



Radioactive Waste Management and Decommissioning

Discussion Paper DIS-16-03

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Preface

Discussion papers play an important role in the selection and development of the regulatory framework and regulatory program of the Canadian Nuclear Safety Commission (CNSC). They are used to solicit early public feedback on CNSC policies or approaches.

The use of discussion papers early in the regulatory process underlines the CNSC's commitment to a transparent consultation process. The CNSC analyzes and considers preliminary feedback when determining the type and nature of requirements and guidance to issue.

Discussion papers are made available for public comment for a specified period of time. At the end of the first comment period, CNSC staff review all public input, which is then posted for feedback on the CNSC website for a second round of consultation.

The CNSC considers all feedback received from this consultation process in determining its regulatory approach.

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Executive Summary

The Canadian Nuclear Safety Commission (CNSC) has a regulatory framework for radioactive waste management and the decommissioning of nuclear facilities. This framework consists of regulatory requirements and guidance set out in legislation, regulations, regulatory documents, standards and policies. It sets out requirements and guidance for:

- waste management programs that CNSC licensees must implement
- the licensing of: waste management activities and different types of waste facilities, such as repositories, waste storage facilities, waste processing facilities and uranium mine tailings sites; and the decommissioning, remediation and abandonment of all types of nuclear facilities, during which a licensed activity is brought to closure, often resulting in the need to disposition or manage large amounts of waste
- financial guarantees, which can be used to ensure that adequate resources will be available to decommission a licensed facility to an approved end state

As a responsible regulator, the CNSC is committed to continuous improvement of its regulatory framework and licensing processes. Although the CNSC's waste management framework provides adequate oversight to meet current needs, there are areas where clarity could be improved to help ensure the CNSC will continue to efficiently and consistently address its evolving responsibilities under its mandate.

This discussion paper seeks early feedback from stakeholders on the opportunities presented to improve the CNSC's regulatory framework for radioactive waste management and decommissioning. As the CNSC proceeds with any regulatory amendments or changes to regulatory documents, stakeholders will have additional opportunities for consultation on specific proposals. By consulting early, the CNSC is seeking to validate the need for improvements in various areas of the framework and to understand stakeholder views on preliminary proposals or issues.

The CNSC is also interested in stakeholder views on the potential impacts of the proposals described in this paper. Questions on impacts have been included throughout the paper.

Stakeholder feedback is being sought on opportunities identified in this paper to incorporate Canadian and international best practices and to update CNSC documents with more modern terminology. In addition, the CNSC is seeking to improve clarity and predictability for applicants and other stakeholders by clearly indicating the information that licence applicants are expected to submit.

This paper presents several proposed changes to CNSC regulations and supporting regulatory documents. These proposals fall into seven general areas:

1) **Defining waste types**

In the context of this document, "radioactive waste" is material containing nuclear substances for which a licence from the CNSC is required, which falls within the CNSC's mandate and that is considered to be waste by its owner. For clarity, the CNSC is considering adopting four main categories of waste as proposed in CSA N292.0-14, which are in turn, based on the International Atomic Energy Agency's (IAEA) GSG-1 Classification of Radioactive Waste. The proposed categories are low-level, intermediate-level and high-level radioactive waste, and uranium mine and mill tailings. These categories are based on the radioactive characteristics of the waste, as opposed to the source. Stakeholders are being asked for input on whether these definitions align well with the Canadian nuclear sector, to describe any impacts that formally adopting these definitions may have on their operations, or if there is an interest in greater clarity in any area.

2) Making “reduce, reuse, recycle” a requirement

While CNSC regulatory documents require licensees to minimize waste, the CNSC is considering a new regulatory requirement for licensees to apply the principle of “reduce, reuse, and recycle” (the 3R) in their waste management programs. Including this principle in regulation would reinforce the CNSC’s view that responsible waste management is an overarching guiding principle for licensees conducting nuclear operations.

3) Establishing record-keeping requirements

The CNSC is requesting feedback on a proposal that record-keeping requirements for waste management, storage and disposal operations for all licences should be consistent with Class I facilities; i.e., 10 years past the expiry of the last licence.

4) Licensing waste management and decommissioning operations

Currently, waste management facilities are licensed under the *Class I Nuclear Facilities Regulations*, waste management activities under the *Nuclear Substances and Radiation Devices Regulations*, and other applicable regulations. The CNSC believes that the existing framework can be clarified. Clarity and consistency will result from further codifying existing practices as they relate to waste management licensing. These may include developing comprehensive waste management regulations. Stakeholders are requested to provide feedback on these proposed options.

