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Spent Nuclear Fuel Management in the Czech Republic

Progress Concerning Deep Geological Repository Development

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May, 2017

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Legislation

Legislative Principles and Responsibility in RW Management

Atomic act – 18/1997 Coll., and the new Atomic Act – 263/2016 Coll.

The main principles:

The state guarantees the safe disposal of all radioactive waste.

Producers of radioactive waste **are required to bear all the costs** associated with its management from the time of origin to its disposal.

In order to provide for activities associated with radioactive waste disposal, the Ministry of Industry and Trade set up the **Radioactive Waste Repository Authority (SURAO)** as a state organization - established on 1 June 1997

The nuclear facility **operator is responsible for decommissioning and the processing of RAW prior to its final disposal**

Nuclear account - Ministry of Finance, Czech National Bank

The **import** of radioactive waste into the Czech Republic **is forbidden by law**

The Czech Republic: National content and strategies

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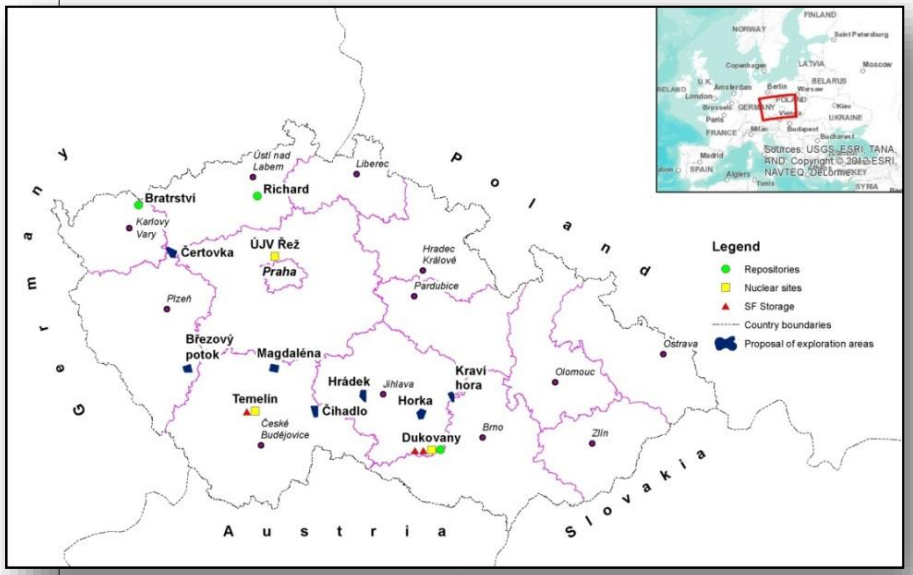

2002 – The government approved the **CR's RAWM Concept**

12/2014 – Government takes into account the **Update of the RAWM Concept (Policy)**

- final approval - SEA – public hearings expected in the first half of 2017

5/2015 – Government approval of the **Update of the National Energy Strategy**

- **4 new NPP units** (Dukovany 2 + Temelin 2)
- **2025 start of new NPP construction**
- Commissioning between 2035 – 2037

5 and 9/2015 – Minister of the Env. approved **licences** for the 1st stage of **geo. surveys for a DGR at 7 sites**

Responsibility:
Financial Aspects of RAW Disposal

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Nuclear Account = NON TAXPAYER system

More than 100 RAW producers in the CR

- The largest - ČEZ a.s.
- Others – ÚJV Řež, industry, hospitals,…

Responsibility of producers:

- To manage RAW only by means of a licence issued by SONS
- **To pay charges** for the disposal of RAW and for DGR development, investment, operation, closure and monitoring

Nuclear account

- Held at the Czech National Bank
- Managed by the Ministry of Finance of the CR

NPP operator

- **CZK 55 (€2 / 2,2 USD) per 1 electricity MWh produced by NPPs**

Other producers = per 1m^3

- **CZK 145 000 - for disposal**
- **CZK 174 000 – for storage and future disposal in the DGR**

