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GEOSAF Part II

The International Intercomparison and Harmonisation Project

on

DEMONSTRATION OF THE OPERATIONAL AND LONG-TERM SAFETY OF GEOLOGICAL DISPOSAL FACILITIES FOR RADIOACTIVE WASTE

TERMS OF REFERENCE

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1 Background

International intercomparison and harmonization projects are one of the mechanisms developed by the IAEA for examining the application and use of safety standards, with a view to ensuring their effectiveness and working towards harmonization of approaches to the safety of radioactive waste management.

The IAEA has convened a number of **international intercomparison and harmonization projects** on the safety of radioactive waste management; in particular on the issues related to safety assessment, carried out in support of safety demonstration for radioactive waste management facilities and activities, decommissioning projects and radioactive waste disposal facilities. These include the project on the Practical Illustration and Use of the Safety Case Concept in the Management of Near Surface Disposal (PRISM), the project; the international project Evaluation and Demonstration of Safety during Decommissioning of Nuclear Facilities (DeSa); the international project Safety Assessment Driven Radioactive Waste Management Solutions (SADRWMS); and the international project on Environmental Modelling for Radiation Safety (EMRAS).

In the field of radioactive waste management and more specifically disposal of radioactive waste, during the period 2008-2011 the GEOSAF project on the demonstration of safety of geological disposal was organized. The GEOSAF project was established to work towards harmonization in approaches to demonstrating the safety of geological disposal with a special emphasis on the expectations from the regulatory authorities engaged in the licensing process with respect to the development of the safety case and supporting safety assessment. In particular the GEOSAF project focused on post-closure safety of geological disposal facilities.

During the course of the project, as so far little had been done at the international level on the operational safety case for geological disposal, on the request of the participating Member States, GEOSAF addressed operational safety under the form of a pilot study, and produced a companion report on that topic.

At the end of GEOSAF, on the basis of the pilot study on operational safety, Member States decided that it would be appropriate to pursue working on the development of safety case for geological disposal, giving a higher focus on the relations between operational activities and post-closure safety.

GEOSAF Part II was initiated with the objective is to reach a joint understanding and work towards harmonization of views and expectations regarding the safety of the operational phase for geological disposal of radioactive waste with regards to post-closure safety. More specifically the approach taken in GEOSAF Part II is to address operational safety for geological disposal working on the development and review of an overall safety case that integrates both operational and post closure aspects.

2 Description of the project

As indicated in the IAEA Safety Requirements on Disposal of Radioactive Waste [1], it is convenient to identify three periods with the development, operation and closure of a disposal facility:

(i) The pre-operational period includes concept definition, site evaluation (selection, verification and confirmation), safety assessment and design studies. It also includes the development of those aspects of the safety case for safety in operation and after closure that are required in order to set the conditions of authorization, obtain the authorization and proceed with the construction of the disposal facility and the initial operational activities. The monitoring and testing programmes that are needed to inform operational management decisions are put in place.

(ii) The operational period begins when waste is first received at the facility. From this time, radiation exposures may occur as a result of waste management activities, and these are subject to control in accordance with the requirements for protection and safety. Monitoring, surveillance and testing programmes continue to inform operational management decisions and to provide the basis for decisions concerning the closure of the facility or parts of it. Safety assessments for the period of operation and the period after closure and the safety case are updated as necessary to reflect actual experience and increasing knowledge. In the operational period, construction activities may take place at the same time as waste emplacement in, and closure of, other parts of the facility. This period may include activities for waste retrieval, if considered necessary, prior to closure, activities following the completion of waste emplacement and the final closure and sealing of the facility.

(iii) The post-closure period begins at the time when all the engineered containment and isolation features have been put in place, operational buildings and supporting services have been decommissioned and the facility is in its final configuration. After its closure, the safety of the disposal facility is provided for by means of passive features inherent in the characteristics of the site and the facility and the characteristics of the waste packages, together with certain institutional controls, particularly for near surface facilities. Such institutional controls are put in place to prevent intrusion into facilities and to confirm that the disposal system is performing as expected by means of monitoring and surveillance. Monitoring may also be carried out to provide public assurance. The licence will be terminated after the period of active institutional control, when all the necessary technical, legal and financial requirements have been fulfilled.

Until recently, the demonstration of safety of geological disposal of radioactive waste in the Member States mainly addressed the post-closure phase of the disposal facilities with a little focus on the operational phase. In relation to that the safety cases and safety assessments supporting this demonstration of safety were also mainly focused on post-closure safety. International requirements and guidance related to the safety of disposal facilities [1, 2, 3] address the development of safety case and safety assessment, but even if operational safety is addressed in these standards, additional specific guidance could be developed on that topic, in particular on the implications of operational safety on long term safety for geological disposal.

A particular challenge to be addressed in the process to implement geological disposal facilities for radioactive waste is to define the interface between the operational and post-closure safety.

The GEOSAF Part II project was established to address this issue and more specifically to elaborate on a structure and methodology to define an overarching safety case supporting the demonstration of safety of geological disposal, integrating both the operational and post-closure phases.

The GEOSAF Part II project takes as its starting point the concept of an "initial state" that is required at the commencement of the post-closure phase and which is required to be delivered by all the components of the phase(s) before closure. As the geological disposal project advances through a number of licensing and approval steps and as further information becomes available, the operator will be able to evaluate and verify that the assumed initial state will be achieved.

At the time of closure of the disposal facility, the final safety case will have to demonstrate that:

- the operational safety case has delivered the safety functions required to achieve the initial state; and that,
- the post-closure safety case (starting from the initial state) will deliver the required level of protection to humans and the environment.

3 Working Methodology

GEOSAF Part II provides a forum to exchange ideas and experience on the development and review of an integrated operational and post-closure safety case for geological disposal facilities. It also aims at providing a platform for knowledge transfer.

The target audience for the project comprises government and industry representatives: senior policymakers, regulators and facility operators, and their technical experts. The project is of particular interest to regulatory authorities, technical safety organizations and waste management organizations responsible for the development and operation of geological disposal facilities.

The project is planned for a period of 3 years starting in 2012. The working methodology for the project consists of core group meetings during which basic supporting material on various relevant issues is developed. This material is then distributed amongst the Member States participating in plenary meetings organized every year. During these plenary meetings the material prepared by the core group is commented, discussed and improved. The plenary meetings should also allow defining the work to be carried out by the core group prior to the next plenary meeting both to improve the existing material and to potentially address new topics.

4 Outputs

The project aims at working towards the development of a methodology and the structure of an integrated safety case for both operational and long term safety. Focus will be put on the definition of the initial state of the disposal facility at the moment of its closure.

At the end of the project the results will be integrated in a working group report to be published under an IAEA publication (tecdoc, safety report).

5 References

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Disposal of Radioactive Waste, IAEA Safety Standards Series No. SSR-5, IAEA, Vienna (2011).

[2] INTERNATIONAL ATOMIC ENERGY AGENCY, Geological Disposal Facilities for Radioactive Waste, IAEA Safety Standards Series No. SSG-14, IAEA, Vienna (2011).

[3] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety Case and Safety Assessment for the Disposal of Radioactive Waste, IAEA Safety Standards Series No. SSR-23, IAEA, Vienna (2012).