The research leading to these results has received funding from the European Union’s European Atomic Energy Community’s (Euratom) Seventh Framework Programme FP7/2007-2013, under Grant Agreement No. 323273 for the DOPAS project.
Geological Disposal of Spent Nuclear Fuel in the Czech Republic

Reference Design of CZ DGR 2011

- The basic fuel back end concept consists of the **direct disposal of spent fuel in steel based canisters in a crystalline host rock**
- Depth: 500 - 600 m
- Operation period **2065 – 2140**
Site Selection Programme for Final DGR Site 2015 - 2025

- Near surface geological survey of preselected sites (7) – now
- Evaluation of primary data from sites and selection of the most suitable sites on the basis of preliminary safety
- Evaluation and other socioeconomic, political and environmental criteria (2016)
- Geological survey of selected sites with deep boreholes (2018 – 2019)
- Evaluation of sites and selection of 2 candidate sites for Government decision (2019/2020)
- Detailed characterisation at 2 candidate sites (2020 – 2024)
- Evaluation of the candidate sites and selection of the final site (2025)
Geological Disposal of Spent Nuclear Fuel in the Czech Republic

Sites

- 7 sites
- Proposed exploration areas
- Located in the crystalline rocks 515 - 320 Ma
- Crystalline = granites and metamorphic rock

Advantages:
strength, homogeneous composition, low permeability, stable environment

Source: SÚRAO

DOPAS Training Workshop 16.9. 2015 Prague
Geological Disposal of Spent Nuclear Fuel in the Czech Republic

Rocks

Granite

Plutonic rock origin from depth 5-10 km

Main minerals: quartz, felds, mica, amphibole

More precisely: granite, granodiorite, syenite, durbachite

Granulite / migmatites

Metamorphic rocks HT-MP condition 20 km depth

Granulites: feldspar, garnet, quartz

Migmatites: quartz, felds, micas
Geological Disposal of Spent Nuclear Fuel in the Czech Republic

Sites

Čertovka

Granite, 515 Ma Tis pluton, reflected the Cambro-ordovician extension

Teplá-Barrandian Unit (west)

East part sediments of the Žihle basin (sandstones, arkose)

Proposed exploration area: 29 km²
Geological Disposal of Spent Nuclear Fuel in the Czech Republic

Sites

Březový potok
Granodiorite, 350 Ma, reflecting subduction processes
Central Bohemian plutonic complex
Moldanubian Unit
Proposed exploration area: 23 km²

Source: trugeo
Source: SÚRAO
Geological Disposal of Spent Nuclear Fuel in the Czech Republic

Sites

**Magdaléna**

Syenite, 340 Ma, mixing of the earth crust and mantle material

Central Bohemian plutonic complex

Moldanubian Unit

Proposed exploration area: 23.5 km²
Geological Disposal of Spent Nuclear Fuel in the Czech Republic

Čihadlo
- Granite, 328 Ma Klenov pluton
- Decompressional melting of deep seated rocks
- Central Moldanubian Plutonic Complex
- Moldanubian unit
- Proposed exploration area: 24 km²

Hrádek
- Granite, 330 Ma
- Decompressional melting of deep seated rocks
- Central Moldanubian Plutonic Complex
- Proposed exploration area: 25 km²
Geological Disposal of Spent Nuclear Fuel in the Czech Republic

Sites

Horka

Durbachite, 340 Ma Třebíč pluton,
Mixing of the earth crust and mantle material
Moldanubian Unit
Proposed exploration area: 28 km²
Geological Disposal of Spent Nuclear Fuel in the Czech Republic

Sites

Kravi Hora

Granulite/migmatite 340 Ma

High-grade rock, continental collision

Moldanubian Unit

Proposed exploration area: 18 km²
Exploration programme stage I

- Near surface geology
- Narrowing the numbers of potential localities

**Aims:**
- Geological map (3D model)
- Verification of faults and brittle structures
- Hydrogeological model
- Define possible block in level of repository
Exploration programme stage I

**Geological mapping**

- Synthesis of all exploration methods
- 3D visualization of geological pattern
- Visualization:
  - Rock types
  - Ductile and brittle structures
  - Geological pattern in the depth
Exploration programme stage I

Remote sensing
Satellite and radar image
3D topographical model
Defining the brittle fractures
Exploration programme stage I

Geophysics

Study of „fields“

Definition of: faults, rock types, geological boundaries

Fields:

Gravity
Regional structures, depth evolution

Electric
Local faults

Magnetic
Faults, rock types

Seismic
Geological boundaries, faults
Exploration programme stage I

Site selection

Criteria:

• Project
• Safety (geology)
• Environmental
• Socio-economic
Generic research for DGR

URF Bukov
- Crystalline rocks – gneisses, migmatites with sequences of fractures
- Depth – 600 m below surface
- Construction - 2013 – 2016
  - 1st research project parallel with construction – Pilot Rock Characterisation / Site Descriptive Model
- Operation until 2025 ...
- Research projects
  - Long-term properties of canister materials in reducing conditions
  - Rock matrix diffusion properties in crystalline rocks
  - T-H-M-C properties of the rock
Generic research for DGR

Bedřichov Water Supply Tunnel

Construction period:
β 1981-83

Tunnel profile:
β Circular 3.6m diameter

Building technology:
β drill and blast 1705 m,
β TBM 890 m

Tunnel depth:
β max. 140 m

Uncovered granite:
β total 1397 m
β TBM section 787 m
Demonstration research for DGR

Josef Gallery

• Operated by CTU
• Demonstrations projects
• Training activities
• Supported by ministries and SÚRAO
Thank you for your attention

Fig. 7. Example of how the surface facility for access to the geological repository might also look

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