Nuclear Account in the end 2016
CZK 25.8 bil. = ± 1 bil € / USD

Responsibility for LLW ILW Disposal

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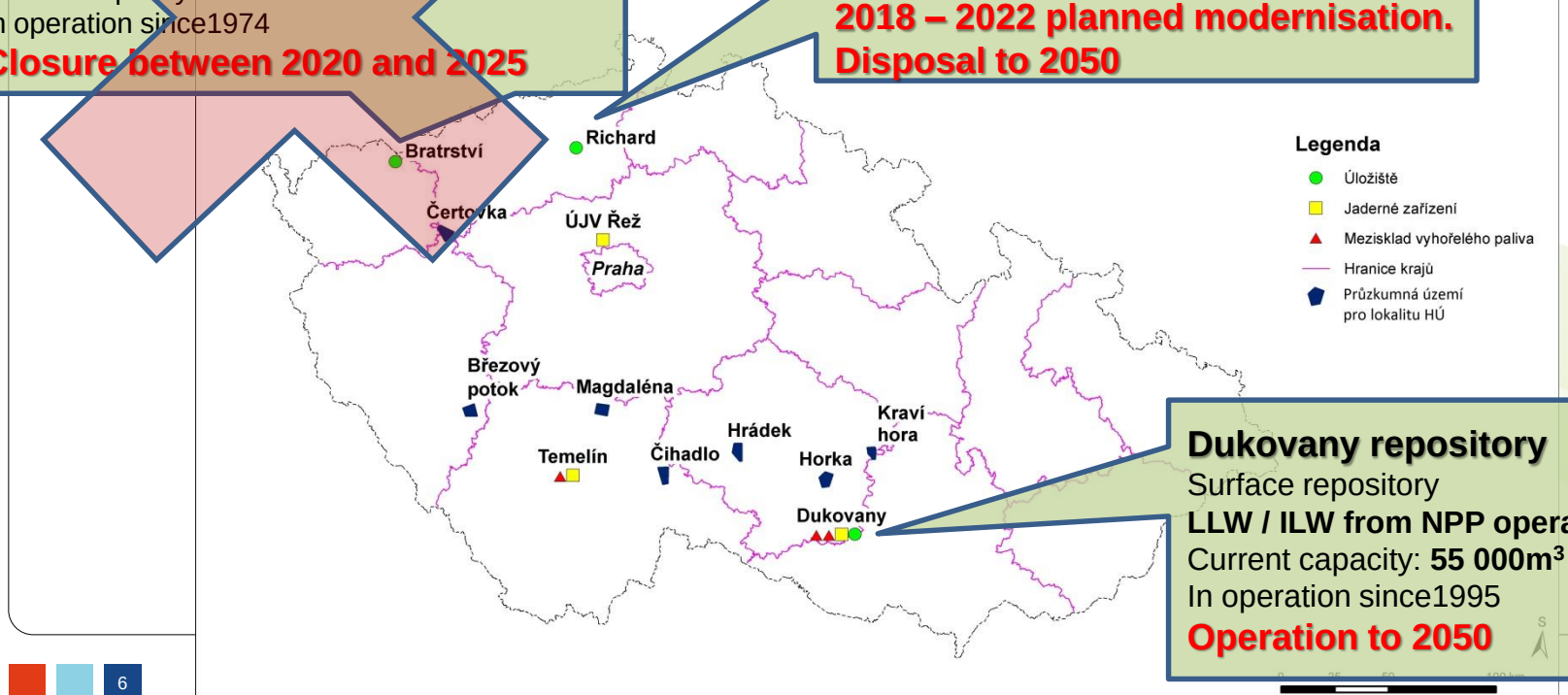
More than 50 years experience with operation of LLW/ILW repositories

Bratrství repository (Jáchymov)
Former uranium mine
Institutional LLW / ILW with natural nuclide content only
Current capacity: **1 200m³**
In operation since1974
Closure between 2020 and 2025

Richard repository (Litoměřice)
Former limestone mine
Institutional LLW / ILW
Current capacity: **8 000m³**
In operation since 1964
2018 – 2022 planned modernisation.
Disposal to 2050



Dukovany repository
Surface repository
LLW / ILW from NPP operation
Current capacity: **55 000m³**
In operation since1995
Operation to 2050

