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REGULATORY REQUIREMENTS AND POLICIES RELATED TO THE MANAGEMENT OF RADIOACTIVE WASTE

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Abstract: This paper provides an overview of the regulatory policies, processes and tools that are used by the Canadian Nuclear Safety Commission (CNSC) to regulate radioactive waste management facilities. Under the Nuclear Safety and Control Act, the CNSC has a mandate to regulate the nuclear industry in order to protect health, safety, the environment and national security, and to implement certain international obligations regarding the safeguarding and non-proliferation of nuclear materials. The main regulatory activities include setting regulatory standards, issuing licences, verifying compliance with those licences and communicating with stakeholders and the public. The CNSC regulatory philosophy is that licensees are directly responsible for ensuring that the activities they engage in are managed so as to protect health, safety, security and the environment and to respect Canada's international commitments. The CNSC is responsible for ensuring that licensees are properly discharging those obligations. With respect to demonstrating safety, the CNSC adopts a non-prescriptive results-oriented approach, where the burden in on the licensees to demonstrate safety. Licensing of nuclear facilities and materials, including waste, is achieved through a comprehensive "cradle to grave" licensing system. It covers the entire life cycle of a facility from site preparation, construction, through operation, to decommissioning and abandonment. In addition, the licensing of waste and waste management facilities takes into account the need for long-term protection from the effects of radioactive waste.

THE CANADIAN NUCLEAR SAFETY COMMISSION

Mission and Mandate

Established by the Nuclear Safety and Control Act (1997), the Canadian Nuclear Safety Commission (CNSC) is an independent federal agency that reports to Parliament through the Minister of Natural Resources. The CNSC does not make policy or investment decisions on the use of nuclear energy. It does not promote the technology or the nuclear industry. As an independent regulator, the CNSC is responsible to the people of Canada through Parliament for regulating the use of nuclear energy and materials to protect health, safety, security and the environment and to respect Canada's international commitments on the peaceful use of nuclear energy. Its vision is to be one of the best nuclear regulators in the world by being effective, efficient, transparent and an employer of choice.

The CNSC replaced the Atomic Energy Control Board (AECB) via the implementation of the Nuclear Safety and Control Act (NSCA) on 31 May 2000. The NSCA was the first major overhaul of Canada's nuclear regulatory regime since the creation of the AECB by the Atomic Energy Control Act (*AECA*) in 1946. The NSCA provides legislative authority for many new developments in the regulation of the nuclear industry since 1946. These include health and safety standards for nuclear energy workers, environmental protection measures, security regarding nuclear facilities and public input into the licensing process.

The CNSC regulates all uses of nuclear energy and nuclear materials from the production, to use, to the final disposition of any nuclear substances. This includes large facilities where the use of nuclear substances and nuclear energy is the primary activity and smaller facilities where nuclear substances are used in a process that supports the primary activity. Such facilities range from uranium mines, power and research reactors, fuel fabrication facilities, radioactive waste management facilities to Medical and industrial applications and others. Under the NSCA, the CNSC has the mandate to:

- Regulate the development, production and use of nuclear energy and materials to protect the health, safety, security and environment;
- Regulate production, possession and use of nuclear substances, prescribed equipment and prescribed information;
- Implementation of measures respecting international commitments on the peaceful use of nuclear energy and substances;
- Dissemination of scientific, technical and regulatory information concerning CNSC activities.

CNSC's Activities and Structure

The main regulatory activities include setting regulatory standards, issuing licenses, verifying compliance and communicating with stakeholders and the public. These activities are accomplished by the work of a commission of up to seven members and a staff of about 565 employees.

The Commission is an independent, quasi-judicial seven member tribunal that provides licensing decisions on nuclear-related activities in a public forum. Meetings are usually held in Ottawa but are sometimes held in municipalities where there are major facilities. Commission members are separate from the rest of staff for they are individually appointed by the federal government. Six are part-time members where the scope of their roles is limited to the tribunal. The seventh member is the President of the tribunal and the CEO of the CNSC staff organization. As a tribunal, their responsibilities are to provide decisions on licensing issues through public hearings, establish legally binding regulations, and set regulatory policy direction relating to the health, safety, security and environmental issues affecting the industry.

