

NUCLEAR ENERGY SERIES

Provisional Title	Roadmap for developing a geological disposal programme
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1. RATIONALE

The radioactive waste generated by nuclear activities, such as nuclear power, can remain hazardous for decades to even thousands of years. Its management needs to protect human health and the environment now and in the future without imposing undue burdens on future generations. This objective is reflected in the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management ('the Joint Convention') and is also a requirement of the fundamental safety principles for waste disposal developed by the IAEA. The need for radioactive waste management led the European Union to establish the Radioactive Waste and Spent Fuel Management Directive. The Directive obliges EU Member States to draw up national programmes for the disposal of nuclear waste.

Substantial progress has been made worldwide in developing solutions for geological disposal of intermediate level, high level waste and spent nuclear fuel. The Finnish waste management organization POSIVA has obtained a license for constructing a geological disposal facility for spent fuel and other countries move towards submitting construction licenses for geological disposal facilities. This progress has come after many decades of research and development. The last few decades have also shown a steady increase of attention given to continued and thoughtful engagement with the public.

Many lessons have thus been learnt on developing a programme for geological disposal. By developing a roadmap of how a geological disposal programme is developed, the IAEA can provide guidance to its Member States on this topic. The interest in having such a roadmap was also expressed by the members of the Network of Underground Research Facilities for Geological Disposal (URF Network) established in 2001 by the IAEA.

The roadmap report's goal is to assist Member States in developing and implementing a programme on the geological disposal of radioactive waste. The report will identify the key phases and activities that contribute to developing a disposal programme from an early research and development phase up to licensing and will include considerations of later phases such as construction, operations, and closure. The roadmap will also be used for identifying the role of Underground Research Laboratories (URLs) and how they may contribute to disposal development in the context of such a roadmap.

The IAEA has already developed a TECDOC on this topic (IAEA-TECDOC-1755 (published in 2014): Planning and Design Considerations for Geological Repository Programmes of Radioactive Waste). This report gives a broad and rather high-level outline of how a geological disposal programme needs to be developed. As the report title suggests, it provides "considerations" on disposal programme development. The new IAEA report will give more specific guidance and is more tailored towards the project managers, engineers and scientists that need to implement the activities that contribute to developing a disposal programme. The report therefore will give a more detailed breakdown of the items that were identified in the previous IAEA-TECDOC-1755.

More fundamentally, the IAEA has published several Safety Standards specifically on disposal, in particular the Specific Safety Requirements SSR-5 for disposal, as well as the Specific Safety Guides SSG-14 on geological disposal and SSG-23 on the safety case and safety assessment for disposal. These link the step-by-step development of geological disposal facilities to the iterative development of the safety assessment and safety case, and state that "the primary objective of the safety case is to support decision making relevant to the stage of development [...]" of the disposal programme. While the scope of the roadmap is not to provide explicit technical guidance on RD&D to conduct at each iteration of the safety case development, it will nevertheless link the general description of typical RD&D activities at the successive development and implementation stages, as well as the associated decisions and gap analyses, to this iterative need for safety case developments towards siting, licensing, operation, and closure decisions.

2. OBJECTIVE

The document is expected to provide MSs with relevant information on how geological disposal solutions are developed by identifying the key phases and activities that contribute to the development of a geological disposal facility as the disposal programme evolves from an early research and development phase to later phases such as construction, operation, and closure. The role of URLs in the development of the disposal programme will be described.

3. SCOPE

The report will provide an overview of the activities that can be included in a geological disposal program. This does not mean that all activities need to be included, and some Member States will see that certain items are not relevant to their national programme. It however seems useful to develop a roadmap that is as complete and widely applicable as possible.

The report will cover a wide range of aspects of the disposal programme such as the strategy and policy, the regulatory framework and licenses, science and engineering, financing, stakeholder engagement, safeguards and security, etc.

This information will be arranged in the form of a matrix, where the rows are key activities and the columns are the phases or milestones in the disposal development timeline.

As part of this overall, generic guidance on how to develop a geological disposal programme, some specific activities may be analysed in more detail, in particular the requirements involved as well as the specific role and contribution of these activities to different phases of implementation of the disposal programme. One such example is the research, development and demonstration work conducted in URLs. Another is the iterative development of disposal system performance assessment or the development and maintenance of a disposal system requirements management tool.

The report will take under consideration the content of the report “Costing methods and financing schemes for radioactive waste disposal programmes” that is currently being developed. As a disposal programme contains a whole range of activities and can become very extensive, assessing its cost can only be done once all the activities or items that need to be done in a disposal programme are identified. That is where a Work Breakdown Structure (WBS) of a disposal programme can be useful as it lists the activities and items of a disposal programme and structures them in a logical way. This WBS evidently needs to be consistent with the roadmap.