Responsibility concerning Spent Nuclear Fuel Management

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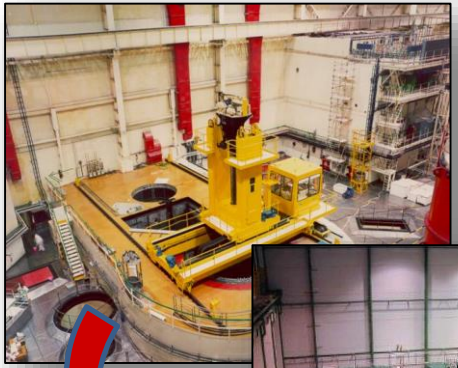
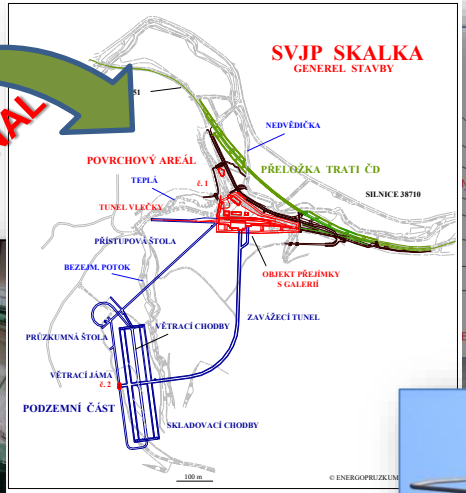
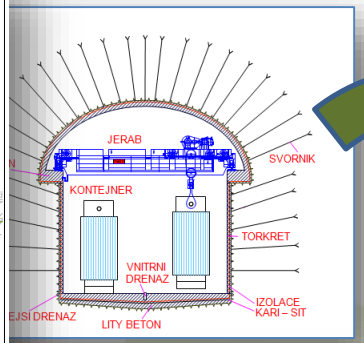
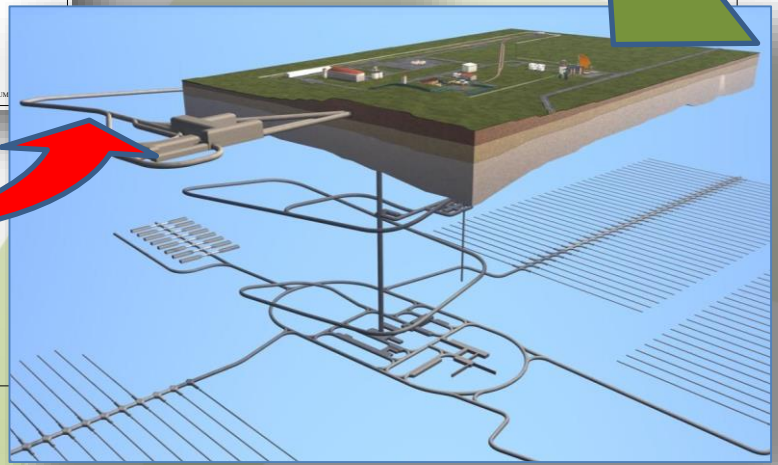
NPPs → Storage at NPP sites → Central interim Storage Skalka (optional) → DGR 2065



OPTIONAL







Interim storage of SNF

CASTOR casks – transport and storage container

440/84 assemblies,

1000/19 assemblies

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RAWM Concept 2002 / 2014

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Main principles

- **Direct SNF disposal in a deep geological repository in the CR**
- **Crystalline rocks as the host environment**
- **Own disposal container**

Main milestones

- **2020** – Two suitable sites = **Two candidate sites**
- **2025** – Selection of **final site** (and reserve site)
- 2030 – Construction of URL
- **2065** – DGR **commissioning**

Responsible solution

Up to 2050 - time to make a responsible decision

Two decades (since 1992) of DGR siting in the CR

	Events and achievements
1992 – 2002	• Project development, screening of the whole of the CR, reference DGR design, generic studies
2003	• Decision on 6 sites, start of the GeoBariera project – airborne geological survey only
2003 – 2005	• Strong local public opposition at all sites
2005	• Government reaction - all geological investigation work stopped to provide time "… to find local public acceptance…"
2008	• Focus on military (and other) areas, Boletice military area as a back-up site
2010	• New additional site – Kraví hora – near U-mining complex • New strategy for the selection of 4 sites based on the VOLUNTARY participation of local municipalities • Establishment of the Working Group for Dialogue on the DGR in the CR
2012	• New strategy (2010) proved to be an unworkable option, responsibility cannot be given to municipalities – responsibility is the role of the state
2013	• Modification of the site selection strategy - steb by step reduction (7) → (4) → (2) → (1) • 3 stages of investigation - first - to reduce the number of sites and affected municipalities

SURAO (CR) experience:
Taking responsibility – adoption of existing knowledge

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Experience from CR disposal concept development (1)

Period (1) 1993 – 1997, coordination by UJV Řež, financing from the government

- Generic studies and screening of the whole of the CR
  - Very limited areas with potentially suitable sedimentary rock complexes
  - Only crystalline disposal concepts are applicable to the CR
- Generic studies on IB – own container, bentonite buffer material from CR deposits

Period (2) 1998 – 2002 – SURAO takes responsibility

- Review of all screening activities conducted to date
  - Identification of 6 potential sites using first criteria (legislation, feasibility, accessibility) –in crystalline host rock only (granites)
- First “Reference design 1999”
  - Adoption of the Swedish – Finnish KBS 3V disposal concept - vertical disposal concept