5) Increasing clarity of requirements for waste management programs

The CNSC proposes to better clarify waste management program requirements in regulations and regulatory documents. This would underscore the importance of the principles of sound waste management and bring Canada fully in line with international approaches for overseeing waste management. Stakeholders are being requested to provide feedback on possible consolidations and updates to CNSC requirements and guidance for waste management programs.

6) Regulating remediation activities

The CNSC is considering how remediation differs from decommissioning in that it is often done outside of lifecycle planning. To date, the CNSC has successfully regulated remediation activities within its existing framework. However, discussions with licensees conclude that the current process is unnecessarily time-consuming with respect to the risks associated with the activities. Furthermore, as international experience has grown, including the International Commission on Radiological Protection’s development of the concept of “reference levels”, the CNSC is looking to update its policies and guidance associated with regulating existing situations and accidents.

Another challenge related to remediated sites will be their long-term care and maintenance. The CNSC is seeking stakeholder feedback on the need for additional clarity in this area.

7) Releasing facilities and activities from CNSC licensing after decommissioning or remediation

Licences to abandon are used to release certain nuclear facilities from CNSC regulatory oversight after licensed activities are completed. To some, the term “abandonment” may not accurately reflect the appropriate release from CNSC licensing after a facility has undergone significant work to responsibly dispose of nuclear substances and to mitigate the hazards of a previously licensed activity. Additionally, issuing a licence to release a licensee from CNSC regulatory oversight may seem counter-intuitive to some stakeholders. The CNSC is interested in stakeholder views on whether it should consider other mechanisms to release from licensing.

Radioactive Waste Management and Decommissioning

1. Introduction

The Canadian Nuclear Safety Commission (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 regulates Canadian nuclear activities, from uranium mining to power generation, as well as industrial, medical and research applications of nuclear substances. The CNSC also regulates the processing, storage and disposal of the waste that results from these activities. Since all nuclear substances associated with licensed activities will eventually decay or become waste, their safe management must be considered when licensing nuclear activities. The CNSC also regulates facilities that process, store or dispose of radioactive waste and the remediation and management of legacy sites. In accordance with Canada's Radioactive Waste Policy Framework developed by Natural Resources Canada, it is the owners of radioactive waste who are responsible for the funding, organization, management and operation of disposal and other facilities required for their waste.

Radioactive waste in Canada is currently managed safely in accordance with CNSC requirements. In 2011, at the CNSC's request, the International Atomic Energy Agency (IAEA) performed a peer review of selected aspects of the CNSC's operations. One specific recommendation, R11, from its Integrated Regulatory Review Service (IRRS) was that the CNSC should improve its regulatory framework, including regulatory documents and guides for radioactive waste management to ensure that radioactive waste is managed consistently. The CNSC committed to reviewing its regulatory framework in response to this IRRS recommendation, and this discussion paper is a part of that review.

The industry has been developing more effective and comprehensive waste management programs to reduce the volume of operational wastes generated. Licensees are leaning towards more sophisticated methods of volume-reducing waste streams and processing methodologies to reduce the amount of waste requiring long-term management or disposal. In response to a variety of factors, the nuclear sector is looking at new options for waste disposal.

As the nuclear industry places increased focus on waste management, the CNSC's regulatory approach must also keep pace. The CNSC is seeking early feedback on opportunities to clarify the waste regulatory framework, to ensure that it continues to facilitate safe and effective regulatory oversight.

The current regulatory framework has allowed the CNSC to maintain safe and effective regulatory oversight in all the areas discussed here. Defining waste management as one of the CNSC's 14 safety and control areas has helped to highlight the importance of processes to assess, review, verify and report on regulatory requirements and performance related to waste. However, the CNSC currently relies on general regulatory authority to request information in support of licence applications. After 15 years of experience, the CNSC sees value in proceeding with separate waste management and decommissioning regulations to consolidate and clarify waste management requirements and to update expectations and guidance in regulatory documents.

The CNSC is committed to minimizing and avoiding the creation of new requirements as a result of this process. Rather, by codifying, clarifying and consolidating expectations, the CNSC is seeking to make it clearer for applicants how to produce licence applications that meet CNSC expectations. Additionally the CNSC's approach to regulating waste management will become more visible and easier for Canadians to understand.

