

# EARLY INVOLVEMENT OF THE CANADIAN NUCLEAR REGULATOR IN AN INITIATIVE FOR A DEEP GEOLOGICAL REPOSITORY FOR THE LONG-TERM MANAGEMENT OF CANADA'S USED NUCLEAR FUEL

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## ABSTRACT:

*The Canadian Nuclear Safety Commission (CNSC) is Canada's independent nuclear regulator, and is responsible for licensing geological repositories intended to provide for long-term management of radioactive wastes, including used nuclear fuel. The CNSC uses a comprehensive licensing system that covers the entire lifecycle of a geological repository from site preparation, construction, operation, decommissioning (closure and post-closure) and, finally, abandonment (release from CNSC licensing).*

*The Nuclear Waste Management Organization (NWMO) is the implementer and is responsible for the long-term management of Canada's used nuclear fuel.*

*Currently, no licence application has been submitted by the NWMO to the CNSC for a deep geological repository for used nuclear fuel. However, it is international best-practice for the regulator to get involved early in initiatives that may involve the long-term management of radioactive wastes, such as deep geological repositories for used nuclear fuel.*

*The CNSC and the NWMO are two very different organizations and independent from each other. The CNSC regulates nuclear energy, and ultimately decides if an applicant should be granted a licence for a nuclear activity. The CNSC will not issue a licence unless it is safe. In the future, if the NWMO finds a willing and informed host community in a suitable geological area, they may submit a licence*

*application to the CNSC for the initial stages of licensing (siting and possibly construction). The NWMO would be the licence applicant.*

*This paper will provide a review of CNSC's current pre-licensing activities, prior to the submission of a licence application. Furthermore this paper will examine how the CNSC is developing its own relationships with communities and Aboriginal groups who want to know more about our regulatory role, the CNSC's independent research program on deep geological repositories, and the CNSC's participation in international projects.*

## 1. INTRODUCTION

*The nuclear regulator: the CNSC*

The CNSC regulates the use of nuclear energy and materials to protect the health, safety and security of Canadians and the environment and 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.

The CNSC uses a comprehensive licensing system that covers the entire lifecycle of a geological repository from site preparation to construction, operation, decommissioning (closure and post-closure) and, finally, abandonment (release from licensing). Figure 1 illustrates CNSC licensing phases (yellow box) and licensing process<sup>[1]</sup>. This approach requires a separate licence at each phase, although the site preparation and site construction licences can be combined.

A licensing decision by the CNSC on a deep geological repository can only be taken after the successful completion of the environmental assessment conducted under the *Canadian Environmental Assessment Act, 2012*. The public has opportunities to participate and be heard throughout the public hearing process (see Figure 1). The outcome of the licensing process feeds back into a compliance program that verifies that the licensee fulfills the regulatory requirements.

The CNSC's regulatory philosophy for radioactive waste stems from the *Nuclear Safety and Control Act, 2000* and is articulated in CNSC regulatory documents: P-290, *Managing Radioactive Waste, 2004* and G-320, *Assessing the Long Term Safety of Radioactive Waste Management, 2006*.

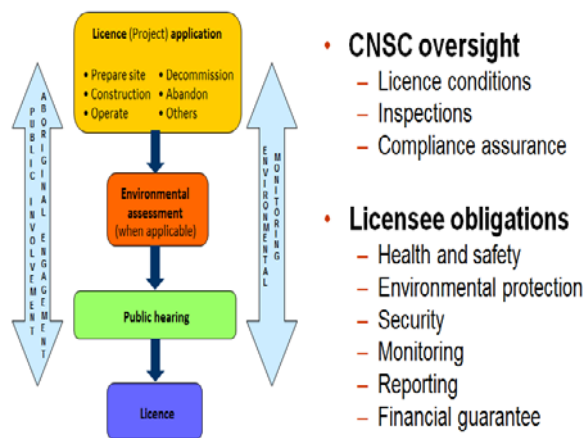


Figure 1: CNSC licensing process

*The future licence applicant: the NWMO*

The Nuclear Waste Management Organization (NWMO) is the implementer (future licence applicant) and was established in 2002 by Ontario Power Generation Inc., Hydro-Québec, New Brunswick Power Corporation and Canadian Nuclear Laboratories (formerly Atomic Energy of Canada Limited), in accordance with the *Nuclear Fuel Waste Act, 2002* (NFWA), to assume responsibility for the long-term management of Canada's used nuclear fuel. The selected approach for the long-term management of used nuclear fuel is Adaptive Phased Management (APM).

