

The International Collaborative Role of Underground Rock Laboratories for Radioactive Waste Disposal

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1. Background

An implementation Organization called NUMO was established in 2000 to prepare for the geological disposal of high-level radioactive waste (HLW) from the reprocessing of spent fuel from commercial nuclear power plants.

For the decision of disposal site a stepwise siting process has been defined shown in Figure 1.

1. The procedures are from literature survey to selection of preliminary investigation areas (PIAs), in which surface-based investigations

and following detailed investigations. In DIAs underground characterization facilities will be constructed and will have the role for the selection of a final disposal site. After selection of an area with a suitable stable geological environment, HLW will be disposed of more than 300 meters below the ground surface.

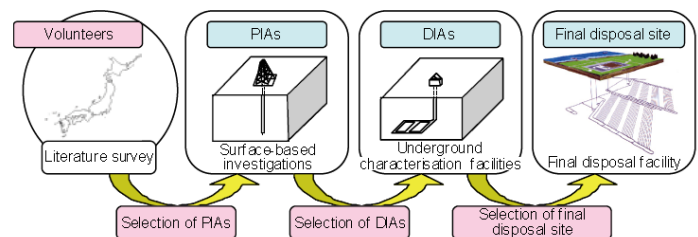


Figure 1 Stepwise Siting Process (NUMO, 2007)



Figure 2 Geological Repository (NUMO, 2002)

2. Common issues for the Geological Repository

A HLW geological repository concept includes surface facilities, underground facilities and an engineered barrier system (EBS) emplaced in a deep host rock more than 300m below ground and have capacity for at least 40,000 canisters of HLW shown in figure 2. In the case of a coastal site, underground facilities can be constructed under the sea-bed. In the repository

operation phase shafts and access tunnels from surface to underground facilities and disposal tunnels grouped in panels will be constructed. Engineering Barrier System (EBS) and HLW in each panel as its construction will be emplaced. In major countries such kind of geological disposal concept are studied for radioactive waste disposal

shown in Figure 3.

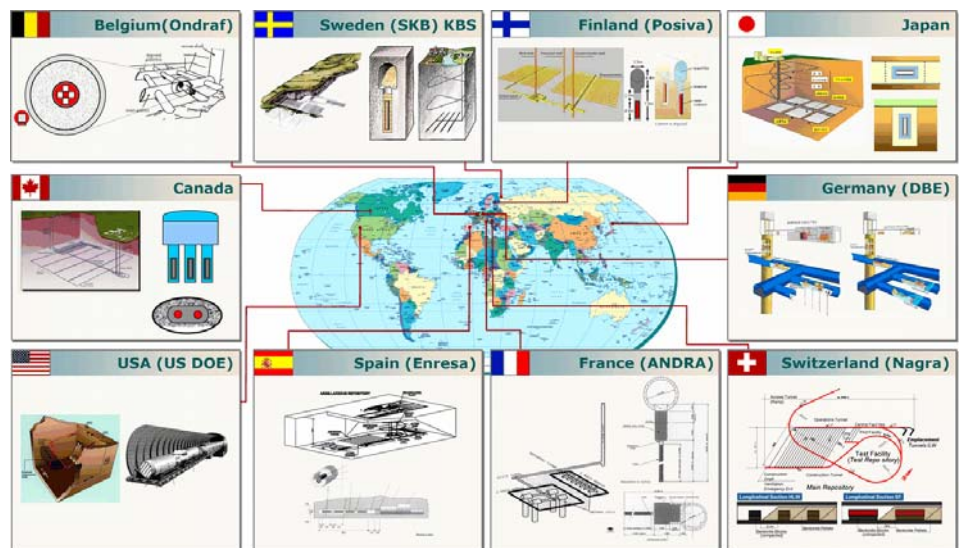


Figure 3 Geological Disposal programs (based on NUMO, 2004 and relevant web site)

Key Words: Geological Disposal, Underground Facility, R&D, URL, International Cooperation

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In all major national radioactive waste disposal programs one or more underground facilities will be planned or constructed, in which geological characterization, testing, disposal technology development, and/or demonstration activities will be carried out.

Such facilities, generically known as underground research laboratory or underground rock laboratory (URLs), are essential to provide scientific and technical information and practical experience that are needed for the design and construction of disposal facilities and, importantly, for the development of the safety case that must be presented at various stages of repository development. The term “URL” has become the accepted generic term for underground facilities in which activities are carried out in support of repository development programs. The research activities in URL aim to confirm geological investigation and demonstration of repository practicability for repository design and construction. URLs in Swiss R&D program are shown in Figure 4.

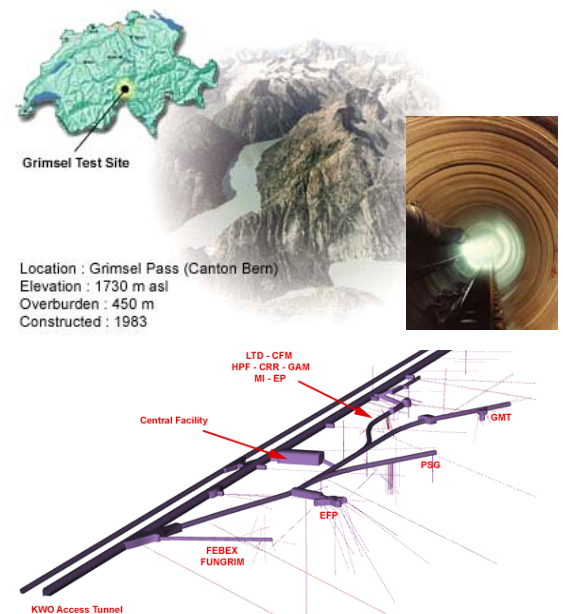


Figure 4 Grimsel Test Site (<http://www.grimsel.com>)

3. International Cooperation in URLs

International cooperation in URL researches can have many advantages from the view points of the costs efficiency involved in the development and operation of URLs, and the possibility of sharing obtained knowledge and experience. Therefore international cooperation drives exchange of information, knowledge, creativity, and better quality and cutting wedge technology. The collective demand from several organizations trends to save the cost and share the budgets. The benefits of international co-operation in URLs include expanded talent pool, expanded contacts and know-how transfer, cost-effectiveness, and international recognition and increased confidence. Direct advantages of the collaborative international projects in URLs are the development of international and interdisciplinary contacts and know-how transfer, such as site characterization and performance assessment.

All organizations in international cooperation projects can obtain research results that they do not have to pay for fully themselves. The host country of the URL obtains the results of effort contributed by other participants having studies conducted in their own URL. The non-host countries can learn practical technology and experience, and develop their technical and managerial expertise, all of which should make their own repository programs more efficient when they will have the URL in future.

International cooperation in specific experiments performed in URLs, such as tests of gas migration in crystalline rock, also avoids expensive complex research in twice times. Collaborative use of a URL to international project promotes the international recognition and credibility of the host program for reliability of world-wide recognized technology. This will support confidence in the R&D program for geological disposal by demonstrating to other organization technical experts and pushing peer review and making research results broader to outside organization.

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