

## ***Treatment and conditioning of metallic intermediate level waste***

Per Lidar, Arne Larsson, Tommi Huutoniemi, and Eva Blank, Studsvik Nuclear AB

Mattias Elfving, SKB

In 2011 SKB started an R&D program for evaluating different disposal concepts for LL-LILW. The purpose was to develop alternative repository concepts and conditioning methods for LL-LILW and to evaluate and compare them from a range of parameters. The goal is to present a comparison between identified repository concepts by 2013. The material should be of such a quality that SKB can make decisions of which concepts that are to be further investigated in a safety analysis.

As a part of the R&D program for the LL-LILW disposal facility, Studsvik was assigned to investigate whether melting of metallic LL-LILW is technically feasible and, if so, what the requirements are to build and operate such a facility. Specific concern was given to the following metallic components:

- Core components and reactor internals from both boiling water reactors (BWRs) and pressurized water reactors (PWRs).
- Reactor pressure vessels from PWRs.

The paper presents a feasibility study of a melting facility for core components and reactor internals. An overview is given of how such a facility for treatment of intermediate level waste might be designed, constructed and operated and highlights both the possibilities and challenges.

A cost estimate and a risk analysis are presented in order to make a conclusion of the technical feasibility of such a facility. Based on the Studsvik authors' experience in operating a low level waste melting facility, their conclusion is presented in the paper, considering cost of constructing and operating such a facility, in conjunction with the radio-logical risks associated with operation and the benefits to disposal and long term safety.

Studsvik also investigated alternative techniques for embedding of metallic ILW components. Embedding of radioactive metallic ILW components protects the component from corrosion and leakage of radionuclides from repository to biosphere can thereby be both delayed and decreased. Conditioning by embedding has potential to ensure long-term safety. Embedding also serves as an efficient radiation protection which simplifies post treatment of waste, and embedding of metallic ILW components is a broad conditioning concept suitable for a wide spectrum of dose rates and component geometries.

If low level metal not subject to free release is used as embedding material, conditioning of metallic ILW waste can be carried out without increasing the total amount to be disposed. Three different embedding alternatives for conditioning of internal core components in the ILW range were discussed and compared in this study. Of special interest was if the embedding alternatives could be considered to have potential to be accounted as safety barriers.