



Feedback from Romanian nuclear waste management organization on Usability and Suggested Improvements to IGD-TP RD&D Guide

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National context

- Cernavoda Nuclear Power Plant, two CANDU reactors in operation (1996, 2007), two reactors planned
- Research reactors and other nuclear applications in industry, medicine, agriculture
- Geological disposal (GD) for SF and LILW-LL – selected option (National Strategy on RWM now in force)
- WMO established in 2004 (ANDRAD, now ANDR) , in charge with final disposal of RW and SF
- GD Program: early development stage



Main Actors and Responsibilities

Waste producers

- Responsible for predisposal activities of SNF and RW and for decommissioning of their facilities;
 - Bear the expenses related to the collection, handling, transport, treatment, conditioning, storage and disposal of its wastes
 - Pay the annual contributions to the funds for disposal of SNF and RW and for decommissioning
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- **National Commission For Nuclear Activities Control (CNCAN)**
 - regulatory and licensing body in the nuclear field
 - **Nuclear Agency and for Radioactive Waste (ANDR)**
 - Responsible for disposal of radioactive waste (RW) and spent nuclear fuel (SNF)
 - according to the National Strategy a geological deep repository should be commissioned by 2055
 - ANDR proposes , approves and receives themes and works in research and development programs in the nuclear field , financed from the state budget, regarding the safe management of radioactive waste and their disposal
 - **Other National authorities (Ministries of Environment, of Health, of Economy)** – involved in the licensing process
 - **Research and education institutions** – national technical, scientific and sociologic support in the disposal program implementation
 - **General Public and local communities** – involvement all along the implementation process

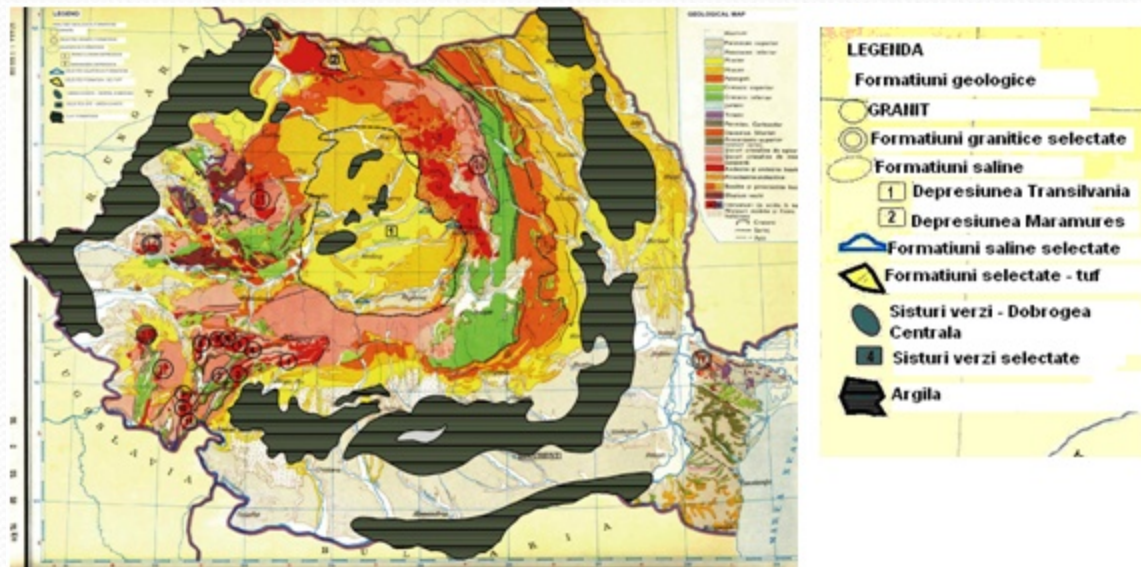


Financial Resources

- **Two financial funds are constituted since 2007:**
 - radioactive waste management fund (fee: 1,4 euro/MWh), and
 - decommissioning fund (0,6 euro/Mwh)
- the contributions come from NPP
- for the institutional waste, finances came from the state budget
- the level of contributions is assessed and up-dated each 5 years

Current Status in Geological Disposal (1)

- The Geological Disposal Program is in early stage of development
- Based on desk studies, 6 geological formations were identified, potentially favourable to host the geological repository, namely: the green schists from Dobrogea, granite, basalt, clay, salt and volcanic stuff.



