

Nuclear disposal in Germany - Challenges for the new site selection process

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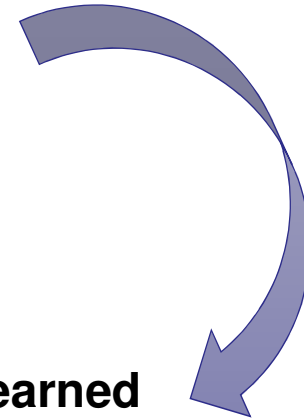
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Outline

- Status of radioactive waste disposal in Germany
- Site selection process for high-level waste
 - Challenges derived from experience & lessons learned
- Open questions ahead



The problem

Waste Prognosis for 2080

Heat generating waste	Negligible Heat generating waste		
Waste from nuclear power generation	Waste from NPP, industry, research etc.	Possibly waste from enrichment activities	Waste from Asse II Mine
ca. 28.000 m ³	ca. 300.000 m ³	ca. 100.000 m ³	ca. 200.000 m ³
Activity: > 99 %	Activity: < 1 %		
↓	↓	↓	↓
Site selection process	Schacht Konrad (Licence for 303.000 m ³)	?	?

The Past: Disposal in Geological Salt Formations



Morsleben (salt mine)

- LAW, MAW disposal site of the former German Democratic Republic
- Emplacement of waste: 1971 – 1991, 1994 – 1998
- Licensing procedure ongoing
- **Challenge: Advancement of Science and Technology**



Asse II (salt mine)

- LAW/MAW disposal between 1967 – 1978
- brine intrusion since 1988, long-term safety not guaranteed
- Public advisory process
- **Challenge: Complete retrieval of the waste**



Gorleben (exploration salt mine)

- Begin of exploration as repository for heat generating waste in 1979
- Exploration work ended in 2013 when Repository Site Selection Act entered into force



The Present: Interim Storage and Konrad Repository



Interim Storages

- LAW/MAW: Several storage sites all over Germany
- HAW (spent fuel, waste from reprocessing):
 - 12 interim storage sites at NPPs, 3 central interim storage sites
- **Challenge: Licence for 40 years**



Konrad Repository

- Final repository for LAW and MAW
- Former iron ore mine, natural barrier in the form of clay/marl layers (up to 400 m thick)
- Licence for 303.000 m³
- **Challenge: Planning with far too optimistic assumptions**

