



NES Colloquium

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Concepts for deep geological disposal of spent fuel – horizontal emplacement tunnels vs deep borehole disposal

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In Switzerland and abroad, concepts for the disposal of spent fuel and high level waste have been developed over many years. In this process a large variety of disposal concepts have been considered. An evaluation of these concepts, taking into account legal & regulatory requirements, design principles and other considerations, led to the current multibarrier concepts for deep geological repositories with engineered and geological barriers that together provide a number of (partially) redundant safety functions. This was confirmed and complemented with the requirement of monitoring & the possibility of retrieval 'without undue efforts' by EKRA, a high-level commission established by the Swiss Government with the mandate to consider all possibilities for nuclear waste management and to suggest a preferred option. EKRA's findings are reflected in the Swiss Nuclear Energy Act of 2005. The presentation summarises the relevant Swiss legal & regulatory requirements, design principles and other considerations and introduces the Swiss HLW repository concept.

Higher burn-up (> 50 GWd/t) spent fuels present problems for long-term management and disposal in mined repositories, principally because of their higher heat output. Notable among these is a need for protracted cooling prior to disposal, possibly for over 120 years. One disposal concept that is relatively insensitive to high temperatures is deep borehole disposal (DBD). This method, which entails the disposal of waste containers in vertical holes drilled to depths of up to 5 km, offers a number of benefits including safety, cost, and security. In this talk it is shown how temperatures on the outer surface of the containers evolve, affect the melting and re-solidification of the surrounding high density support matrix and their consequences for the feasibility of this disposal concept. It may be concluded that DBD is a viable option for high burn-up spent fuel.