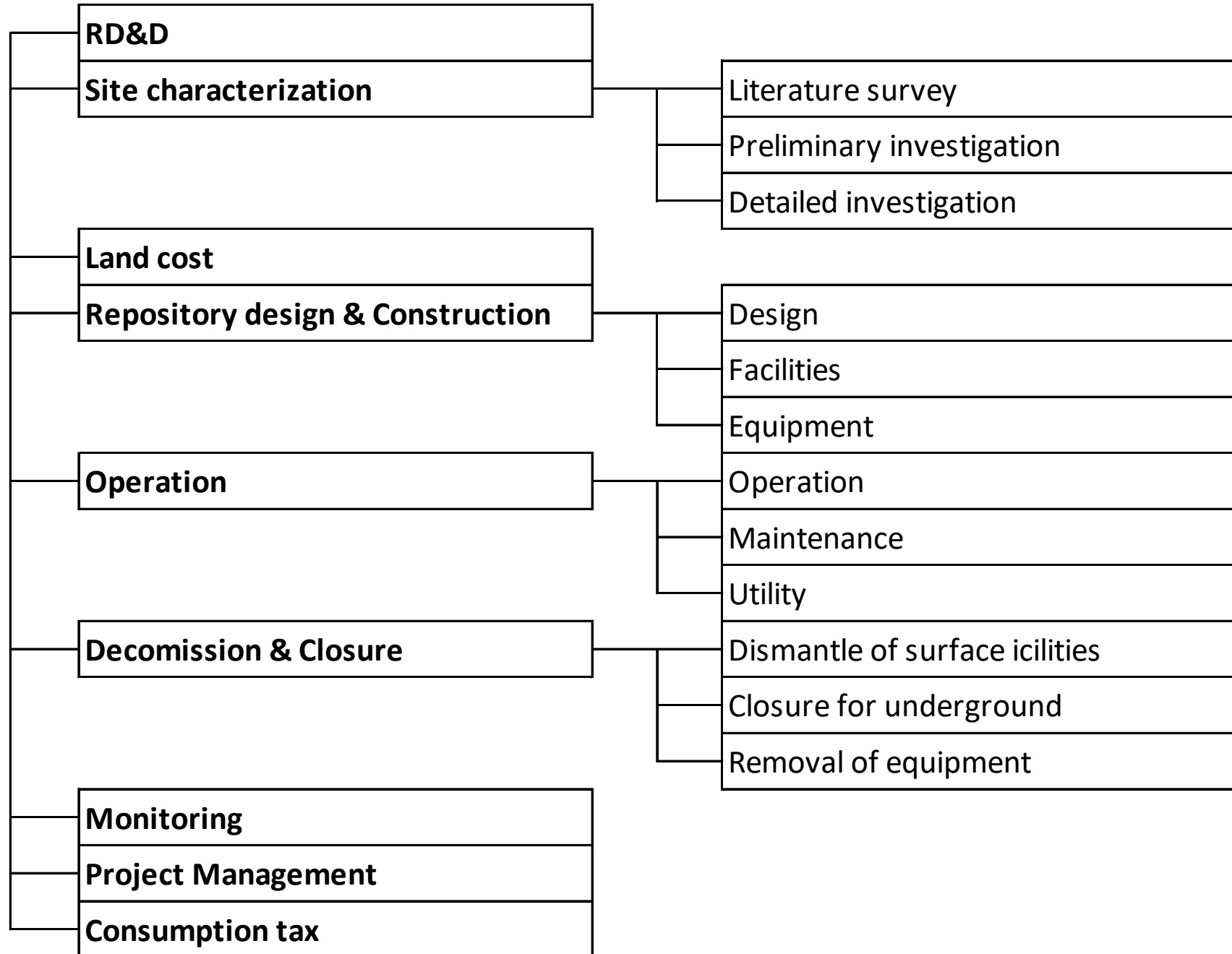
	Case A	Case B
Host rock	Soft rock (Sedimentary rock)	Hard rock (Granite)
Depth of repository	500m	1000m
Tunnel support	Concrete	Nothing
Thickness of Buffer material	70cm	
Installation of buffer material	Block installation	
Material of Overpack	Carbon steel	
Thickness of Overpack	19cm	
Access type	1 ramp and 6 shafts	
Siting process	10 sites → 5 sites → 1 sites (LS) (PI) (DI)	