SURAO (CR) experience:
Taking responsibility – adoption of existing knowledge

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Experience from CR disposal concept development (2)

Period (3) 2003 – 2008 – first site-specific studies (sites of around 40km^2) and generic studies

- ***GeoBariéra* project** – geological research using airborne geophysical methods, preliminary feasibility studies, definition of areas for conducting surface geological surveys (approx. 25km^2 for each site)
- **Generic studies** such as:
  - **Near-field studies**
  - **Far-field studies**
  - **Melechov Test Site programme** – geological characterisation of granitic rocks at a “test” site, borehole drilling campaign oriented at adopting specific, on-site research, HG modelling, etc.
  - **Ruprechtov Natural Analogue Study** (with the intensive cooperation of GRS) – behaviour and migration of uranium in claystone
  - **Bedřichov Water Supply Tunnel Programme** – in situ generic measurement and first host rock generic data acquisition
  - Methods and methodology for use in site geological surveys

SURAO (CR) experience:

Taking responsibility – adoption of existing knowledge

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Experience from CR disposal concept development (3)

Period (4) 2009 – 2013 - Second state-of-the-art programme review

- **Reference Design 2011** – with advisory support from SKB (SKB Int. advisory contract)
  - Adoption of the Swedish – Finnish KBS 3 – H horizontal disposal concept
  - Defining development requirements for own disposal container – based on a combination of carbon and stainless steel materials
  - Generic safety case study
  - Generic environmental impact assessment study
- **Additional site development**
  - **Geological research of CR military sites** - identification of a potential site in the Boletice military area (BUT only 10km from both the Austrian and German borders) and **identification of the new Kravi hora site** (close to the potential SKALKA SNF central interim storage site and Rožná U-mine);
- **Development of a draft of a new disposal concept / layout – 3DD**
  - based on a progressively constructed disposal system in horizontal / sub-horizontal disposal wells

SURAO (CR) experience:

Taking responsibility – adoption of existing knowledge and capability building

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Experience from CR disposal concept development (4)

Period (5) 2014 onwards – reduction in the number of sites (till end of 2018) **and capability building period**

- **Geological survey at all 7 sites using only surface methods**
  - Development of geological models of the sites
- **Moldanubicum project -** geological survey at two new sites near existing NPPs
- **Medium-term RD&D plan for the period 2015 – 2025**
  - Support for the siting programme for the selection of candidate sites for DGR siting
  - Adoption of a DGR design suitable for the candidate sites
  - Support for the disposal concept safety case and its adaptation to suit selected sites
  - Support for environmental impact assessments
  - Improvements in communication and enhanced DGR acceptability
- **Bukov Underground Research Facility construction (Bukov URF)**
  - 320m blasted access gallery - diameter 9.2m2
  - 90m pre-split research gallery - diameter 10.2m2
  - 2 research chambers - 20m long

