



Summary of CNSC Pre-Licensing Reviews

Conceptual Design and Post-Closure Safety Assessment for a
Deep Geological Repository for Used Nuclear Fuel

Crystalline and Sedimentary Host Rock Formations

December 2016



1.0 Introduction

The Canadian Nuclear Safety Commission (CNSC) regulates the use of nuclear energy and materials to protect health, safety, security and the environment; to implement Canada's international commitments on the peaceful use of nuclear energy; and to disseminate objective scientific, technical and regulatory information to the public.

As a best practice, the CNSC gets involved early in any proposed new nuclear projects, to provide future applicants with information and guidance on the regulatory requirements and licensing process before the submission of a licence application and the initiation of the environmental assessment process.

The CNSC signed a service arrangement with the Nuclear Waste Management Organization (NWMO) to provide regulatory guidance in relation to the adaptive phased management (APM) approach. As part of the service arrangement, the NWMO requested a pre-licensing review of design concepts for the APM approach.

CNSC staff provide the optional service of a pre-licensing review to future licence applicants. The objective of a pre-licensing review is to increase regulatory certainty while ensuring public safety. This service does not certify a concept design, does not involve issuing a licence under the *Nuclear Safety and Control Act* (NSCA), and is not required as part of the licensing process for the deep geological repository (DGR). The conclusions in any design reviews do not bind or otherwise influence the decisions made by the Commission.

2.0 Summary

The NWMO submitted for pre-licensing review reports on the conceptual design and post-closure safety assessment of a hypothetical DGR for used nuclear fuel – one in a [representative crystalline](#) and the other in a [sedimentary](#) host rock formation.

Currently, it is not known where the repository will be located in Canada. Consequently, the NWMO developed conceptual designs for DGRs – designs that are not finalized (i.e., models) – for two hypothetical but realistic sites. Since it is not known where the repository will be located in Canada, a complete safety case has not been submitted.

The purpose of CNSC staff reviews was to determine whether the conceptual design and post-closure safety assessment are consistent at a high level with the guidance in regulatory guide *G-320, Assessing the Long Term Safety of Radioactive Waste Management* and other international guidance, in particular the International Atomic Energy Agency's Specific Safety Guide No.SSG-23, *The Safety Case and Safety Assessment for the Disposal of Radioactive Waste*.

Based on reviews of both documents and some supporting information documents, CNSC staff found that, in general, both submissions met expectations for this stage of implementation of the APM approach – a stage at which there is no licence application, no site has been selected, and site-specific data is not available.

CNSC staff have provided 120 recommendations to NWMO. The recommendations are meant to highlight areas of importance for future work, should the APM initiative progress to the point where a licence application is submitted for a DGR for Canada's used nuclear fuel to be hosted within a crystalline or sedimentary rock formation.

The recommendations focus mostly on future work and research to be carried out in support of the safety assessment for both rock types. The recommendations included the following areas:

- characterization of fractures
- natural analogues
- contaminant transport modelling
- modelling coupled processes
- used nuclear fuel inventory
- traceability of documentation
- supporting research on sedimentary and granitic rock
- design development program, including long-term integrity of materials proposed for the used fuel container (ex. research on copper corrosion)
- management system
- long-term performance of the buffer and seals

Further, CNSC staff recommended that in the future, NWMO reports such as these should be as self-sufficient and up to date as possible. In particular, it is expected that the NWMO will provide a more systematic reference system.

For questions about the review, contact cnsccanada@nrc.ca.