Assumed schedule for the cost estimation

Schedule is based on the amendment of "Plan of Final Disposal" in 2008



Work breakdown structure



Result of HLW disposal cost

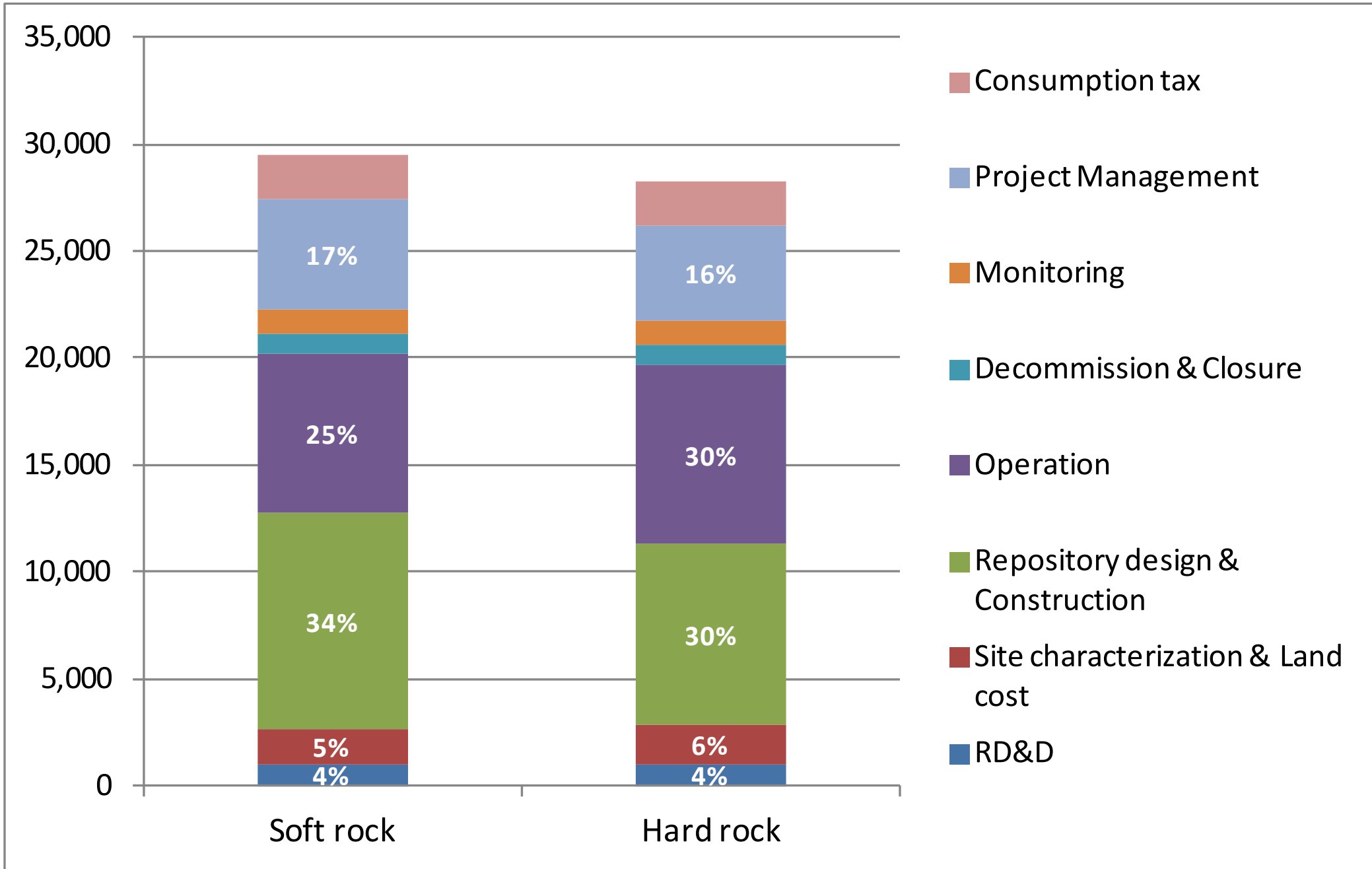
Adaption of mean value (from 2 reference cases/scenarios)

(Billion JPY)

	Soft rock	Hard rock	Mean value
RD&D	117	117	117
Site characterizaton & Land cost	178	199	188
Repository design & Contruction	1,081	903	992
Operation	767	841	804
Decommission & Closure	93	100	97
Monitoring	122	122	122
Project Management	519	447	483
Consumptuion tax	223	215	219
Sum	3,100	2,944	3,022

**As of FY2017 after annual review*

Result of HLW disposal cost



Results of expenditure and fund

- Total cost

- Approx. **3,826 billion JPY**

- ✓ **HLW**: approx. **3,022 billion JPY***

- ✓ **TRU** : approx. **804 billion JPY**

*: Number of waste equivalent (as of the end of FY2017)

-> approx. 24,996 canisters (of the total 40,000 canisters)

- Total of fund from annual contribution (as of the end of FY2017)

- HLW : **944.0 billion JPY**

- TRU : **58.3 billion JPY**

Thank you for your attention