Progress on Deep Repository Programmes Around the World
Cigéo, the French project

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WMS 2016 - 6-10 March
Cigéo facilities

2 surface facilities:
- **Nuclear**: Receiving, inspecting, and preparing packages
- **Non Nuclear**: Shafts for construction work

Underground facility in clay (500m depth)
Surface installations

- **Reception Area (100 Ha)** (nuclear)
- **Digging area (200 Ha)** (non nuclear)
Waste packages transfer

Funicular proposed by POMA

- Length: 4.2 km
- Difference in elevation: more than 500 m
- Slope: 12%
- Payload: 130 t
- Total rolling weight: 175 t
- Pulley effort required: 750 kW
Zoom on the IL-LLW disposal cell

- Length: ≈400 m
- Excavated diameter: 9 m
- 2x2 or 3x3 packages
- No. of containers: 800-1,900
Zoom on the HLW disposal cell

- Length: 100 m
- Diameter: 70 cm
- No. of containers: 7-20
The development of the project is very progressive, as will be its construction.
Progressivity and reversibility

- This progressivity implies the concept of reversibility
  - Take a decision which commits the society for 120 years (4 generations!) is not reasonable
  - It is therefore necessary to make the decision progressive in order to make it possible

- The concept of reversibility is moving towards a Governance approach
  - Master plan of operations
    - Moving from a static vision of the project to an alive one
    - Defining major milestones and decisions to be taken during the lifetime of the repository

- Technologies provide tools for reversibility
  - Monitoring
  - Retrievability
Reversible disposal may be defined as a progressive process, where freedom of choice is left at each step. So that:

- The process may be *controlled*
- *Alternative waste management options* may be chosen if relevant
- In case of undesired repository evolution, *corrective actions* may be implemented
- If waste becomes a *resource*, it may be retrieved.
Updated vision on “reversibility”

- Allows a gradual and controlled implementation of the repository
- Provides the possibility to retrieve already disposed of radioactive waste packages
- It also offers opportunities for
  - Controlling: monitoring
  - Adaptability, including optimization
  - Flexibility (options for SF direct disposal)
  - Testing at scale 1 (industrial pilot phase)
  - Implying next generations in the decision process, letting them a burden with already available solutions, but also with the freedom of developing their own solutions
  - Making funds available

- In such a context it becomes possible
  - To allow a learning phase
  - To give way to technical progress
  - To enable the next generation to redirect choices made before or to go back: *every generation decides for itself, leaving open the option for the following*
Retrievability is a tool for reversibility

- Retrievability can’t be demonstrated indefinitely

- Retrievability can only be a tool for reversibility, not an objective and an end by itself

- COST linked to retrievability
  
  - Retrievability does not imply high costs if it is considered at the design phase and thus be intrinsic to the disposal design
  - Taking account of retrievability from the early design stages is estimated to be at the level of a few % of the total cost (2 to 10)
  - The cost for retrieving will have to be supported by the generation making the decision for; it does not need to be provisioned by the present generation
Next steps

**Engineering**
- End of the preliminary design phase
- Stabilization of input data
- Detailed design
- Preparation of the field works, networks and investigations prior to construction

**Licensing and Governance**
- Report on safety options
- Reversibility
- Master Plan for operations
- Develop the integration in the territory
Updated Provisional Time-schedule

- Public Debate: 2013
  - Proposed Master Plan
  - Safety Options
  - Retrievability
  - Technical Options
- Application: 2018
- Licence: 2021
- Start of Industrial Pilot Phase: 2025
- First Waste Package Emplacement: 2030

- Detailed design
- Reviews
- Amenities
- Construction

Licence 2021

First Waste Package Emplacement 2030