2. Opportunities for Improvement

2.1 Defining waste types (waste categories)

Radioactive waste can be defined as materials within the CNSC's mandate that contain licensable quantities of nuclear substances for which no future use or benefit is foreseen. Just as there are a wide variety of uses for nuclear substances, the amounts, types, physical forms and hazards of radioactive waste also vary considerably. Consequently, radioactive waste can be subdivided into categories based on its characteristics, including hazard.

To increase clarity and consistency, the CNSC is proposing to formally adopt the waste categories as defined in CSA N292.0-14, *General Principles for the Management of Radioactive Waste and Irradiated Fuel*, for use in its regulatory framework. CSA N292.0-14 reflects international guidance from the IAEA, including IAEA General Safety Guide GSG-1, *Classification of Radioactive Waste*.

2.1.1 Proposed categories of radioactive waste

Internationally, numerical boundaries are not typically used to differentiate waste categories since the associated hazard is not based solely on the level of radioactivity. Many other factors are considered and help us characterize and manage the risks associated with a specific waste. Examples of these might be how quickly the specific radioactive elements in the waste will decay, or the degree of isolation and containment required to ensure both short- and long-term safety.

Much of this discussion, with input from industry, regulators, policy makers and other stakeholders, has already taken place in the development of CSA N292.0-14. This standard calls for four specific radioactive waste categories. Low-level, intermediate-level, and high-level waste categories are defined by specific constraints based on their overall characterization. The category of uranium mine and mill tailings is the only proposed waste classification defined by its source. Fundamentally, uranium tailings are very large volumes of long-lived, low-level waste, which often have other chemical hazards associated with them as a result of the milling process. These large volumes and associated chemical hazards present unique challenges, within the realm of safely managing and regulating radioactive waste. Internationally, uranium mine tailings are often classified as naturally occurring radioactive materials (NORM). This is not the case in Canada, which considers uranium tailings as part of the fuel cycle.

Proposed Categories of Radioactive Waste			
Limits	Low-level waste	Intermediate-level waste	High-level waste
Alpha	< 400 Bq/g average, but not exceeding 4000 Bq/g for individual packages	No limit	No limit
Long-lived beta/gamma¹	Ranges to tens of kBq/g and may be specific to the site and disposal facility.	No limit	No limit; typically levels of 10 ⁴ to 10 ⁶ TBq/m ³
Unshielded contact dose rate	< 2 mSv/h	>2 mSv/h	No limit

¹ Examples of long-lived beta/gamma include: C-14, Cl-36, Ni-63, Zr-93, Nb-94, Tc-99 and I-129.

Thermal power	None	< 2 kW/m ³	No limit
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1) **Low-level radioactive waste**

Low-level radioactive waste (LLW) contains material with radionuclide content above clearance levels, as defined in the *Nuclear Substance and Radiation Devices Regulations*, but has limited amounts of long-lived activity. LLW is generated from hospitals, laboratories and industry, as well as the nuclear fuel production cycle. This waste typically consists of contaminated protective clothing, rags, mops, filters, medical tubes, swabs, needles, syringes, laboratory animal carcasses and tissues, equipment, waste from refurbishment activities such as steam generators, and reactor water treatment residues, which all contain small amounts of short-lived radioactivity. Waste may also be produced during the manufacture of devices such as certain gauges, luminous watches, exit signs and smoke detectors, which contain radioactive material. These wastes are not particularly dangerous to handle if managed properly, but must be disposed of more carefully than conventional waste. LLW does not generally require significant shielding during handling and interim storage. Shielding refers to a barrier (like a concrete wall or protective clothing) between contaminated waste and workers. LLW may require isolation and containment for periods of up to 300 years. In the long term, LLW may be suitable for surface or near-surface storage; e.g. in a manner similar to that of a municipal landfill, but designed for nuclear waste.

By volume, about 90 percent of all radioactive waste is considered to be LLW. Despite this, LLW contains just 1 percent of the radioactivity of all radioactive waste generated.

Much of the waste in this category is safely stored until the radioactivity has decayed to levels below which the CNSC has any safety concerns about. It can then be disposed of by conventional means. This is referred to as delay and decay. This meets the 3R principle of “reduce” and helps licensees to appropriately manage contaminated wastes.