As part of the APM approach, in May 2010, the NWMO launched its site selection process to select a willing and informed community in a suitable rock formation to host a deep geological repository for the long-term management of Canada's used nuclear fuel [2]. As of January 22, 2015, there are eleven communities learning more about the APM approach.

## 2. THE CNSC'S ROLE AND EARLY INVOLVEMENT IN A POTENTIAL DEEP GEOLOGICAL REPOSITORY FOR USED NUCLEAR FUEL

Currently, no licence application has been submitted to the CNSC for a deep geological repository for used nuclear fuel. However, it is international best-practice for the regulator to get involved early in initiatives that may involve the long-term management of radioactive wastes, such as a deep geological repository for used nuclear fuel [3].

CNSC is involved early in the process to ensure that the future licence applicant, the NWMO, and potentially affected communities have a comprehensive understanding of the CNSC's role in regulating Canada's nuclear sector, and if a licence application were submitted to the CNSC in the future, the licensing process. CNSC operates in an open and transparent manner as such we post information on our early involvement on our website [4].

### 2.A.1 Service arrangement between the CNSC and NWMO

The CNSC signed a service arrangement with the NWMO to provide regulatory guidance prior to the submission of a licence application [5]. Services include providing pre-licensing design reviews of deep geological repository concepts, identifying regulatory requirements for a geological repository and participating in public meetings to provide information on the CNSC's regulatory role. The current service arrangement is valid for a five-year period, unless a licence application for the early stages is submitted, at which point the arrangement would no longer be in effect.

#### 2.A.1.1 Pre-licensing Reviews

As part of the service arrangement, CNSC staff will conduct pre-licensing reviews of reports that the NWMO has submitted on the conceptual design and illustrative post-closure safety assessment for the APM deep geological repository for used nuclear fuel [5].

A design review is an assessment of a proposed design based on the concepts presented by a future licence applicant. The term "pre-licensing" signifies that a design review takes place before a licence application is submitted to the CNSC.

The CNSC provides reviews as an optional service when requested by a future licence applicant (in this case the NWMO). To be clear, no regulatory decisions are being made. This service does not certify a concept design or involve issuing a licence under the NSCA and it is not required as part of the

licensing process for the deep geological repository. The conclusions of any reviews do not bind or otherwise influence decisions that the CNSC makes.

At this time, it is not known where the repository will be located in Canada; therefore, the NWMO is developing conceptual designs – these are draft designs (i.e., models) – for two hypothetical sites. The NWMO is also looking at methods to assess the safety of these two hypothetical sites after a decision is made to close the sites (i.e., post-closure). CNSC staff are currently reviewing the conceptual designs and illustrative post-closure safety assessment reports for the two hypothetical, but realistic sites in representative rock formations – one in crystalline rock and the other in sedimentary rock.

### **2.A.2 Pre-licensing Outreach Activities with Communities**

An important part of the CNSC's mandate is to disseminate objective scientific and regulatory information. Outreach activities are meant to describe CNSC's role as Canada's nuclear regulator and to bring a CNSC face into a community. There are a variety of audiences CNSC conducts outreach with and activities are designed to educate the public, licensees and other stakeholders about a particular issue or topic.

In this early stage, CNSC staff have been meeting with communities involved in the NWMO's site selection process to help them understand how the CNSC regulates the nuclear sector, safety matters that would be examined for a deep geological repository for used nuclear fuel if a licence application were submitted by the NWMO and how the public can participate in the public hearing process <sup>[1]</sup>. Furthermore, CNSC staff have also met with Aboriginal groups. In order to maintain the independence of the nuclear regulator and to build our own relationship with communities, it is important to note that these activities are between the communities/Aboriginal groups and the regulator, the NWMO is not present at these activities, nor are they apprised of discussions. The NWMO voluntarily does not attend CNSC outreach activities. If the NWMO wants to learn more about the CNSC, there is an established process under the service arrangement. Furthermore, there are other options open to the NWMO or consultants, such as CNSC 101 or topic specific sessions. To date, CNSC staff has not received requests. To be clear, CNSC outreach activities, such as CNSC open houses, are open to members of the public. Therefore, CNSC staff would not prevent NWMO employees or consultants from attending.

CNSC's current outreach activities have been focused on relationship building with the

communities and Aboriginal groups. The meetings provide an opportunity for meeting participants to ask questions and clarify issues of concern. During these meetings, CNSC staff are also interested in hearing about the most effective ways to involve communities and Aboriginal groups and how to best provide information to those who want to know more about the CNSC and other relevant matters within the scope of CNSC's mandate.

