

Impact of Minor Actinide Transmutation Options on Interim Storage and Geological Disposal: the French Case

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Abstract

In the frame of June 28th, 2006 waste management French Act, it is requested to obtain in 2012 an assessment of industrial perspectives of partitioning and transmutation of long-lived elements. These studies must be carried out in tight connection with GENIV systems development.

The expected results must include the evaluation of technical and economic scenarios taking into account the optimization options between minor actinide (MA) transmutation processes, the interim storage and the geological disposal, based upon a systematic criteria evaluation methodology.

In this perspective, CEA asked the French waste management Agency (Andra) to assess the impact of HLW (High Level Waste) and ILW (Intermediate Level Waste) as produced by various transmutation options, on the dimensioning of the geological repository.

Three scenario studies were taken into account:

- The first scenario concerns the recycling of plutonium only in a Sodium Fast Reactor (SFR) , with the final HLW still containing the minor actinides and the fission products (FPs),
- The second scenario concerns the recycling of Pu in SFR and the MAs transmutation in MA bearing blankets; the HLW only contain FPs.
- The third scenario concerns the recycling of Pu in SFR and the transmutation of Am only in Am bearing blankets; HLW therefore includes FPs, curium and neptunium.

Andra used repository architectures similar to those employed in the Cigéo project. High level waste packages are placed in the repository cells consisting of micro-tunnels with a diameter close to that of the waste packages. The cells are accessed via horizontal drifts located in the same plan as the cells. The cells are metal clad in order to ensure their dimensional stability.

Results allow comparing the underground footprint and the excavated volume for each scenario; the impact of the interim storage duration (70 years or 120 years) is also assessed. An analysis of the advantages and drawbacks of transmutation options on the interim storage are performed. Solutions are proposed to optimize the footprint of the ILW and HLW repository.