Potențiale formațiuni geologice gazdă pentru depozitul geologic



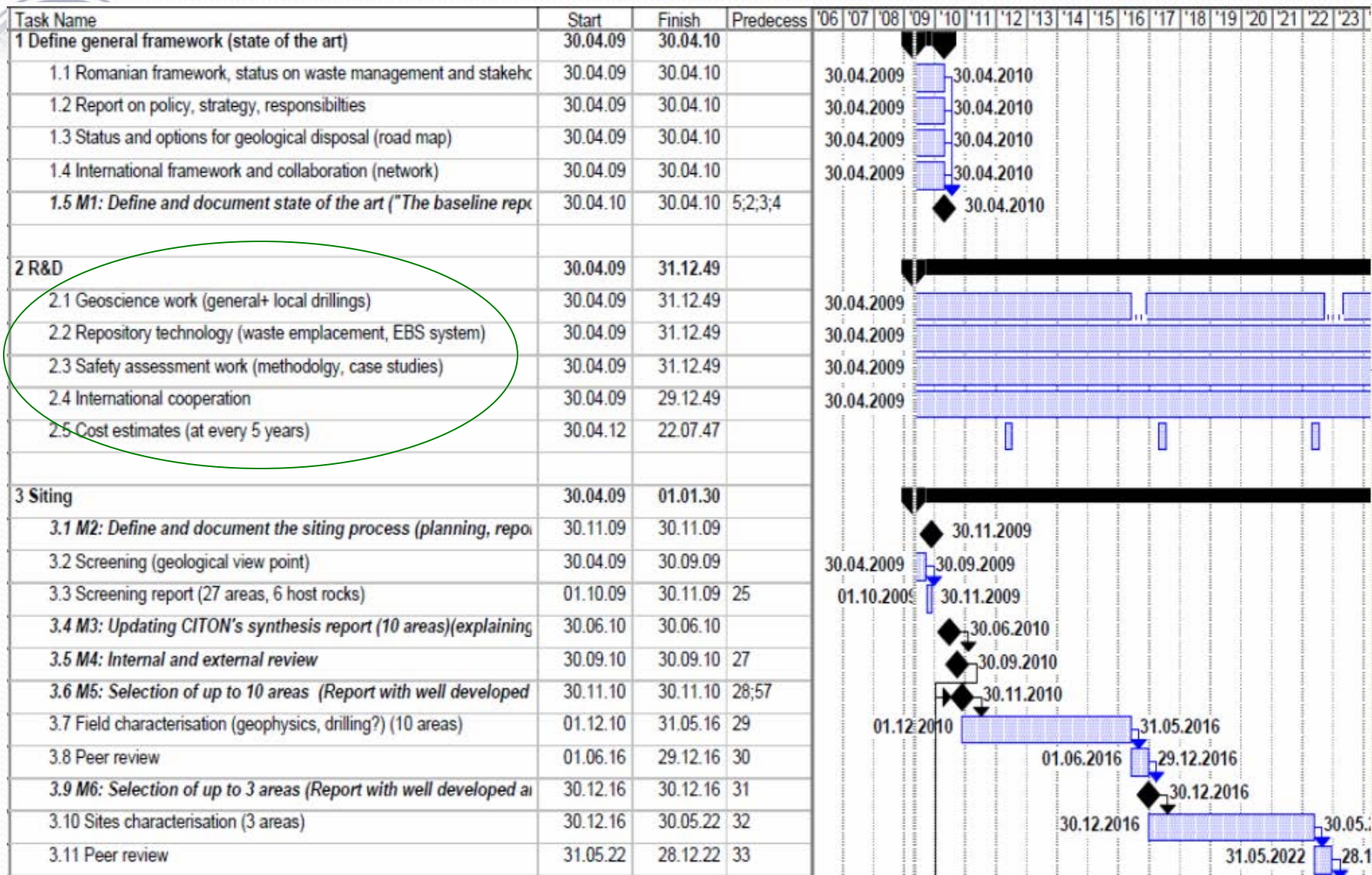
Current Status in Geological Disposal (2)