Proposed characterization

- Alpha: < 400 Bq/g average, but not exceeding 4000 Bq/g for individual packages
- Long-lived beta/gamma¹: Ranges to tens of kBq/g and may be specific to the site and disposal facility.
- Unshielded contact dose rate: < 2 mSv/h
- Thermal power: None

2) **Intermediate-level radioactive waste**

Intermediate-level radioactive waste (ILW) contains higher amounts of radioactivity and may require special shielding, both in the short and long term. It typically comprises resins, chemical sludge and reactor components from reactor refurbishment or decommissioning.

ILW makes up 7 percent of the volume of radioactive waste in Canada, and contains 4 percent of the radioactivity of all radioactive waste. Generally, short-lived waste, mainly from reactors, is isolated in engineered, near-surface facilities. Longer-lived waste; e.g., some radioactive sources used in radiation therapy, is stored in shielded surface or near surface facilities.

The owners of ILW are responsible for managing the waste they produce. This usually takes place onsite, within the facility. Intermediate-level radioactive waste that requires long-term management may also be returned to the manufacturer or transferred to an authorized waste management operator.

Proposed characterization

- Alpha: No limit
- Long-lived beta/gamma¹: No limit
- Unshielded contact dose rate: >2 mSv/h

- Thermal power: $< 2 \text{ kW/m}^3$

3) **High-level radioactive waste**

Most high-level radioactive waste (HLW) is used fuel from nuclear reactors. Other waste forms derived from irradiated nuclear fuel, such as waste from medical isotope production, can also exhibit similar characteristics and are also considered HLW. Irradiated nuclear fuel also contains significant quantities of long-lived radionuclides, requiring long-term isolation and containment. Irradiated fuel is currently transferred directly to pools of water to assist in cooling for several years. The water also acts as a shield from the radiation. After several years the used fuel is moved to “dry-storage” in shielded above-ground containers stored on the reactor site.

HLW is being safely managed by its owners, usually onsite. The inventory of HWL at any site is subject to strict security and verification by both the CNSC and the IAEA. HWL accounts for 95 percent of the total radioactivity of all nuclear waste.

Proposed characterization

- Alpha: No limit
- Long-lived beta/gamma¹: No limit, typically levels of 10^4 to 10^6 TBq/m^3
- Contact dose rate: No limit
- Thermal power: No limit

4) **Uranium mine and mill tailings**

Uranium mine and mill tailings (UMMT) are a specific type of radioactive waste generated during the mining and milling of uranium ore and the production of uranium concentrate. In addition to tailings, mining activities typically result in the production of large quantities of waste rock, as workings are excavated to access the ore body. The wastes contain long-lived activity that does not decrease significantly over extended time periods. UMMT are typically disposed of on site, which are often located in remote areas. For the long term, engineered placement in surface or near-surface facilities is considered a safe and practical option for wastes such as mine tailings and waste rock. In Canada, uranium mining generally takes place in remote areas.

Questions for stakeholders

- Do the definitions provided above align well with current usage within the Canadian nuclear sector?
- Should any waste categories be re-examined?
- If these categories were adopted within the CNSC regulatory framework, how would licensees operationalize the proposed definitions? That is, how would they demonstrate/ensure that their waste management programs comply with the proposed definitions?
- What would be the impact on licensees or other stakeholders if the CNSC adopted these definitions for use within its regulatory framework; e.g. by referencing or including them in regulations or regulatory documents?

2.1.2 Other types of waste

Hazardous waste is defined in the *General Nuclear Safety and Control Regulations* as waste, other than a nuclear substance, used or produced in the course of carrying on a licensed activity that may pose a risk to the environment or the health and safety of persons. This waste may be comprised of substances that are not radioactive, but are toxic, flammable or corrosive and may require special treatment in order to achieve safe disposal.

Conventional waste is not defined, but generally includes non-hazardous, inert materials produced as a result of the regulated activity.

Mixed wastes are those with mixed properties, usually hazardous waste combined with radioactive waste. Mixed wastes require special management and storage provisions because of their unique chemical, toxicological, physical and nuclear properties.

Although some areas of this paper deal exclusively with radioactive waste, hazardous and conventional waste management also requires careful planning and implementation by the CNSC's licensees. Consequently, stakeholder opinions are being requested on the need for greater clarity regarding these types of waste within the CNSC's regulatory framework.

Questions for stakeholders:

- Should the CNSC revise or clarify the types of waste described above?
- Are there other types of waste that the CNSC should describe or define?

