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Spent Nuclear Fuel Management in Switzerland: Perspective for Final Disposal

Spent nuclear fuel management in Switzerland must be considered from the perspective of the development and implementation of a safe geological repository for both high-level waste and spent fuel assemblies. This paper provides a brief overview of the most relevant issues relating to the management and disposal of the spent fuel arising from the five operational Swiss nuclear power plants.

The principal strategy for spent fuel disposal in Switzerland is to enclose it in canisters that are embedded in bentonite, surrounded by the host rock, Opalinus Clay. A prerequisite for the licencing of the geological repository is the development of the scientific basis to ensure, with specified safety margins, the handling of the spent fuel and its encapsulation in repository canisters. The performance of the spent nuclear fuel has to be assessed by accurate characterisation of the fuel properties, such as radionuclide inventory, source term, fission gas release and decay heat. Specific issues such as opening the transport/storage cask, handling of spent fuel in the repository surface facility and repackaging of the fuel into the canisters for geological disposal must be properly addressed. Taking into account handling operations, there are numerous safety-relevant issues to be considered, starting from material ageing to possible radioactivity release from the cask/fuel. The current technology for handling and encapsulation of damaged fuel in special containers at NPP's is also addressed in the paper.

One of the most important considerations for the near-field of the geological repository is the heat transfer between the canisters and the surrounding bentonite and host rock, which sets a bounding value for heat production per canister. Because of the very high values for burnups and decay heat of the Swiss spent fuels, the loading of the canisters must be optimised according to the spent fuel properties at the time of emplacement. Some relevant aspects of this optimised loading process are discussed in the paper.

The paper also examines aspects that are relevant for the assessment of long-term safety; these require comprehensive analysis and development of appropriate programs and strategies. A brief overview of the most significant NAGRA programs under development is also given: the burnup credit program for the assessment of criticality safety and the Full-Scale Emplacement Experiment in the Mont Terri Rock Laboratory for geophysical monitoring of the changes in the material properties of the bentonite backfill with simulated decay heat.

Country/ int. organization

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Primary author: Dr CARUSO, Stefano (NAGRA)

Co-author: Dr PANTELIAS GARCES, Manuel (NAGRA)

Presenter: Dr CARUSO, Stefano (NAGRA)