- **Repository concept – generic - (only for costing purposes) based on Canadian Concept for a Deep Geological Repository for CANDU spent fuel; the design is based on encapsulation of spent fuel in copper/steel double-shell containers, and emplacement of these containers, inside the emplacement rooms, in horizontal position.**
- **Between 2007-2008 a technical project of cooperation with IAEA was carried out, entitled “Developing a geological disposal concept for spent nuclear fuel in Romania” (TC ROM 3/005).**
- **“National Workshop on Geological Disposal Planning” was organized in the frame of IAEA TC Project ROM9031, in December 2013**



Geological disposal roadmap (1)

as recommended in IAEA TC ROM 3/005 Project "Developing a geological disposal concept for spent fuel in Romania"

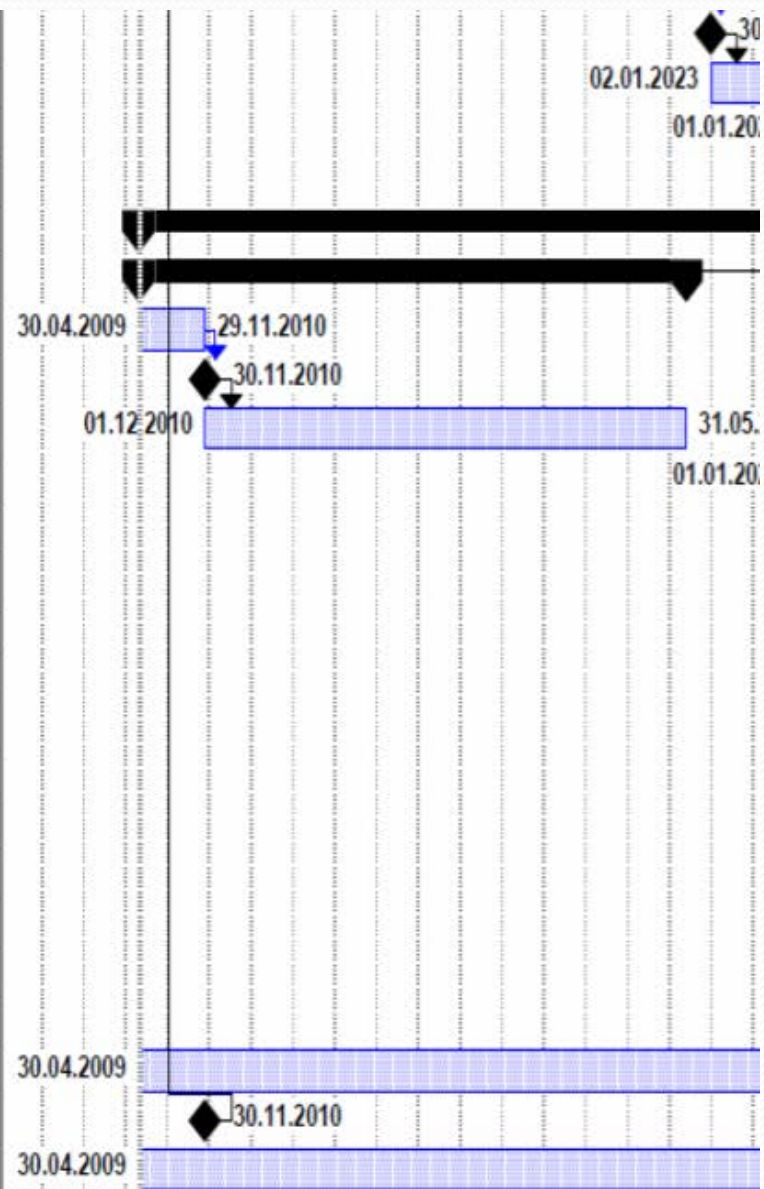




Geological disposal roadmap (2)

is recommended in IAEA TC ROM 3/005 Project "Developing a geological disposal concept for spent fuel in Romania"