2.2 Making “reduce, reuse, recycle” a requirement

The CNSC is considering a new regulatory requirement for licensees to apply the principle of “reduce, reuse, and recycle” in their waste management programs. This principle is already reflected in P-290, *Managing Radioactive Waste*, and has long been viewed as a best practice in the nuclear and other industrial sectors. Including this principle in regulation would reinforce the CNSC's view that responsible waste management is an overarching guiding principle for licensees conducting nuclear operations. Stakeholder opinions are being requested on the need for and the potential impact of codifying this requirement within the regulations made under the *Nuclear Safety and Control Act* (NSCA).

Questions for stakeholders:

- Should the CNSC reinforce the importance of “reduce, reuse, recycle” in regulations?
- The CNSC is of the view that licensees are already applying “reduce, reuse, recycle” in their waste management programs. If there are significant compliance or administrative costs associated with this proposed new regulatory requirement, please describe the nature of these costs.

2.3 Establishing record-keeping requirements for waste operations

Some waste management licences are currently issued under the *Nuclear Substances and Radiation Devices Regulations*, while others are issued under the *Class I Nuclear Facilities Regulations*. The requirements for record-keeping under these two licensing methods are not the same. The CNSC proposes that all licences issued to waste management and storage operations have record-keeping requirements that are consistent with those for Class I facilities; i.e., 10 years past a licence's expiry.

Subsection 14(1) of the *Class I Nuclear Facilities Regulations* specifies the records to be retained for Class I nuclear facilities. They include records for effluent and environmental monitoring programs; operating and

maintenance procedures; commissioning programs; inspection and maintenance programs; the nature and amount of radiation, nuclear substances and hazardous substances within the nuclear facility; and the status of each worker's qualifications, requalification and training programs.

Record-keeping requirements are prescribed for nuclear substances regulated under the *Nuclear Substances and Radiation Devices Regulations*, but not all provisions relevant to waste management facilities are specified (such as those associated with facility design, operations or environmental protection). Currently, requirements for record keeping of these facility types are imposed through the *General Nuclear Safety and Control Regulations*, which provide a record retention period of one year past the expiry of a licence if no other period is specified.

Additionally, given the long timelines associated with waste management, business resumption planning should be clarified in order to preserve critical information, such as location, characteristics, inventories and how waste is stored (e.g., when inventory records have been lost due to fire or flood, and duplicate records are not available). Clarifying CNSC expectations for the safe storage of records, and more importantly, the protection of information, will potentially save licensees significant time and expense if records are lost. From a radiation protection perspective, protecting records and keeping duplicates of records about the nature of a waste could avoid the need for a waste re-characterization. If records were lost, then staff would need to re-inspect the waste in order to determine the nature of the waste again, which would entail additional radiation doses to workers when they do that re-characterization. This compromises the As Low As Reasonably Achievable (ALARA) principle, since that additional dose could have been avoided had there been duplicate records in another location.

For disposal facilities, information should be kept long after the facility is closed to inform future generations about the presence, location, inventory, performance expectations and design of the closed facility.

Consequently, the CNSC is proposing to consolidate and update record-keeping requirements for all waste facilities in regulations, to ensure clarity and consistency in their application. Taking into account the issues described previously, the CNSC proposes that records associated with waste management facilities provide appropriate information for longer retention periods than for other nuclear facilities and that unique record-keeping provisions for business resumption planning and repositories be required. Stakeholder opinions are being sought regarding the need for greater clarity regarding these important records within the CNSC's regulatory framework.

Questions for stakeholders:

- Should the CNSC standardize the minimum record retention period for all waste management and storage facilities? What should be the minimum retention period after a licence expires?
- Are there other considerations (e.g. administrative costs) that the CNSC should take into account when setting record-keeping requirements for disposal facilities?

2.4 Licensing of waste management and decommissioning operations

At this time, the CNSC does not intend to create new classes of licences, nor create new requirements for existing licences.

Determining which of the CNSC's regulations apply to a waste management operation is currently based on the total activity in the waste or where the waste was generated. For example, most decommissioned uranium tailings sites are licensed under the *Nuclear Substances and Radiation Devices Regulations* because their total radioactive inventory is below the Class 1 threshold of 10^{15} Bq. Some uranium tailings sites are regulated under the *Class I Nuclear Facilities Regulations* because their total radioactive inventory is above the 10^{15} Bq threshold. The ongoing and anticipated activities at these sites, and the risks associated with all of

these sites, are fundamentally the same. While this approach has worked for many facilities, it may not be the most efficient way to manage the risks posed by the operational complexities of potential future waste facilities.