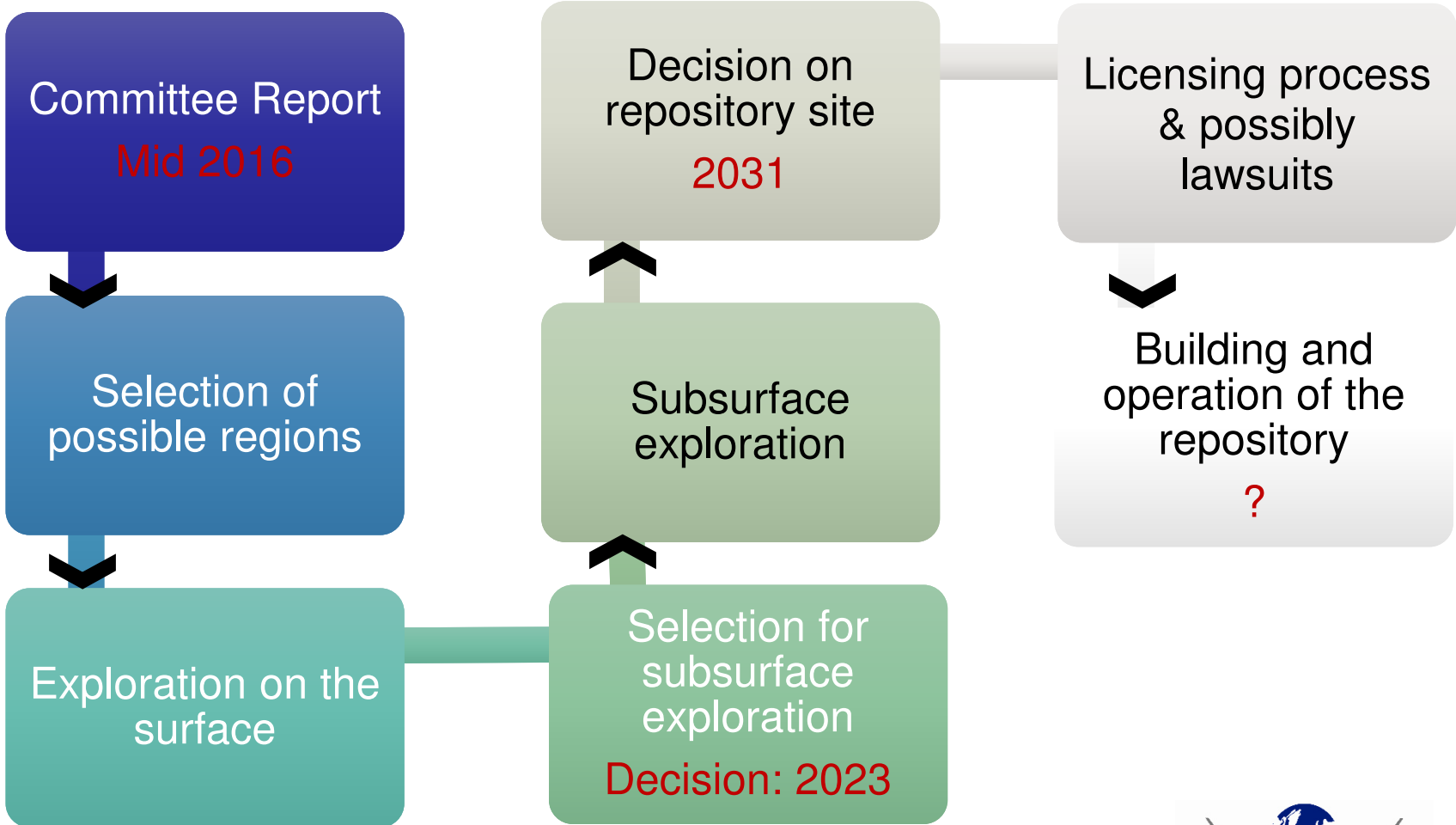
The Future: Site Selection Process

Principles & Objectives

- **Science-based, open selection process: „White Map“**
- **Repository for particularly high-level-waste**
- **Transparency and Participation**
- **Parliamentary decisions for major steps**
- **New organisational setting**



Site Selection Process – Schedule & Major Steps



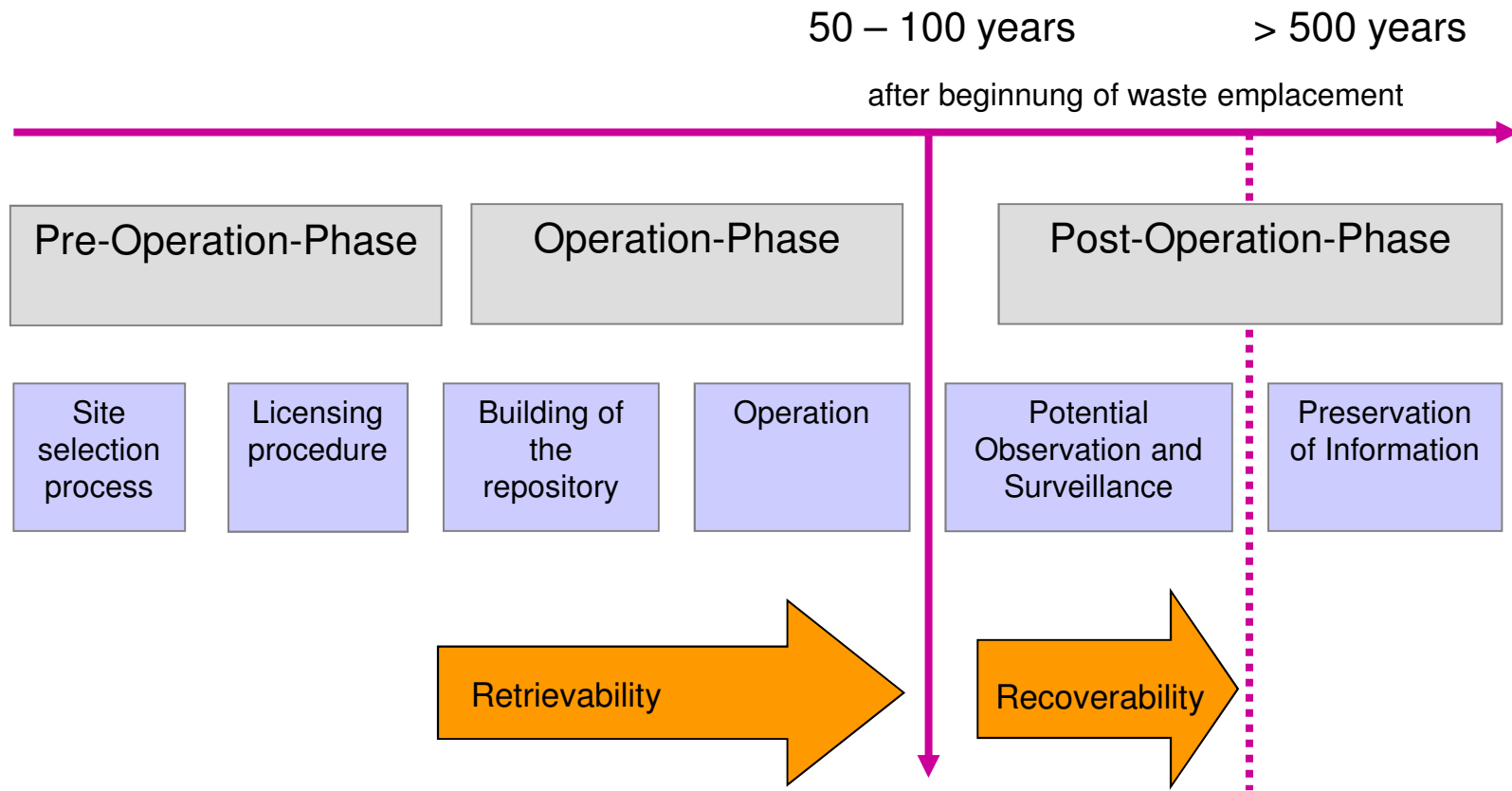
Learning from the Past...