Current DGR Site Selection Strategy

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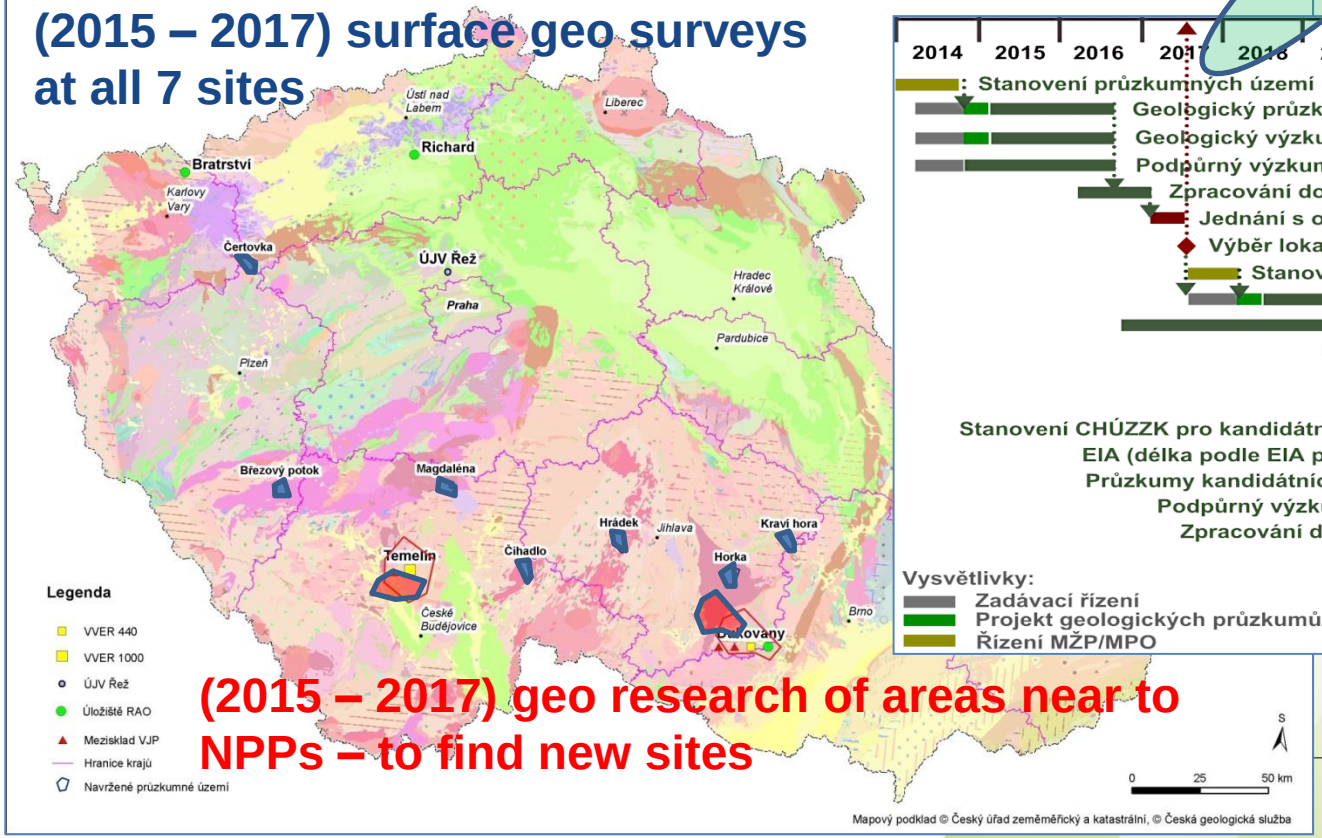
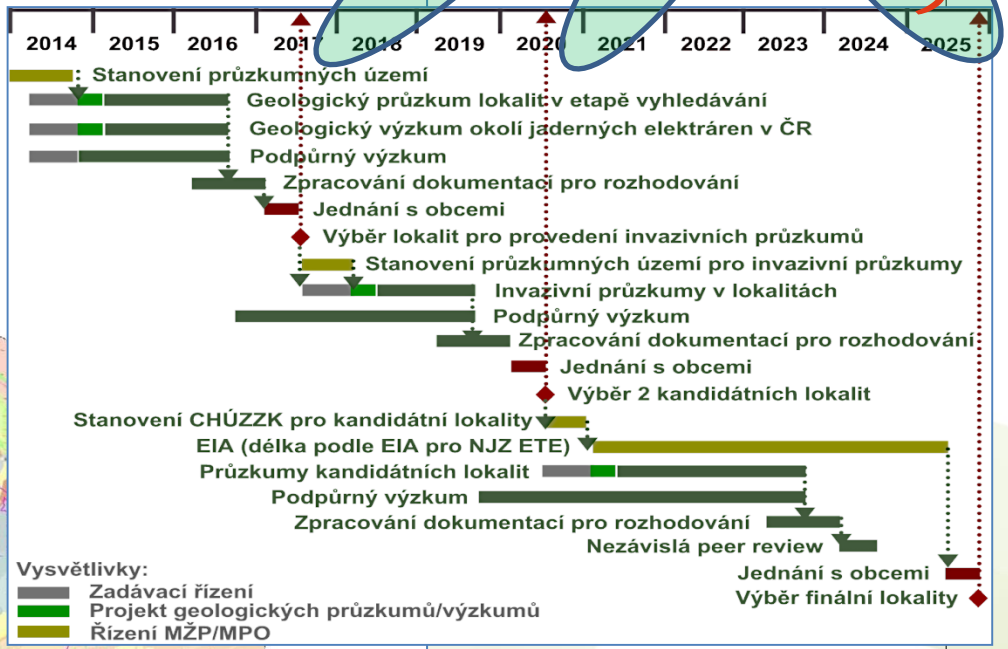
7 (+) → 4 → 2 → 1 + 1