The work of the commission is supported by the *Commission Secretariat.* This group is responsible for the logistics of hearings and meetings of the tribunal, including public releases of notices, commission decisions, and records of proceedings

The tribunal is supported by *staff* members, whose roles include: advisors to the tribunal and assistants to the President, preparing recommendations on licensing issues, presenting recommendations to the tribunal for consideration during public hearings and administering the decisions made by the tribunal, including exercising certain licensing decision-making powers delegated by the Commission to Designated officers, and undertaking the compliance activities needed to administer licensing decisions.

REGULATORY PHILOSOPHY

CNSC's regulatory philosophy is based on two principles:

- Those persons and organisations subject to the *NSCA* and Regulations are directly responsible for ensuring that the regulated activities that they engage in are managed so as to protect health, safety, security and the environment and to respect Canada's international commitments on the peaceful use of nuclear energy.

- The CNSC is responsible to the public for regulating persons and organisations subject to the *Nuclear Safety and Control Act* and regulations to assure that they are properly discharging their obligations.

Accounting for the above principles, the CNSC: establishes, and require compliance with, regulatory requirements; makes independent and objective decisions; bases regulatory action on the level of risk; and serves the public interest. With respect to demonstrating safety, The CNSC has a non prescriptive approach where the burden in on the licensees to demonstrate safety. It provides guidance and the licensees are free to use the technology and methods they prefer to demonstrate compliance with the requirements.

CNSC LICENSING SYSTEM

Types of Licences and Facilities

There are several types of licenses issued. A facility (Class I, II, Uranium Mines or Mills) is licensed during its lifecycle where licenses are required for site preparation, construction, operations and preliminary decommissioning and decommissioning. Other operations are required to have one or more of the following: Nuclear Substance and Radiation Device, Waste Nuclear Substance, Import, Export, Transport, Prescribed Information, Dosimetry Service and/or a License to Abandon. Radioactive waste management facilities do not have a separate status. They are licensed as any other nuclear facilities following the process described in the following section.

Licensing Process

The Licensing process for any stage starts with a project description and a licence application. The application could be a detailed submission if the project is well defined or just a letter of intent if the project is still at the planning stage. An application for a license (including renewals or amendments) can trigger other legislation and regulations. For example, compliance with the *Canadian Environmental Assessment Act (CEAA)* and its regulations is a prerequisite to proceeding with a license application under the *NSCA*. *CEAA* may require an Environmental Assessment (EA) of a project to analyze potential environmental impacts and their severity, possible mitigation measures and residual impacts of them. Both the physical and socio-economic environments must be considered in the EA. The range of stakeholder consultations is determined based on the severity of the potential environmental impacts.

Once CEAA requirements are met, the application for the license must provide all information required by the NSCA and its regulations. CNSC staff will then complete an independent, technical review of the application for compliance and to identify additional requirements that should be imposed as specific license conditions. Recommendations are made to the Commission or the Designated Officer, as appropriate.

In addition, CNSC also licenses the import and export of nuclear substances, equipment information and nuclear-related dual-use items. Proposed imports and exports are evaluated by CNSC staff to ensure compliance with Canada's nuclear non-proliferation and export policies, international agreements related to safeguards, health, safety and security, and the *NSCA* and its Regulations.

Licensing Hearings

The tribunal considers applications in public hearings, which are usually two days in duration for each applicant or licensee. The first day is to hear the application and CNSC staff recommendations. The second day is to entertain interventions, and is held (typically 60 days) after the first day to permit stakeholders time to review the application and recommendations.

During the first hearing day, applicants present the information on their application. CNSC staff presents their comments and recommendations to the tribunal. Commission members question both staff and applicant regarding the available information. No decision is made at this time.