3.12 M7: Selection of one area ("the site") and request for appro	30.12.22	30.12.22	34
3.13 License application (siting license)	02.01.23	31.12.24	35
3.14 Detailed characterization ("the site")	01.01.25	01.01.30	36
4 Repository design	30.04.09	01.01.30	
4.1 Conceptual Design	30.04.09	31.05.22	
4.1.1 Define several reference designs/inventories	30.04.09	29.11.10	
4.1.2 M8: Reference designs/inventories report	30.11.10	30.11.10	41
4.1.3 Refine according to new data, R&D and geological setting:	01.12.10	31.05.22	42
4.2 Final design	01.01.25	01.01.30	40;37SS
5 Repository construction	02.01.30	31.12.49	39
5.1 License application (construction license)	02.01.30	30.12.33	
5.2 M9: Start construction	02.01.34	02.01.34	47
5.3 Construction	03.01.34	31.12.49	48
5.4 Validation and demonstration work in a first phase of final reposit	02.01.36	28.12.40	
6 Repository operation	01.01.46	31.12.49	
6.1 License application (operation license)	01.01.46	03.12.49	50
6.2 Operation (start 2055)	31.12.49	31.12.49	53
7 Interaction with stakeholders (throughout the program)	30.04.09	31.12.49	
8 M10: Inventory of administrative situation at the 10 studied sites	30.11.10	30.11.10	
9 Waste inventory	30.04.09	31.12.27	





Current approach for national RD&D program

- **ANDR approach for RD&D related to GD:**
 - use of the existing knowledge at international level
 - joining to appropriate international on-going RD&D projects
 - national RD&D for specific topics
 - developing national competence
- **In order to support this approach, ANDR shall:**
 - deliver a focused R&D programme to support geological disposal, taking into account the available expertise, including the recommendation of the present Guide
 - promote international co-operation
 - periodically review the new RD&D results
 - maintain the activity of Romanian RW Stakeholders Group



R&D in Geological Disposal

Studies were carried out by ICN, CITON, University of Bucharest – Faculty of Geology in the frame of :

- National R&D programs (RATEN R&D Program, PNCDI)
- Participation in FP7 Euratom
 - Gas migration in compacted bentonite – FORGE
 - Public participation approaches – IPPA
 - Defining C-14 source term – CAST
 - CEBAMA
- Cooperation under the IAEA TCP



Topics investigated

- **Inventory:** experimental methods for radionuclide measurement in SF and LL-ILW
- **Concept:** optimisation of the gallery in granite and clay, alternative disposal concept in deep boreholes
- **Siting:** desk research based on the existing geology data
- **Near field:** laboratory tests on backfill materials (bentonite, crushed salt)
- **Spent fuel behavior:** UO₂ dissolution in different pore water compositions
- **Material behavior:** corrosion mechanisms of canister – Ti alloys
- **Modeling:** radiological impact of a generic repository in granite and salt (SF only), laboratory experiments on radionuclides sorption on geological media (far field)
- **Public involvement:** methodology for public participation
- **Risk management:** risk management of national context in geological disposal planning



Topics/challenges to be discussed based on “Guidance for less-advanced Programmes”

- In order to develop a Generic Safety Case, a lot of data could be used from the international RD&D completed projects; a review of the results of this projects which could allow a quick and easy selection of those data which are appropriate for our case might be very useful;
- More info/practical examples/links on contractual mechanisms for completing RD&D activities, with pro and cons arguments for each type (MoU, involvement in EC or international collaborative projects or alignment with similar programmes) would be beneficial;
- Data and expertise management on long-term inside WMO is also a challenge
- Opportunities for training “Program managers for RD&D activities”
- Interdependences/correlations between the technical investigations and the societal involvement steps worth a more insight investigation



THANK YOU FOR YOUR KIND ATTENTION!