(2015 – 2017) surface geo surveys at all 7 sites



(2015 – 2017) geo research of areas near to NPPs – to find new sites



Stages and Activities of DGR Siting

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STAGE	ACTIVITIES	No. OF SITES	SCHEDULE
Areas Reduction + Tentative sites selection	• Surface geological investigation • Boundary of host rock massive determination • Estimation of faults and fracture zones with deep water circulation • **Prefeasibility studies** updating • **Safety cases** - used only generic data • **Public opinion poll** – on site and regional studies	**7** preselected sites	2015 - 2017
Two Candidate sites selection	• Geological investigation using drilling • Boundary of host rock massive in the depth • Preliminary host rock characterisation • **Site specific feasibility studies** • **Preliminary site specific safety cases** • **Local municipalities statements**	**4** potential sites	2018 - 2020
Final site selection	• Detail geological investigation (borehole drilling) • Detail host rock characterisation • **DGR´s Site specific design** • **EIA studies** • **Site specific Safety cases** • **Local municipalities statement**	**2** candidate sites	2020 - 2025

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The role of URL research in the DGR development programme

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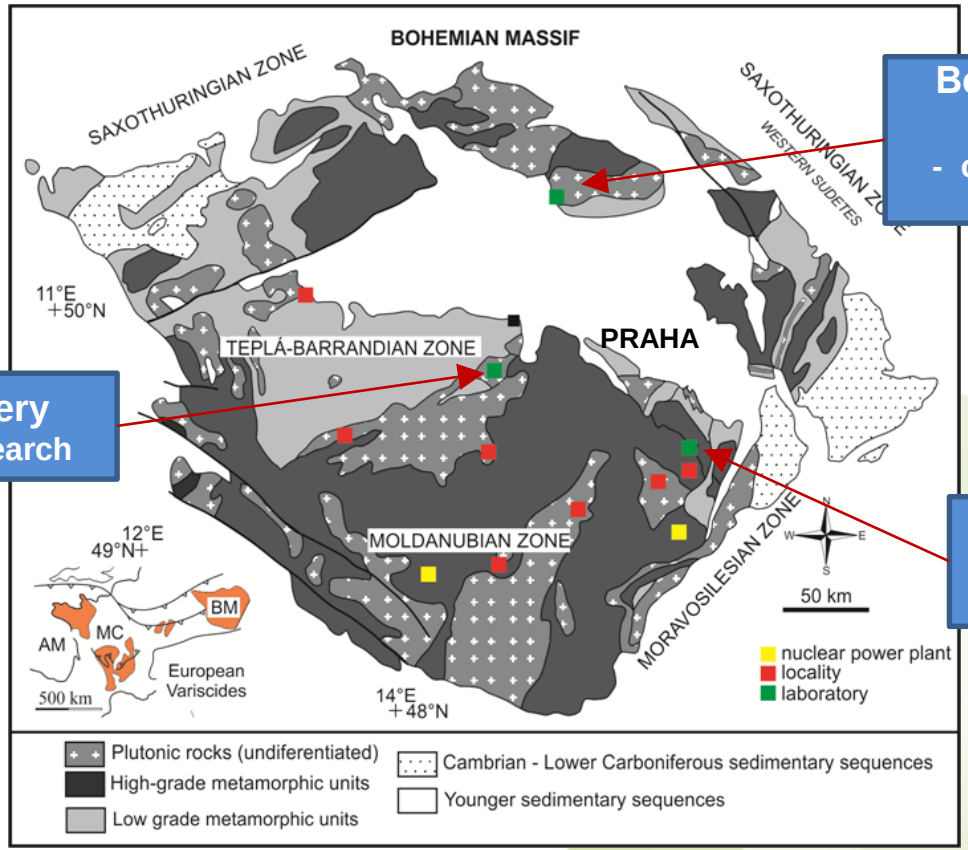
Bedřichov Water Supply Tunnel
- only monitoring of granitic rock characteristics