During the second day, as appropriate, the applicant and CNSC staff presents additional information to the tribunal. Any interveners who filed a request 30 days prior to the hearing date are able to present their views at this time or their intervention document(s) can be tabled without a presentation. Commission members can pose questions to the applicant, CNSC staff and any interveners present regarding the submissions made. Participants at the hearing may question each other through the Chairperson. Upon the conclusion of Hearing Day 2, there will be no further submissions considered.

After Day 2 hearing, the tribunal discusses in camera the application and all the information submitted during the two days to reach a decision. The Notice of the Decision and Reasons for the Decision are sent to all participants and is published on the CNSC website (www.nuclearsafety.gc.ca).

CNSC COMPLIANCE PROGRAM

Administering licensing decisions of the tribunal entails a planned and continuous oversight. Whether based on or off-site, CNSC staff work on a daily basis carrying out regular inspections, audits and reviews to provide a comprehensive overall and day to day picture of operations, ensuring that it is safe and in compliance with the licence.

Confirmation of compliance with licenses is managed within a formal compliance program that includes promotion, verification and enforcement. The program monitors and reports on licensee compliance to confirm their safe operation.

Promotion – Voluntary compliance is the key to this aspect and this is promoted through communication of regulatory expectations, guidance and rewarding good performers. Industry (and other stakeholders) involvement is important whereby standards development and regulatory issues are consistently shared. Good performers are recognized for their performance with a concurrent reduction in regulatory burden.

Verification – This guides regulatory effort and involves reporting on the licensee's safety performance. Activities include regular on-site inspections, reviewing documents submitted to satisfy reporting requirements stated in the license, and performing formal audits or evaluations of the overall effectiveness of programs, processes or systems.

Enforcement – This is a set of designed activities to re-establish compliance and/or discourage future non-compliance. Measures that could be taken include: discussion, written notice (inspection report), request for corrective action, publicity (e.g. inclusion in the Industry Annual Report), licensing actions, order or prosecution.

COMMUNICATION ACTIVITIES

The CNSC recognizes open, transparent and timely communications as being central to the work and management of the Canada's nuclear regulatory regime. As a function of good management, open and proactive communications ensure that stakeholders receive information, and that their views and concerns are taken into account in the formulation, implementation and evaluation of CNSC policies, programs, services and initiatives.

The CNSC disseminates objective scientific, technical and regulatory information to stakeholders concerning the activities of the CNSC and the effects of the uses of nuclear energy and materials on health, safety, security and the environment.

The NSCA establishes a legislative requirement for the Commission to hold public hearings with respect to exercising its power to license. It is also a requirement that applicants, licensees and anyone named in or subject to an order must have the opportunity to be heard. Accordingly, the CNSC Rules of Procedure sets out the requirements for notification of Public Hearings and publication of decisions from Public Hearings, as described earlier. A communication policy was recently developed relating to CNSC interactions with internal and external stakeholders.

To facilitate external communication, a corporate outreach program is also currently under development. This program provides a proactive, systematic and risk-informed approach in interacting with stakeholders. Outreach activities and events are planned and organized accordingly and as appropriate.

As an agent of the Government of Canada, the CNSC makes all information and services for stakeholders available in both official languages.

REGULATORY REQUIREMENTS FOR MANAGING RADIOACTIVE WASTE

Nuclear Safety and Control Act and associated Regulations

The regulations under the NSCA allow licensees some flexibility in how they comply with the regulatory requirements. With some exceptions, such as the dose limits, transport packaging and licence exemption criteria for certain devices, the regulations do not specify in detail the criteria that will be used in assessing a licence application or judging compliance. The regulations provide licence applicants with general performance criteria and lists of information that they must supply. Acceptable information may be referred to in the licence, thus making it a legal requirement for the licensee in question. There are nine regulations issued under the NSCA:

- *General Nuclear Safety and Control Regulations;*
- *Radiation Protection Regulations;*
- *Class I Nuclear Facilities Regulations;*
- *Class II Nuclear Facilities and Prescribed Equipment Regulations;*
- *Uranium Mines and Mills Regulations;*
- *Nuclear Substances and Radiation Devices Regulations;*
- *Packaging and Transport of Nuclear Substances Regulations;*
- *Nuclear Security Regulations; and*
- *Nuclear Non-proliferation Import and Export Control Regulations.*

In addition, the nuclear industry is subject to the provincial acts and regulations in force within the provinces where nuclear-related activities are carried out. Where there is an overlap of jurisdictions and responsibilities, the CNSC takes the lead in attempts to harmonize the regulatory activities.

The information that proponents must submit when applying for a waste management facility licence depends on the type of facility and on the stage in the licensing life cycle. CNSC requires early planning in the sense that relevant information about the operation and decommissioning of a facility must be submitted early in the life cycle of a facility. Typical information that is required includes:

- Detailed description of the facility and its operation;
- Organizational structure, Quality Assurance programs and qualifications of the applicant;
- Safety Analysis Reports which are usually preliminary at early stages in the life cycle and get more detailed at the operation stage;
- Environmental Impacts associated with the current and subsequent stages in the life cycle;
- Decommissioning plans and financial guarantees; and
- Proposed public information program.

In addition to the regulations, the CNSC has developed a number of policies, guides and standards that provide direction and guidance to stakeholders on how to meet the requirements.

REGULATORY POLICIES FOR RADIOACTIVE WASTE MANAGEMENT

In addition to the NSCA and associated regulations, which are central to regulating the nuclear industry in Canada, there are several major policies and acts pertaining specifically to radioactive waste.

All CNSC regulatory documents can be consulted and downloaded using the CNSC website: http://www.nuclearsafety.gc.ca/eng/regulatory_information/

The 1996 Government of Canada Policy Framework for Radioactive Waste

This policy provides a national context for waste management. This policy framework sets the stage for institutional and financial arrangements to implement disposal of radioactive waste in a safe, comprehensive, environmentally sound, integrated, and cost-effective manner. The *Policy Framework for Radioactive Waste* [1] specifies that:

- The federal government has the responsibility to develop policy, to regulate, and to oversee radioactive waste producers and owners so that they meet their operational and funding responsibilities in accordance with approved disposal plans; and

- Waste producers and owners are responsible, in accordance with the “polluter pays principle,” for the funding, organization, management and operation of disposal and other facilities required for their waste.

The policy framework recognizes that arrangements may be different for the three broad categories of radioactive waste found in Canada, namely, nuclear fuel waste, low-level radioactive waste, and uranium and mill tailings.

CNSC Regulatory Policy Managing Radioactive Waste (P-290).

This policy describes the philosophy that underlies the Canadian Nuclear Safety Commission's (CNSC) approach to regulating the management of radioactive waste and the principles that are taken into account when making a regulatory decision concerning radioactive waste management. The policy applies to all forms of radioactive waste, to all methods of waste management and to all stages of licensing. This leads to the concept that the safe long-term management should be taken into consideration right from the initial planning stages of the activity that generates the waste. When making regulatory decisions concerning the management of radioactive waste, it is the policy of the Canadian Nuclear Safety Commission to consider the extent to which the owners of the waste have addressed the following principles:

a) The generation of radioactive waste is minimized to the extent practicable by the implementation of design measures, operating procedures and decommissioning practices;
b) The management of radioactive waste is commensurate with its radiological, chemical and biological hazard to the health and safety of persons and the environment and to national security;
c) The assessment of future impacts of radioactive waste on the health and safety of persons and the environment encompasses the period of time when the maximum impact is predicted to occur;
d) The predicted impacts on the health and safety of persons and the environment from the management of radioactive waste are no greater than the impacts that are permissible in Canada at the time of the regulatory decision;
e) The measures needed to prevent unreasonable risk to present and to future generations from the hazards of radioactive waste are developed, funded and implemented as soon as reasonably practicable;
f) The trans-border effects on the health and safety of persons and the environment that could result from the management of radioactive waste in Canada are not greater than the effects experienced in Canada;
g) Promote harmonized regulation and consistent national and international standards for the management of radioactive waste; and
h) Achieve conformity with the measures of control and international obligations to which Canada has agreed concerning radioactive waste.

