

# Radioactive Waste Management in the Czech Republic & its Integration into EURAD 2

SÚRAO, SÚRO, CVŘ

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# Czech Stakeholders in RW Management

## National Roles:

- **SÚRAO** – Implementer of the Czech RW management programme
- **SÚRO** – Technical Support Organisation for the regulatory authority
- **RE** – Research organisations (e.g. CV Řež, universities, institutions)

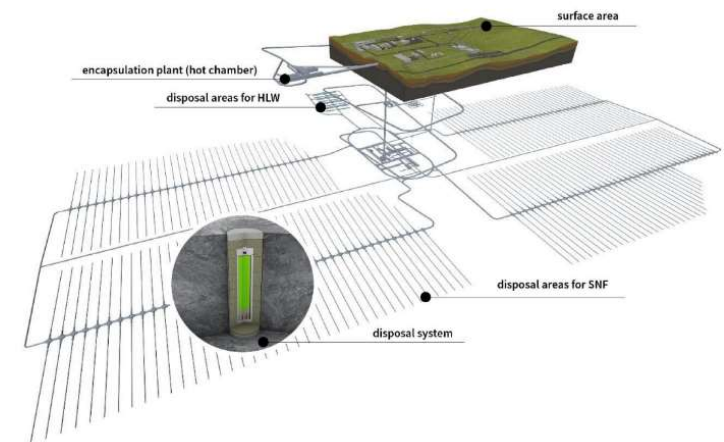
## Shared Goals:

- Safe and long-term RW management
- Transparent development of the deep geological repository
- Evidence-based decision-making supported by science and international collaboration

# Czech National Radioactive Waste Disposal Programme

## SÚRAO – Radioactive Waste Repository Authority of the Czech Republic

- Nationally responsible for the safe management and final disposal of radioactive waste and spent nuclear fuel
- Ongoing development of a **Deep Geological Repository (DGR)** with the aim of being in operation by **2050**.
- Strong focus on **research and development**, including long-term safety assessments and in-situ testing
- Operation of the **Bukov Underground Research Facility** supporting technical and scientific studies
- Current priority: **Site selection process** for the DGR, including feasibility studies across four shortlisted sites
- **Key milestone**: Selection of the final site by **2030**, aligned with national policy commitments



# Reliable and Safe Waste Disposal – A Czech Experience

- **Czech Republic has been safely operating radioactive waste repositories for decades**, proving that well-managed solutions work in practice.
- The Czech Republic **operates three near-surface repositories** for low and intermediate level radioactive waste:
- **Richard repository** (in operation since 1964) – for institutional waste from medicine, research, and industry
- **Dukovany repository** – serving nuclear power plants since 1995
- **Bratrství repository** – for waste with natural radionuclides
- All facilities are operated in compliance with international safety standards and under regulatory oversight
- **Richard repository has been in safe operation for over 60 years** and continues to meet national capacity needs

