

## Waste management routes under research

Disposal involves the isolation of radioactive wastes in a suitable facility without the intention to retrieve and with minimal requirements of long-term surveillance or maintenance. Internationally, there is general agreement that deep disposal in geological formations, below 300m represents the safest and most sustainable option for the long-term management of high-level waste and spent fuel subject to direct disposal. The concept has evolved over the last few years to incorporate extended monitoring and the possibility for its retrieval if required in the future. Although most Member States are committed in principle to this option, there are, as yet, no facilities in operation. All such waste is currently being stored in surface or near-surface facilities pending the availability of more permanent solutions.

A few countries have established precise programmes for the development of geological disposal repositories with fixed milestones and deadlines and have made significant progress towards the implementation of this solution. For example, current indications are that Finland, France and Sweden will have operational disposal facilities by about 2025 or 2030. Germany and Belgium will possibly follow before 2050. The remaining Member States have set target dates, but are less advanced in the implementation of repository development or, in some cases, the definition of a definitive spent fuel management policy.

Complementary solutions to disposal are also under investigation in some countries, in particular partitioning and transmutation (P&T) and long-term storage. In the case of P&T, research is still on-going. While having the potential to reduce significantly the quantities of long-lived and/or radiotoxic radionuclides in the most hazardous waste forms, P&T would not completely eliminate all such waste constituents and therefore is not a replacement for geological disposal. Nonetheless, it could be a valuable complement, enabling optimum use to be made of the space in geological repositories, in particular by reducing the heat generation of the waste.

In order to optimise the cost of disposal, there are an increasing number of multi-national initiatives in support of national solutions through joint work, programs and knowledge transfer, as well as assessment of the feasibility of regional solutions both at international and EU levels. The research and demonstration under the European Framework Programmes have contributed to advancement in this field.

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