Three important challenges

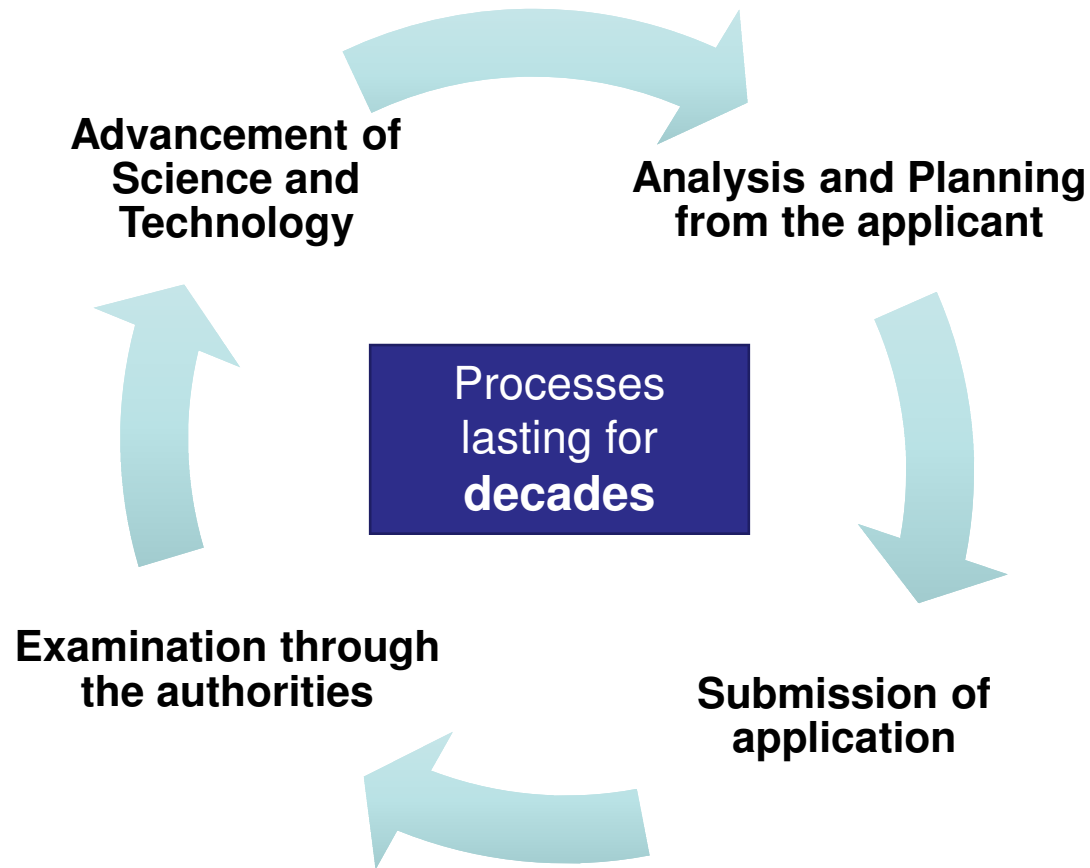
- Question of retrievability
- Advancement of Science and Technology
- Public Participation



Challenge No. 1: Reversability of Decisions



Challenge No. 2: Advancement of Science and Technology



Example: Konrad repository

Safety Analysis for Konrad	
1	Safe Operation Radiation protection for employees, emissions
2	Incident Analysis Fire, earthquake, container leaking, ...
3	Thermal influence on the host rock
4	Criticality Safety Criticality during operation and long term storage
5	Longterm Safety Mobilisation of radionuclides, transport with groundwater, entry into the biosphere

Stake holder Involvement

- Local authorities
- Licensing authorities
- General Public

Scientific peer review

- Scientific institutions
- Advisory Boards
- International Workshops



Challenge No. 3: Public Participation

— Site Selection Act:

- **Public Councils (preparation for upcoming steps)**
- **Public Dialogues**
- **Information Centres at possible sites**
- **Possibility to develop more forms of participation that go beyond the legally minimum requirements**

Problem: Declining awareness + participation paradox



Challenge No. 3: Public Participation

Lessons learned from Asse advisory process:

- **Definition of roles, mandates and responsibilities necessary at the beginning**
- **Sufficient time and resources**
- **Mutual respect (Criticism: Yes, challenge someone's integrity: No)**
- **Communication of knowledge and uncertainties**

Summary

- **Various experiences with nuclear repositories in Germany**
- **LAW/MAW: Licensed repository for a part of the waste**
- **After phase-out decision: Chance for sustainable way to dispose of HAW, if**
 - **New forms of communication with public**
 - **Consequent consideration of Advancement of Science and Technology but also societal agreement on limits**
 - **Reversability of decisions without safety cutbacks**





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