



Siting deep geologic repositories for high-level nuclear waste – revisiting Finnish concept and future outlooks

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There are currently approximately 450 operating civil nuclear reactors in the world. Finland is the first country in the world where the construction of deep geological repository for final disposal of high-level nuclear waste has commenced. The main geological criteria for site selection, defined by The International Atomic Energy Agency are: 1) long term (millions of years) geological stability, in terms of major earth movements and deformation, faulting, seismicity and heat flow; 2) small groundwater flux at repository depths; 3) stable geochemical and hydrochemical conditions at depth (characterized by reducing environment and a relative equilibrium between water and rock forming minerals), and 4) good engineering properties, which allow construction of the repository by normal working methods and safe operation of the repository.

The Finnish site selection procedure and workflow was developed in 1980's by the Geological Survey of Finland, GTK, and it followed the main criteria listed above. This procedure was also utilized in the site selection process of the Olkiluoto site, SW Finland, where the Finnish high-level nuclear waste will be finally disposed starting from the first half of 2020's.

The site selection in the Finnish case has been a 4-step procedure: 1) GIS desktop lineament interpretation from available data such as digital elevation models (DEM), geological and geophysical maps in order to define bedrock blocks potentially suitable for final disposal; 2) Defining the geological suitability (block size and homogeneity, fracture/fracture zone density, topography, groundwater conditions and seismicity etc.) of the bedrock within the blocks defined in step 1; 3) Evaluating potential excluding criteria (natural resources, urban areas, nature reserve areas and areas of potential future development) of blocks defined in step 1; 4) Field studies of the potential areas defined in step 1-3 to increase the knowledge and reduce uncertainties of the potential sites.

This presentation aims to present the site selection work-flow in conceptual manner and how it links to the site characterization. Finally it concludes with evaluating the future possibilities of introducing information modelling for the site selection and characterization procedures. However, most important for the site selection research is that it has to be conducted in open and scientifically transparent manner to receive and endure the political and social acceptance within the municipalities, where the repository site might be located.