CTU Josef Gallery
Demonstration research

Bukov URF
Rock characterisation research



Czech DGR development strategy

Capability building - Team of SURAO and PARTNERS

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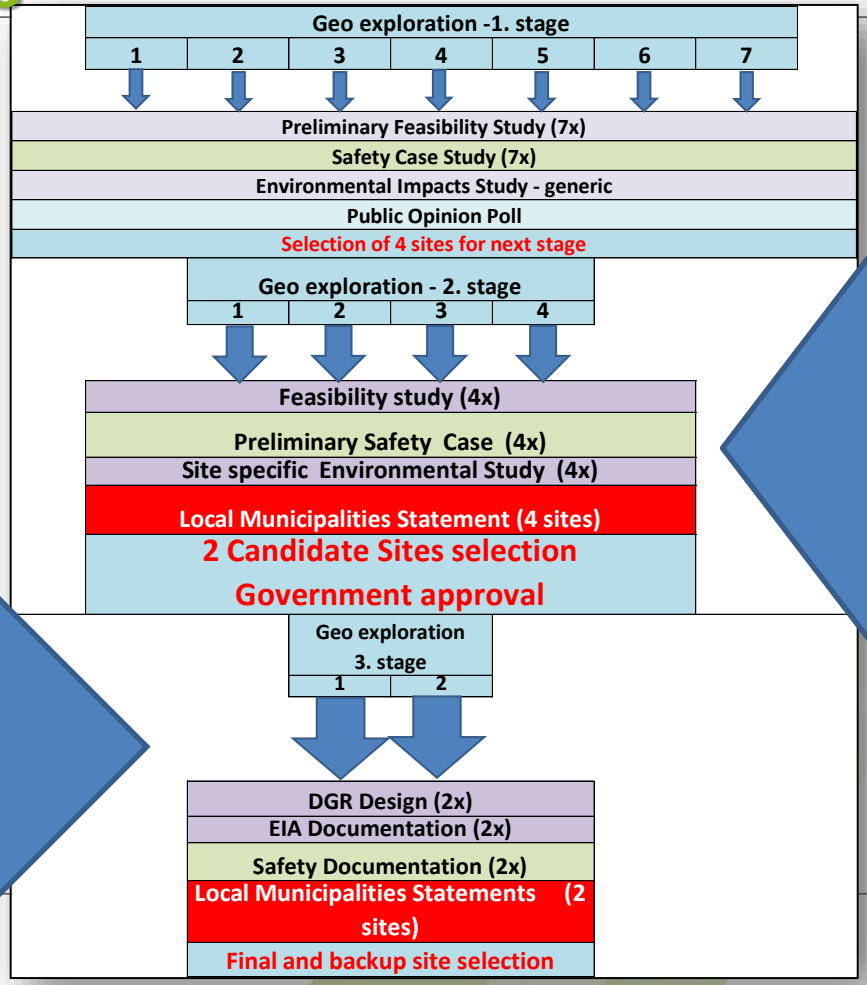
Consortium
ÚJV Řež
Safety related R&D

Consortium
Czech Technical University
Feasibility R&D

Consortium **ŠKODA JS**
Disposal canister related R&D

International cooperation
7 EC projects,
6 international projects,
IGD-TP, IAEA, NEA/OECD
Bilateral cooperation with Fr, Fi, It, Sw, …



Since 12.10.2016
SURAO - Posiva
Framework Agreement
JAG
Joint Advisory Group

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Czech DGR Development and Public Acceptance

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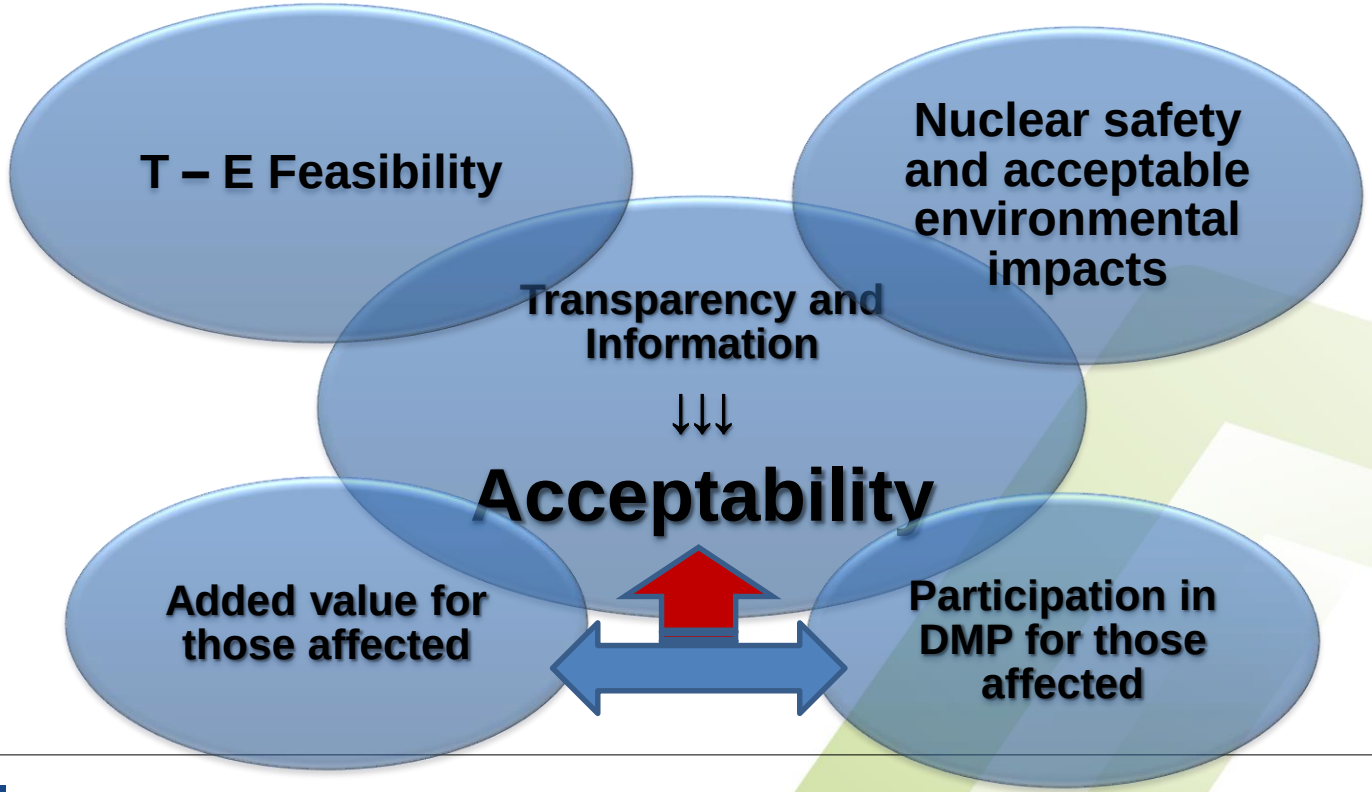
DGR Site Selection process → key factor→ ACCEPTANCE