The first six principles provide for risk-informed regulation of radioactive waste management that includes maintaining current levels protection of persons and the environment into the future, with responsibility for that protection being accepted now, not left for future generations. They also address issues related to minimizing the generation of radioactive waste, implementing a life cycle approach to radioactive waste management and transboundary impacts of radioactive waste management in Canada.

The two last principles reflect the CNSC's commitment to harmonize its regulatory work with complementary jurisdictions within Canada and to meeting the international commitments regarding the regulation of radioactive waste to which Canada has agreed. This includes commitments to non-proliferation and to compliance with the requirements of the *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.*

The principles expressed in this policy are consistent with internationally-accepted principles of radioactive waste management such as those recommended in the IAEA's Safety Fundamentals document *The Principles of Radioactive Waste Management* [2].

Regulatory Policy for the Protection of the Environment, (P-233)

This Policy describes the principles and factors that guide the CNSC in regulating the development, production, and use of nuclear energy. It also covers the production, possession, and use of nuclear substances, prescribed equipment, and prescribed information to prevent unreasonable risk to the environment in a manner consistent with Canadian environmental policies, acts, and regulations and with Canada's international obligations. This policy applies to all regulatory decisions made by the Commission or its staff.

Each facility in Canada that stores radioactive waste or spent fuel has a monitoring program in place to ensure that radioactive discharges released to the environment are kept at an acceptable level. Samples are obtained at regular intervals at various locations around the site, and the results are analyzed for trends. The monitoring programs ensure the detection of any chronic radiation releases at very low levels and steps can then be taken to control the releases. As a condition of the licence, licensees submit the results of their monitoring programs to the CNSC at specific intervals described in the licence.

REGULATORY GUIDES RELATED TO RADIOCATIVE WASTE MANAGEMENT

This section discusses the key existing and planned regulatory guides that are related to the safe management of radioactive waste.

Siting, Concept Assessment and Safety Assessment of Radioactive Disposal Facilities

During the mid-eighties, the Atomic Energy Control Board (now the CNSC) issued a number of regulatory documents dealing with siting and safety assessment of Radioactive Waste Disposal Facilities. These documents have been developed to mainly address issues arising from the Canadian Nuclear Fuel Waste Management Program (CNFWMP), established in 1978, to develop a concept for nuclear fuel disposal.

The CNFWMP program led to a federal Environmental Assessment Panel (known as the 'Seaborn Panel') and the release of an Environmental Impact Statement for public review in 1995. The program was concluded in 1998 when the Government of Canada accepted the Seaborn Panel's recommendations to return to the Canadian public to determine what would be a socially acceptable long-term management strategy for nuclear fuel waste, effectively 'shelving' the disposal concept. In 2002 the *Nuclear Fuel Waste Act* came into force, requiring the owners of used nuclear fuel to establish the Nuclear Waste Management Office (NWMO). This Act tasks the NWMO to recommend to Canada's Minister of Natural Resources by November 2005 a long-term approach for managing used nuclear fuel that is socially acceptable, technically sound, environmentally responsible and economically feasible.

The content of these early regulatory documents included a number of requirements and technical guidance on the disposal concept and its assessment. However, with the coming into force of the NSCA (and its regulations) and the Nuclear Fuel Waste Act, the content of these documents is out of date or superseded in other regulatory documents. Therefore, they have been either withdrawn [R-104] or are under review [R-71, R-72] to better reflect the new legislation and current national approaches for the management of radioactive waste. Most of the requirements have been embedded in NSCA and its regulations. Guidance associated with the safety assessment of radioactive waste facilities is being updated and developed in a new draft regulatory guide G-320, which is discussed in the next section.