The existing *Class I Nuclear Facilities Regulations* currently provide for the licensing of waste disposal facilities (repositories). However, these facilities will not undergo typical decommissioning or abandonment phases common to other Class I facilities, and their safety cases must be developed and extended to include timeframes associated with both the operational and post-closure period. Licence application requirements could be developed to more clearly reflect the unique aspects of a repository lifecycle.

The CNSC is considering whether new waste regulations could better align licence application requirements with the risk and nature of the proposed activities, including the unique licence application requirements specific to repositories. Licence application requirements are proposed for the following three types of waste operations and activities:

2.4.1 Licensing requirements for waste disposal facilities (repositories)

These are facilities for the disposal of waste nuclear substances (regardless of inventory) where there is no foreseeable intention of future retrieval; for example, waste repositories or uranium tailings sites. Licence application requirements would be geared towards the risk of the activity over the facility's lifetime, including the construction, operation, closure and post-closure phases.

2.4.2 Licensing requirements for waste management facilities

These are facilities (other than repositories) for the management and/or processing of waste nuclear substances where the inventory is greater than 1×10^{15} Bq. As under the existing Class I regulations, licensing phases would include: prepare site, construct, operate, decommission and abandon. Activities that could be conducted at these sites are laid out in paragraphs 26(a), (b) and (e) of the NSCA. Licence application requirements would generally align with existing requirements in the *Class I Nuclear Facilities Regulations*, but better reflect the variable risks of different types of operations.

2.4.3 Licensing requirements for waste storage facilities

This category includes the management and/or processing of waste nuclear substances at facilities or locations (other than repositories and tailings disposal sites), with an inventory not exceeding 1×10^{15} Bq. Activities that could be authorized are set out in paragraphs 26(a) and (b) of the NSCA. Licence application requirements would align with existing requirements in the *Nuclear Substances and Radiation Devices Regulations*, but would better reflect the variable risks of different types of operations. These requirements could include information on facility design and operation programs in cases where safety relies on the structures and components.

Consequently, the CNSC proposes to develop licence application requirements for waste facilities and activities that are based on the risk of the proposed operations.

Stakeholder opinions are being requested on the proposed approach, the need for clearer regulation, and the value of waste management specific regulations for waste operations within the CNSC's regulatory framework.

Questions for stakeholders:

- Should the CNSC clarify its licence application requirements for different types of waste operations? What are your comments on the proposals above?
- Waste management and storage facilities are currently subject to the *Class I Nuclear Facilities Regulations* when they have an inventory greater than 1×10^{15} Bq. Does this continue to provide an effective, safe and practical point to distinguish between a Class I facility and other waste operations?
- The CNSC is of the view that classifying facilities as described above would improve clarity by codifying the application requirements now addressed by using the “any other information” clause. If there are any new compliance or administrative costs associated with the proposals above, please describe the nature of these costs.

2.5 Waste management program requirements

The CNSC proposes to clarify waste management program requirements in regulations and regulatory documents. This would underscore the importance of the principles of sound waste management, and increase alignment with international approaches for overseeing waste management.

Currently, regulations made under the NSCA provide authority to require all licensees to develop and implement waste management programs. However, these requirements could be made clearer and more consistent, using modern terminology.

The intent of this guidance would not be to duplicate information already provided to the CNSC in a management system. However, it may be useful to clarify specific waste management expectations for all stakeholders.

Waste management is a core safety and control process for most licensed activities. It starts in the planning phase of a facility or activity and continues through to final decommissioning. It also plays an important role in optimizing activities during remediation programs for planned activities and unplanned events. Licensees are required to develop, implement and maintain waste management programs.

While the details of individual waste management programs may vary to address site-specific conditions, all are designed to meet the same common principles namely the need for waste minimization, re-use and recycling. Additionally, the overall objective of a waste management program remains the same: the protection of people and the environment from the potential hazards arising from waste production and management, both in the present and for the future.

The CNSC is committed to creating as few new requirements as possible. Rather, by codifying, clarifying and consolidating expectations, the CNSC seeks to make it clearer for applicants how to develop waste management programs that meet its expectations. Additionally, the CNSC’s approach to regulating waste management will become more visible and easier for Canadians to understand.