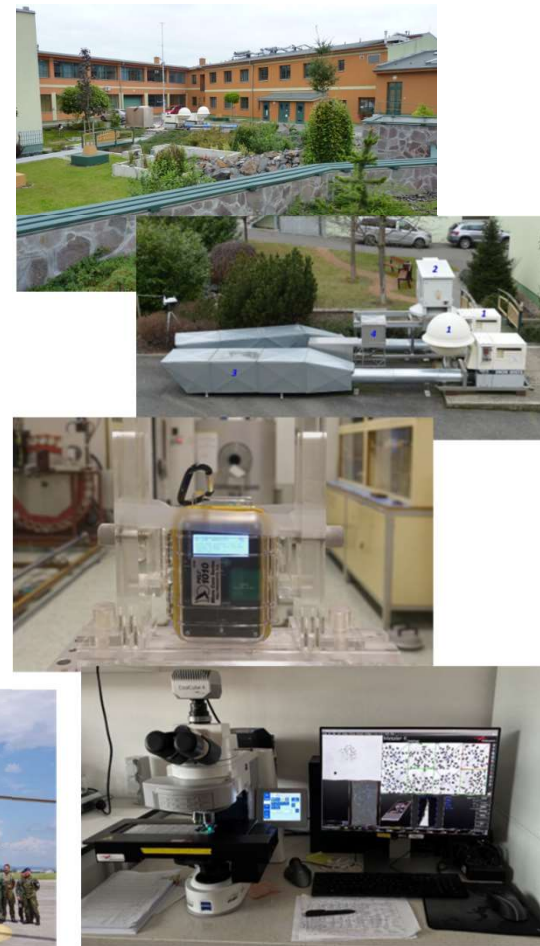




# National Radiation Protection Institute (SÚRO)

**SÚRO – Technical Support Organisation for the Regulatory Authority (SÚJB) in the field of RWM, radiation protection and nuclear safety**

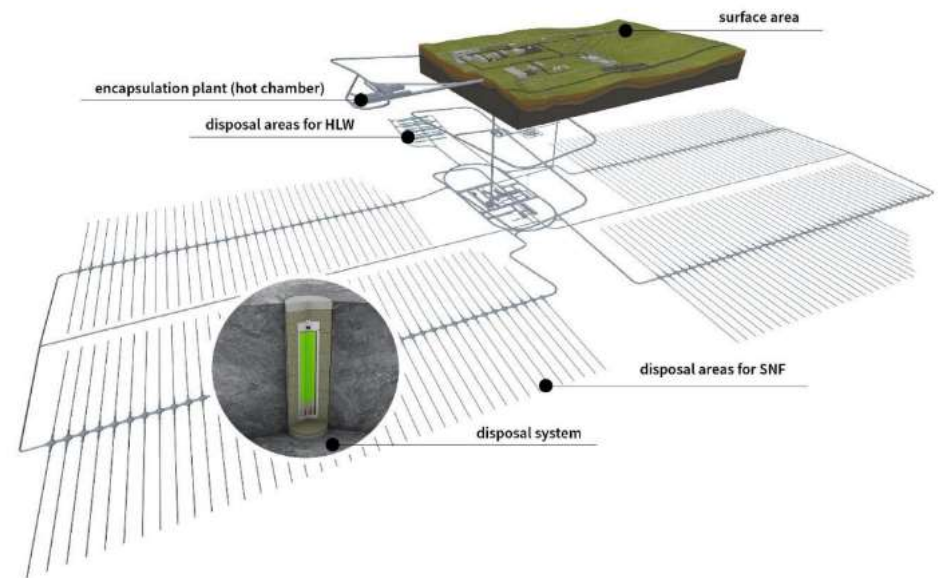
- SÚRO performs research related to radiation protection and safety, environmental monitoring, public health protection from radiation exposure, radioactive waste management including long-term safety assessments and in-situ testing.
- **SÚRO activities related to RWM:**
  - ✓ Developing guidelines and advising government bodies on best practices for radiation protection and nuclear safety;
  - ✓ Involvement in legislative framework development;
  - ✓ Contribution to the identification of relevant research needs supporting nuclear safety, including RAW disposal and radiation protection;
  - ✓ Research in the field of EBS and geological barrier, nuclear facilities design, siting, safety case development, safety assessment.
- SÚRO is a member of international networks/platforms (e.g. SITEX, ETSON and NAWG)