At the request of community representatives, additional outreach activities, including information sessions and open houses, have been undertaken. Since May 2010, CNSC staff have conducted over 35 meetings with communities and 5 open houses. In addition to the meeting with communities, CNSC staff have also met with two Aboriginal groups who requested a meeting to learn more about CNSC's regulatory role.

These information sessions take place at the request of the community's representatives (usually the community liaison committees (CLCs)) or Aboriginal groups, and comprise of:

- an initial conference call between community/CLC representative and CNSC staff
- a day-long meeting at the CNSC's Ottawa offices with community representatives (typically the mayor and council, but often a separate meeting is held for the CLC)
- presentations by the CNSC at CLC meetings in the community. The CLC chair these meetings and the CLC meetings are typically open to the public
- information sessions, such as an open house in the communities. CNSC open houses are open to all members of the public, however the focus are members of the community where the open house is being held. CNSC staff will also notify surrounding communities as well as Aboriginal groups of CNSC's upcoming open houses.

The exchange of information between communities and the CNSC has been beneficial, and feedback from communities has been positive. They know that the CNSC is Canada's independent nuclear regulator, that the CNSC does not promote nuclear energy nor the NWMO's APM approach and that CNSC's mandate is to ensure safety. Should the project move forward, the NWMO would need a licence from the CNSC before any work could

begin. The CNSC will only issue a licence if it is safe to do so.

What CNSC staff have learned so far is that it is beneficial to get involved early and start to talk to communities. It is important to continue clarifying our independent regulatory role, important to build relationships with communities as it is a long process and also start to get an understanding of the general concerns within the communities. Communities also get to meet some of the actual CNSC inspectors and technical staff –who are involved in the rigorous review of licence applications and compliance activities. In addition, if the CNSC is conducting an open house, it is CNSC's open house; however CNSC staff work with the local CLC to obtain feedback on where to hold the event, time of day and who CNSC staff should send invitations to. The CLCs have proved to be helpful and a great resource. CNSC staff have also established a single point of contact for CLCs and Aboriginal groups and have developed a living Communications Assessment Plan which includes awareness building and proactive activities. Based on feedback from these meetings and open houses, CNSC staff are refining/creating new outreach tools.

### **2.A.3 Independent Research**

In order to prepare for a possible rigorous review of a licence application, the CNSC has its own independent research program on deep geological repositories. CNSC's research is not meant to duplicate research done by the project applicant, but rather to identify gaps in information, and to verify key safety aspects related to geological repositories.

Since 1978, the CNSC has been involved in independent research and assessment, including international collaboration, on the long-term management of used nuclear fuel in geological repositories. These activities initially looked at the Canadian Shield's granitic rock because it was the only type of rock formation being considered for the long-term management of used nuclear fuel in Canada.

However, the NWMO is currently looking for a voluntary community, with a site that is technically acceptable, in either granitic rock formations of the Canadian Shield, or in sedimentary rock formations. At the same time, there is another initiative in Canada from Ontario Power Generation for a deep geologic repository for its low- and intermediate-level radioactive waste, at approximately 680 metres deep in a sedimentary formation. In response to the above two initiatives, the CNSC has expanded its technical expertise from granitic rock to include knowledge and understanding of deep geological disposal in sedimentary rock.

Therefore, the CNSC is conducting a research program to evaluate long-term safety issues related to the deep geological disposal of radioactive waste and used nuclear fuel in sedimentary rock. A team of CNSC specialists, working in collaboration with external national and international experts, perform these activities. It also includes monitoring and review of state-of-the-art scientific advancements, and participation in international forums to exchange information and knowledge related to geological repositories.

#### *Independent Advisory Group*

To help CNSC staff prepare for a future licence, specifically with respect to geoscientific research activities at the pre-licensing stage, an Independent Advisory Group (IAG) was established by CNSC staff and comprising Canadian experts in the geosciences.

Due to the early stage of the project ( no site has been selected) the initial focus of the IAG will be to provide advice to CNSC staff by conducting a high level review of the NWMO research program focusing on the geosciences. In the future, the IAG may be requested to focus on one or more specific topics or evaluate areas of investigation that may be included in an actual safety case (if a site is identified) and/or supporting safety assessment.