Licence application requirements for waste management are currently found in several locations; for example:

- Paragraph (3)(1)(j) of the *General Nuclear Safety and Control Regulations* requires all licence applications to contain “the name, quantity, form, origin and volume of any radioactive waste or hazardous waste that may result from the activity to be licensed, including waste that may be stored, managed, processed or disposed of at the site of the activity to be licensed, and the proposed method for managing and disposing of that waste.”
- Paragraph 3(c) of the *Uranium Mines and Mills Regulations* specifies several licence application requirements associated with waste management, such as “a description of the proposed waste

management system”, which is defined as “a system for collecting, transporting, receiving, treating, processing, storing or disposing of the wastes that are produced as a result of the licensed activity at a uranium mine or mill.”

- The *Class I Nuclear Facilities Regulations* do not specify detailed waste provisions in their licence application requirements. However, they do require information on all proposed measures, policies, methods and procedures for operating and maintaining a nuclear facility, and the handling, storing and release of nuclear and hazardous substances.

Several CNSC regulatory documents and CSA Group standards also provide information. These include:

- P-290, *Managing Radioactive Waste* (CNSC)
- RD/GD-370, *Management of Uranium Mine Waste Rock and Mill Tailings* (CNSC)
- G-320, *Assessing the Long Term Safety of Radioactive Waste Management* (CNSC)
- CSA N292.3-14, *Management of low- and intermediate-level radioactive waste*
- CSA N292.2-13, *Interim Dry Storage of Irradiated Fuel*
- CSA N292.0-14, *General principles for the management of radioactive waste and irradiated fuel*

CNSC licences contain conditions requiring responsible waste management practices. While these conditions may be specific to a particular site or activity, many reflect general principles.

The CNSC is planning to consolidate P-290, RD/GD-370 and G-320, and update their information; for example, by clarifying waste definitions and categories. This is not intended to create any new requirements for existing licensees.

Questions for stakeholders:

- In what areas does the CNSC need to clarify its requirements for waste management programs?
- Are there any specific comments on the proposed activities above?
- The CNSC is of the view that licensees are already implementing these requirements, although they have not yet been codified in the regulatory framework. If there are significant compliance or administrative costs associated with the requirements described, please describe the nature of these costs.

2.6 Regulating remediation activities

Unlike decommissioning, remediation is often done outside of lifecycle planning. The process of remediation is often reactive and planned with much less information, years after operations cease at a facility. Remediation activities often take place at a location that was not under a modern licence, and the site exists after being orphaned, abandoned, or as a result of an offsite accident. Furthermore, it is often not the original operator who is proposing remediation activities. In any case, regulatory oversight of remediation activities must be clear, fair and commensurate with the risks involved.

Currently, contaminated lands that existed before the NSCA came into force may require regulatory oversight if the concentration of nuclear substances is greater than the exemption or clearance limits prescribed in the *Nuclear Substances and Radiation Devices Regulations*. Remediation is not explicitly covered in the NSCA or its regulations; however, under the NSCA and regulations, no one shall possess, manage or store (among other activities) nuclear substances, above the exemption quantities without a licence. To date, the type of licence and the requirements for licensing have been determined by the inventory. Sites that likely contain more than 10^{15} Bq of radionuclides are considered under the *Class I Nuclear Facilities Regulations*, while the remaining sites take their licence application requirements from the *Nuclear Substances and Radiation Devices Regulations*.

The risk associated with existing legacy situations has often been understood, but difficult to accurately model. Decisions about these legacy sites must be made in the absence of the knowledge that would be present when licensing a modern facility throughout its lifecycle.

When dealing with legacy sites, the CNSC has relied on the *General Nuclear Substances and Control Regulations*, paragraph 3(1)(m), which allows “any other additional information” to be requested as part of a licence application. The CNSC has been successful in regulating remediation activities within the existing framework. Additional clarity and documented definitions result in fewer delays for licence applicants.

Since the NSCA came into force in 2000, the CNSC has gathered extensive experience in regulating the remediation of existing situations. During this same time period, the international community has become more aware of the complexities associated with legacy site remediation and the long-term management implications of many of these sites. Major legacy challenges in other countries have been addressed, and numerous international efforts have identified the interim- and long-term regulatory approaches to existing situations. The International Commission on Radiation Protection (ICRP) has developed the concept of “reference levels” to address the decision-making challenges associated with regulating existing situations and accidents (ICRP Publication 111).

Major decisions related to remediated sites will be required in the future as these sites will likely enter institutional control programs for their long-term care and maintenance. The CNSC seeks stakeholder feedback on the desirability for additional clarity in this area.