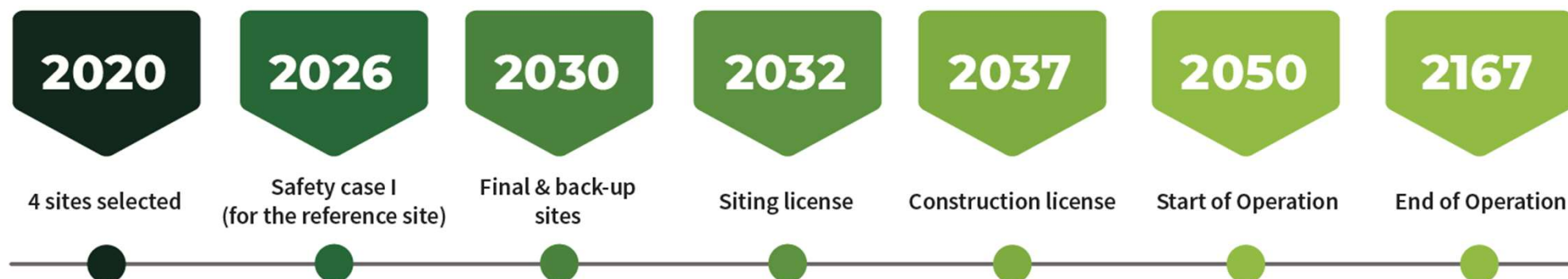


# Deep Geological Repository Project

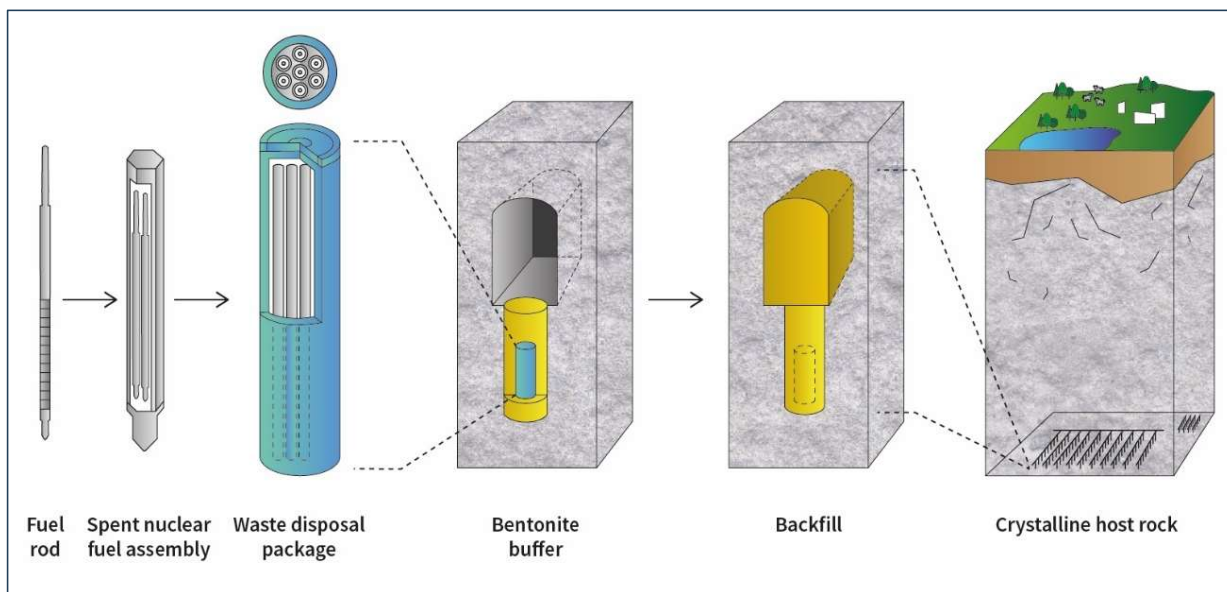
- Estimated inventory 14 500 T of SNF, 23 500m<sup>3</sup> of other RAW
- Underground part (approx. 4km<sup>2</sup>), surface area (12 ha)
- Depth 500 m in crystalline host rock
- Multibarrier concept—bentonite barrier— steel-based waste disposal package
- Legislative requirements 263/2016 (Atomic Act) and 378/2016 (Decree on the Siting of Nuclear Installations)



## The Czech DGR – current schedule



## The Czech DGR concept



### Canister

double walled, consisting of a 65 mm thick carbon steel outer casing and a 36/40 mm thick stainless-steel inner casing/s

