

# **Engineered Barrier Systems for Radioactive Waste Disposal (EBSSYN)**

## **Final publishable summary report**

### **1.1 Introduction**

The EBSSYN project has developed a Synthesis Report on a multi-year European Commission (EC) and Organisation for Economic Co-operation and Development (OECD) Nuclear Energy Agency (NEA)-sponsored project on the engineered barrier system (EBS) used in geological disposal of long-lived radioactive wastes. The EBS Project examined how to design, characterise, model and assess the performance of the EBS, and how to integrate EBS issues in the safety case for disposal.

EBSSYN has been conducted by TerraSalus Limited (the beneficiary) in collaboration with an EC/NEA-coordinated Task Group comprising representatives from the EC and the NEA, as well from national radioactive waste management and disposal organisations in Canada, France, Finland, Germany, Japan, Spain, Sweden, Switzerland, the UK and the US.

TerraSalus Limited provides high-quality, professional consultancy advice on a range of environmental issues, including radioactive waste management. TerraSalus Limited is led by Dr David Bennett ([DavidBennett@TerraSalus.co.uk](mailto:DavidBennett@TerraSalus.co.uk)) who is an expert in safety cases and engineered barrier systems, and who participated in all aspects of the EBS Project.

In addition to producing the EBS Synthesis Report, one of the most important benefits of the project has been its role in facilitating high-level consideration, and international discussion, of how the various necessary studies on detailed aspects of the EBS should be integrated within the safety case.

### **1.2 Results**

The EBS has a central role in the safety case for disposal. EBS design and optimisation requires a significant programme of work, typically lasting from several years to several tens of years. During such a programme, it is essential to maintain good links all the way from the fundamental understanding of the processes and phenomena that may affect the behaviour of the wastes, the EBS materials and the host rock, to their representation in safety assessment.

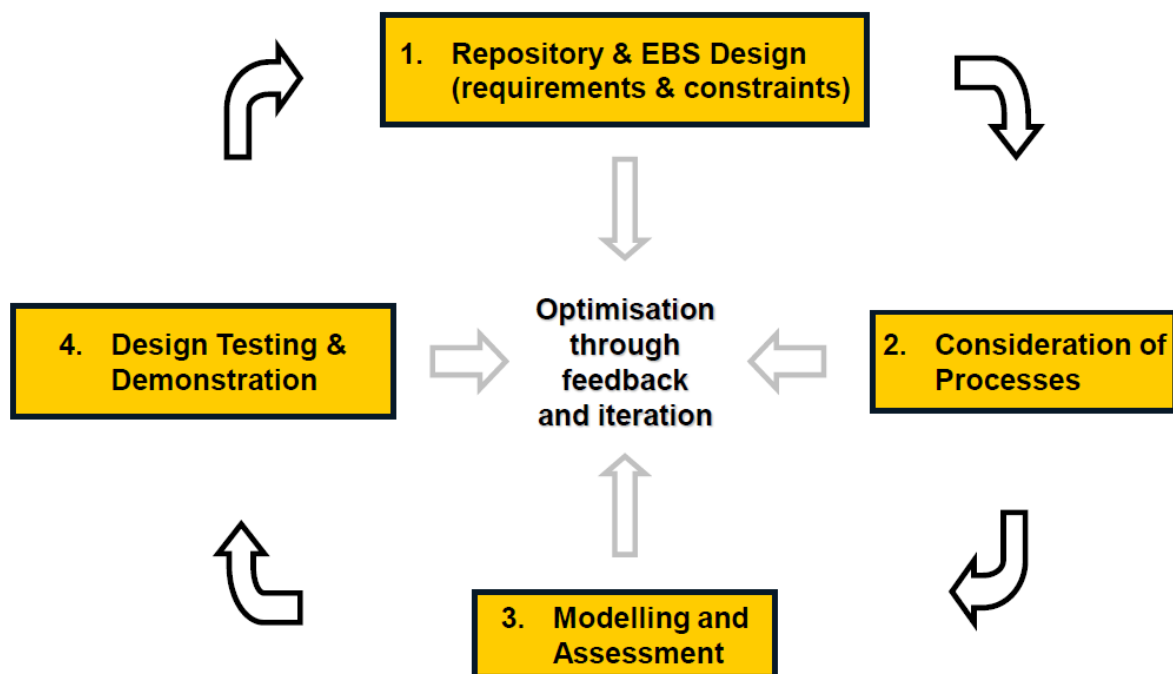
The rationale for the project was to enhance understanding of how safety cases for disposal can be used to integrate results from various activities. These activities include:

- Defining the requirements of the disposal system and the EBS.
- Understanding the materials of the EBS components and the processes that may affect them.
- Modelling the behaviour and performance of the EBS components.
- Demonstrating that the EBS can be manufactured, constructed and installed.
- Providing reasonable assurance that the disposal system will provide acceptable levels of safety.

The results of the project will be disseminated as a public-domain EUR-report and will be made available for download from the EC website and the NEA website. The final report will also be widely disseminated by the EC and the NEA to stakeholders worldwide.

The key result from EBSSYN is a highly visible international publication that addresses directly many issues associated with performance and safety assessment for geological repositories, as well as giving high-level guidance on approaches to repository design and implementation.

The project has led to a better understanding of the EBS design process. EBS design and optimisation is necessarily an iterative process that follows an initial step of defining the safety strategy for disposal. The optimisation process then involves a range of studies as illustrated in Figure 1.



The project has illustrated aspects of each of these steps and their combination by examining a series of examples and trends in radioactive waste disposal.

### **1.3 Socio-economic impact**

The EBS Synthesis Report should assist radioactive waste disposal programmes to proceed in a better informed, well-integrated and planned manner and, therefore, have an increased chance of success.

Sharing of knowledge and best practices between different disposal programmes should increase stakeholder confidence, help to ensure the safety of waste disposal, and reduce the costs and emissions associated with necessary research and development works.

The results from the project should be of interest to waste disposal organisations, regulatory authorities and stakeholders in radioactive waste generation and disposal.