Transparent information, pro-active communication

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Key aspects of future acceptance

Meetings

- GEO survey methods
- Round Table meetings
- Ad Hoc meetings
- Excursions

Public information and Richard Repository Control Commission

Newspapers, leaflets, brochures, web, Facebook, YouTube

Information points and centres

- Prague, Bystřice n P., Litoměřice, Jáchymov
- Dolní Cerekev, Lubenec, Rouchovany, Dukovany, Rohozná

Advertising

and…

Working Group for Dialogue on the DGR

Working Group for Dialogue on the DGR

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Institutionalisation of WG for Dialogue:

2010 – creation of the WG for Dialogue on the DGR – advisory group

2015 -2016 - new WG for Dialogue - a regular section of the Government Energy and Raw Materials Strategy Committee

- **5** delegates from ministries and state organisations – MTI (3), MEnv. (1), SONS (1)
- 2 delegates from affected local municipalities – in total **14**
- 1 delegate from local NGOs – in total **7**
- **2** delegates from CR NGOs
- **2** delegates from both chambers of Parliament
- **1** representative from SURAO
- **1** lawyer - delegate nominated by municipalities
- **1** expert nominated from the Sociological Institute of the CR Academy of Sciences
- **1** scientific expert nominated by municipalities

New WG for Dialogue = 34 delegates

Successful site selection – how to achieve it?

Guarantees and Motivation – main issues for WG for Dialogue meetings

GUARANTEE = clear decision-making process supported by legislation

- Who will decide? (before commencing standard application)
  - At present SURAO only decides and the Government approves SURAO's plans
- How will the issue be decided?
  - Clear site selection criteria - SURAO has issued site selection criteria for the first stage of the process
- Clear role of the municipalities concerned
  - Currently municipalities participate in the standard procedure and can set out conditions only
  - Future – local public control and information committee
- WG of Dialogue proposed Specific act – special law "On participation of municipalities in the DGR site selection process"

MOTIVATION / ADDED VALUE

- Direct payment into municipality budgets
- Support for local development – local development projects
- Support for regional development – micro-regional development projects

Conclusions

- **Current progress in SNF management**
  - SURAO is implementing the national strategy for RAW disposal
  - SURAO is fulfilling its responsibility to prepare a DGR for the future disposal of SNF / HLW; progress in the DGR siting process is evident
  - Transparency and informing the public form integral parts of SURAO's everyday work
- **Future Challenges**
  - Improvement of the DGR implementation strategy – **DGR Road Map adapting Posiva and SKB experience**
  - **Step by step reduction of the sites and selection of two candidate sites and a final site up to 2025**
  - **CZ specific disposal concept** must fulfil site-specific conditions and fully meet safety requirements … and will respect Industry 4.0 and operation after decades
  - **Specific Act on how the public will be involved** in the decision-making process to select two candidate sites and one final site for the future DGR
  - Fair and **balanced added value** for participating municipalities in the DGR decision-making process

Thank you for your attention

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