### Buffer

Czech Ca-Mg bentonite, bentonite blocks + granulated bentonite mixture, average dry density of 1600 kg/m<sup>3</sup>

### Backfill

Czech Ca-Mg bentonite, granulated bentonite mixture, average dry density of 1400 kg/m<sup>3</sup>





## Research & Development Plan 2024-2028

The main objectives:

- Preliminary safety assessment of the DGR concept (Safety Case 1)
- Update of the DGR technical solution
- Selection of the final and backup location for the DGR



[https://surao.gov.cz/wp-content/uploads/2024/10/TZ746\\_2024\\_ENG-1.pdf](https://surao.gov.cz/wp-content/uploads/2024/10/TZ746_2024_ENG-1.pdf)

# Updated Strategic context in the Czech Republic

## Expansion of Nuclear Energy in CZ

- Up to 4 new large-scale units (e.g. Dukovany 5+)
- Up to 6 SMRs under consideration  
Requires updated inventory, increased disposal capacity, and flexible disposal planning

## EU Taxonomy Alignment

- DGR must be operational by 2050
- This sets a critical deadline:  
Final site selection by 2030  
Accelerated development and decision-making needed
- Included in the new **Czech National Policy** on RAW and spent fuel management (2025).

# Updated Strategic Priorities and Perspectives

## **Timely Availability of DGR**

- DGR must be operational by 2050 (EU Taxonomy)
- Site selection by 2030, design & permitting by mid-2030s

## **Evolving Waste Inventory**

- New sources: 4 large reactors + 6 SMRs planned
- SMR waste: uncertainties in matrix, packaging, radionuclides
- Institutional and legacy waste: integration into planning

## **Repository Capacity and Flexibility**

- Increased volumes of spent fuel and HLW
- Need to adapt the design and repository capacity
- Include operational waste from new NPPs

## **Updated Waste Acceptance Criteria (WAC)**

- Reflect new waste forms, containers, long-term storage
- Support robust safety case and operational feasibility

## **Strategic and Technical Advancements**

- Refinement of repository performance indicators for Czech conditions
- Updated assessment criteria for new nuclear sources (e.g., Dukovany 5)
- Exploration of alternative disposal options (e.g., Deep Borehole Disposal) – follow-up to VARAO project

# Ongoing Development & Implementation

- **Safety Case & Methodologies**
  - Methodology for safety assessment of the Czech disposal system
  - First draft of the national safety case under development
  - Update of the technical concept for the DGR
- **EBS System Design & Validation**
  - Design and in-situ testing of engineered barriers at the Bukov URF
  - Modelling and demonstration of long-term performance – container and buffer
- **Site Selection Process**
  - Site selection methodology with defined criteria
  - Geological evaluation and modelling of candidate sites
  - Preparations for detailed site investigations

These developments form an integrated implementation programme, aligning technical progress with safety assessment, supported by the updated **National Policy on Radioactive Waste and Spent Fuel Management (2025)**.

# Expectations from EURAD-2

- Enhanced Technical and Scientific Capabilities
- Access to cutting-edge knowledge and infrastructure  
Participation in experiments and modelling platforms provides validated data to support national repository design.
- Development of safety assessment methodologies:  
Shared progress in:
  - Safety functions and indicators for EBS and host rock
  - Scenario development and FEP management
  - Coupled processes (THMC) modelling and validation
- Tools for independent verification:  
Advanced modelling and benchmarking tools strengthen the ability to conduct and review robust long-term safety assessments.
- Capacity building and sustainability of expertise.



# EURAD benefits to CZECH programme

- Improving self-confidence – verifying of conclusions, results, models
- Integrating newcomers faster into this complicated field (knowledge and networking)
- Supporting students in their research and helping them to grow and become experts, who are highly in demand
- Establishment of the national research community
  - research organisations, technical support organisation, waste management organisation
  - We meet in person once a year
  - More than 50 people

## THANKS TO EURAD WE BUILT THE CZ-TEAM



# Thank you for your attention!