Draft Regulatory Guide on Assessing Long-term Safety of Radioactive Waste Management (G-320)

The purpose of this draft regulatory guide is to assist licensees and applicants assess the long-term safety of storage and disposal of radioactive wastes. It describes typical ways for assessing the impacts that radioactive waste storage and disposal methods could have on the environment and on the health and safety of people. The main topics addressed include:

- assessment methodologies;
- level of detail of assessments;
- confidence to be placed in assessment results;
- applying radiological and non-radiological criteria;
- defining critical groups for impact assessments;
- selecting time frames for impact assessments;
- setting post-decommissioning objectives;
- long-term care and maintenance considerations; and
- use of institutional controls.

The guidance is directed toward long-term assessments of safety and is based on current international practices and recommendations. The guidance is provided in a step by step manner reflecting the structure of the recommendations provided by the IAEA Research Coordinated Project on Improvement of Safety Assessment Methodologies for Near Surface Disposal Facilities, ISAM, [3].

Decommissioning and Financial Guarantees

Proponents and operators must provide guarantees that adequate financial and human resources are available for the decommissioning of radioactive waste management facilities and the management of the resulting radioactive wastes. Guidance on the preparation of plans for the decommissioning of activities licensed by the CNSC is provided in regulatory guide G-219. Proposed decommissioning plans must be sufficiently detailed in order to:

- Demonstrate that they will remediate all significant impacts and hazards to persons and the environment in a technically feasible fashion;
- Ensure that compliance with all applicable requirements and criteria established in acts, regulations, and other regulatory standards and guides is met; and
- Enable credible estimates of financial guarantees amounts.

Guidance on Financial Guarantees for the Decommissioning of Licensed Activities *is provided in* Regulatory Guide G-206. Financial guarantees must be sufficient to fund all approved decommissioning activities. The CNSC must be assured that it, or its agents, can access adequate funding measures upon demand if a licensee is not available to fulfill its obligations for decommissioning. Measures to fund decommissioning may involve various types of financial guarantees. Acceptable guarantees include: cash, letters of credit, surety bonds, insurance, and legally binding commitments from a government (either federal or provincial). The acceptability of any of the above measures will be ultimately determined by the CNSC on the basis of the following general criteria:

- *Liquidity*: The proposed funding measures should be such that the financial vehicle can be drawn upon only with the approval of the CNSC, and that pay-out for decommissioning purposes is not prevented, unduly delayed, or compromised for any reason.
- *Certainty of Value*: Licensees should select funding, security instruments, and arrangements that provide full assurance of their value.
- *Adequacy of Value*: Funding measures should be sufficient, at all or predetermined points in time, to fund the decommissioning plans for which they are intended.
- *Continuity*: The required funding measures for decommissioning should be maintained on a continuing basis. This may require periodic renewals, revisions, and replacements of securities provided or issued for fixed terms. Where necessary, to ensure that there is continuity of coverage, funding measures should include provisions for advance notice of termination or intent to not renew.

CONCLUSION

The Canadian Nuclear Safety Commission operates on behalf of the people of Canada as an independent competent authority responsible for regulating the use of nuclear energy and materials to protect health, safety, security and the environment and to respect Canada's international commitments on the peaceful use of nuclear energy. As an agency of the Federal Government dealing with public safety, not only is the CNSC obliged to entertain stakeholder involvement, but is continually seeking ways to improve its capability to engage stakeholders.

Regulation of radioactive waste is achieved within a well established regulatory framework where roles and responsibilities are clearly allocated, a clear and predictable licensing process that covers the entire life cycle of radioactive waste facilities and a comprehensive compliance program. CNSC regulatory documents are being reviewed and updated to reflect the new legislation and current national approaches for the management of radioactive waste.

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