### **2.A.4 International collaboration**

Participation in international projects, such as through the International Atomic Energy Agency (IAEA), allows CNSC staff to maintain their knowledge and competence by keeping up-to-date with international state-of-the-art science, practices and regulations.

CNSC staff contribute actively to those projects by sharing their knowledge and contributing to the writing and/or providing peer review of project documents. Below are brief descriptions of some of international projects in which CNSC staff have participated in:

- SITEX (Sustainable network of Independent Technical Expertise for radioactive waste disposal) - SITEX was a two-year project implemented within the 7th Framework Program of the European Atomic Energy Community (Euratom). The project was led by the Institute for Radiological Protection and Nuclear Safety (IRSN, France). The objective of SITEX was to establish a sustainable network of technical support organizations and regulatory bodies with the goal of harmonizing European and international approaches to reviewing safety cases for geological disposal. CNSC participated

in working groups to look at the development of guidance documents, regulatory research and planning for the future reviews of safety cases.

- Underground Research Facility (URF) Network - This IAEA program provides an overview and general update of experimental programs in all URFs that are part of the network at Annual Network Meetings. The CNSC contributes on regulatory guidance and receives access to expert information and training.
- Human Intrusion in the context of Disposal of Radioactive Waste (HIDRA) - CNSC participates in, and contributes to this IAEA project, to provide recommendations to clarify existing IAEA requirements and guidance relevant to the assessment of future human actions and human intrusion.

CNSC has also met with other regulatory bodies in Sweden (SSM) and in Finland (STUK) and the United States of America (US EPA) to learn more about their regulatory role in the pre-licensing phase for deep geological repositories for used nuclear fuel and in the case of the US EPA for the Waste Isolation Pilot Plant (WIPP). CNSC also provided information on activities that the CNSC is conducting in the pre-licensing phase for the Adaptive Phased Management (APM) approach. The meetings consisted of short presentations from subject matters experts, which allowed more time for discussion that included sharing experiences. CNSC staff also visited repositories for short-lived low - and intermediate-level radioactive waste, WIPP and underground research laboratories in both Finland and Sweden to investigate the long-term management of used nuclear fuel in geological repositories.

Through these meetings CNSC received confirmation that for the most part, the activities that the CNSC staff are currently conducting and planning are in-line with what other regulators did in the pre-licensing phase. Informal discussions and site visits provided CNSC with valuable information and new international connections in the repository community. In addition, lessons learned and perspectives on how those regulators would improve the process based on those lessons, were extremely beneficial, and will inform CNSC staff in our daily work at this pre-licensing stage, but also for future stages. It also provided CNSC staff the opportunity to share pre-licensing experiences regarding a deep geological repository for the long-term management of used nuclear fuel.

### 3. CONCLUSIONS

In summary, the CNSC's participation in the pre-licensing period over the next several years will

continue to involve pre-licensing regulatory reviews of conceptual designs.

CNSC staff are expected to make many presentations during this period on CNSC's regulatory role and requirements for the long-term management of used nuclear fuel to various communities, Aboriginal groups and regional groups participating in the NWMO's siting process.

CNSC will also continue to work on establishing relationships and ways to maintain relationships with these communities and Aboriginal groups and will seek feedback from communities on ways to do this.

Only one repository for used nuclear fuel is expected to be built in Canada, therefore it is important to keep up to date with other countries, continue to develop relationships with other regulators and to also share experiences in the pre-licensing phase.

As well, the CNSC will continue to actively participate in working groups of the IAEA and the Nuclear Energy Agency Radioactive Waste Management Committee as well as other initiatives upon invitation, such as the SITEX II project for regulators and technical support organizations.

### REFERENCES

1. *Canadian National report for the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, Fifth Report, October 2014.* Canadian Nuclear Safety Commission, 2014.
2. *Moving Forward Together: Process for Selecting a Site for Canada's Deep Geological Repository for Used Nuclear Fuel, Nuclear Waste Management Organization, May 2010.* Available at: <http://www.nwmo.ca/designingasitingprocess> (accessed: October 27, 2014)
3. *The Evolving Role and Image of the Regulator in Radioactive Waste Management: Trends over Two Decades, Organisation for Economic Co-operation and development, Nuclear Energy Agency, 2012, NEA No. 7083.*
4. Information on CNSC's pre-licensing activities is available at: <http://www.nuclearsafety.gc.ca/eng/waste/high-level-waste/index.cfm#Long-term>
5. Special Project Agreement between the CNSC and the NWMO, dated March 31, 2014.