Questions for stakeholders:

- Is there a need for the CNSC to define the concepts of remediation, legacy site, existing situation, and reference levels?
- Are there other definitions that may be useful to the consideration of the requirements for long-term management of remediated sites?
- Is there a need for an alternative process to the issuance of a licence to perform remediation for existing situations?
- Are there any additional comments on the proposals above?

2.7 Release from licensing after decommissioning or remediation

The CNSC is evaluating if existing regulatory approaches intended to release a nuclear facility from its regulatory oversight after decommissioning or remediation are still the most efficient and effective.

CNSC staff are interested in feedback on the need to clarify the concept of abandonment, which may not convey the intent of the regulatory activities. Some may interpret the word “abandon” to mean that a nuclear facility, prescribed equipment or information is simply being left unregulated, with potential hazards remaining. This perception may be reinforced by the fact that some legacy sites were abandoned in the past without proper environmental remediation. It may also seem counter-intuitive to some stakeholders to issue a licence for what is, in effect, the cessation of a licence or the release from regulatory control under the NSCA.

The NSCA currently prohibits abandoning a nuclear facility except in accordance with a licence. This means that the CNSC must review the results of the decommissioning or remediation process and be satisfied that any remaining risks to health, safety and the environment have been appropriately mitigated. The *General Nuclear Safety and Control Regulations* contain application requirements for licences to abandon, which apply to all nuclear facilities, nuclear substances, prescribed equipment and prescribed information. The *Class I and Uranium Mine and Mill Regulations* specify additional application requirements for licences to abandon.

An alternative process to a licence to abandon could be developed, continuing to provide a clear end point for CNSC regulatory oversight and an assurance that all health and safety aspects at the site have been properly addressed. While serving the same function as a licence to abandon, an alternative process may create more clarity about the end of a facility's lifecycle.

For example, a licence revocation (or other) process could be implemented for end-of-life situations with application requirements being defined in regulation. A licensee who has completed a decommissioning or remediation process would apply to have their licence revoked, instead of applying for a licence to abandon. This would allow the CNSC to verify satisfactory completion of the decommissioning or remediation process, and to consider the transfer of the facility to institutional control (if approved by the Commission). Certain licence revocation requirements already exist, but are not currently employed in this manner.

An example of application requirements for a licence revocation could be, but not limited to:

- a summary of the results of the decommissioning or remediation, including the name and location of the land, and any remaining buildings, structures, components and equipment and the manner in which these will be dispositioned
- the results of environmental monitoring programs
- any residual effects on the environment and the health and safety of persons, and the measures that will be taken to prevent or mitigate those effects
- the proposed public information program and disclosure protocol to inform persons living in the vicinity of the site when the end of decommissioning or remediation has been reached and the plan for the site post-decommissioning
- if applicable, a copy of any administrative agreement between the applicant and another regulatory authority concerning the post-decommissioning/remediation management or administration of the site (institutional control).

If a facility is demonstrated to be below CNSC regulatory concern, there should be no problem releasing it from CNSC regulatory control. However, some decommissioned or remediated sites may require continuous, long-term management of the site to ensure site safety. This long-term institutional control is often assumed by a central government agency. Currently, the CNSC may exempt sites under Section 7 of the NSCA. However, this applies to sites where nuclear substances are below levels required for exemption and may not be applicable to the long-term institutional control of certain sites. The requirements for the transfer of residual CNSC regulatory responsibility to an institutional control agency should be defined in order to explore this as an option for the long-term management of decommissioned or remediated nuclear sites.

Questions for stakeholders:

- Is there a need for the CNSC to clarify the role of a licence to abandon in a nuclear facility's lifecycle?
- Is "abandon" the appropriate term to use for a nuclear facility that has successfully completed a decommissioning or remediation process and no longer requires CNSC oversight?
- Is there a need for an alternative process to the issuance of a licence to abandon for nuclear facilities when they reach the end of their lifecycle, but still require long term care and maintenance?
- Are there any additional comments on the proposals above?

3. How to Participate

The discussion paper seeks early feedback on the opportunities presented to improve the CNSC's regulatory framework for waste and decommissioning.

The CNSC seeks comments from all interested parties, and is interested in stakeholder views on the impacts of the proposals described in this paper. Questions on impacts have been included throughout the paper. Additional views are welcome.

If the CNSC proceeds with any regulatory amendments or changes to regulatory documents, additional opportunities for consultation on specific proposals will be available to stakeholders. By consulting early, the CNSC is seeking to validate the need for improvements in various areas of the framework and to understand stakeholder views on preliminary proposals.

Please submit your comments or feedback to:

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