

Oversight of Canada's Framework for Radioactive Waste Management

April 2018

What is radioactive waste?

Radioactive waste is defined as any material (liquid, gaseous or solid) that contains a radioactive nuclear substance for which the owner has no foreseen use and which is determined to be a waste product. In Canada, nuclear facilities produce a range of radioactive waste, such as uranium mine waste and mill tailings, medical isotope waste, used nuclear fuel, decommissioning waste, industrial waste and cleaning material contaminated with low levels of nuclear substances. All the radioactive waste in Canada, including used nuclear fuel, is currently held in safe, secure and environmentally sound interim storage facilities.

In all licensed activities in Canada, the waste producers are required to manage the waste in a safe and secure manner and to make arrangements for the long-term management of the waste.

Policy framework for radioactive waste management

The Government of Canada's [Radioactive Waste Policy Framework](#) sets the stage for institutional and financial arrangements to manage radioactive waste in a safe, comprehensive, environmentally sound, integrated and cost-effective manner. The Framework recognizes that long-term management arrangements may be different for various categories of radioactive wastes, such as used nuclear fuel, low- and intermediate-level radioactive waste, and uranium mining and milling waste. The framework specifies that:

- the Government of Canada is responsible for developing policy and for regulating and overseeing radioactive waste producers and owners to ensure that they comply with legal requirements and they meet their funding and operational responsibilities in accordance with approved long-term waste management plans
- in accordance with the "polluter pays" principle, waste owners are responsible for the funding, organization, management and operation of the facilities required to safely manage their wastes over the short and long terms

In 2002, Parliament passed the [Nuclear Fuel Waste Act](#) (NFWA), making the owners of used fuel responsible for the development of long-term waste management approaches. The legislation required nuclear energy corporations to establish a waste management organization as a separate legal entity to manage the full range of long-term used fuel management activities. It also required the organization to prepare and submit a study to the Government of Canada on proposed approaches for the long-term management of the waste. Under the NFWA, the Government of Canada is

Quick facts

- The three Rs apply to the management of radioactive waste: **reduce, reuse and recycle.**
- The CNSC supports the principle of good waste management practices in the nuclear industry to reduce the volume of radioactive waste requiring storage.
- The CNSC's policy on managing radioactive waste requires that waste owners put in place design measures, operating procedures and decommissioning practices to minimize radioactive waste.
- The Government of Canada and the nuclear industry are developing solutions for long-term radioactive waste management that protects the health, safety and security of persons and the environment.

responsible for reviewing the study prepared by the waste management organization, selecting a long-term management option from those proposed and ensuring oversight during its implementation.

In accordance with the NFWA, the [Nuclear Waste Management Organization](#) (NWMO) was established in 2002 by Canada's nuclear electricity producers. The NWMO assumed responsibility for designing and implementing Canada's plan for the safe, long-term management of used nuclear fuel through deep geological repositories, among other solutions. After a comprehensive three-year study and public engagement, the Government of Canada selected the NWMO's [Adaptive Phased Management](#) approach for the safe and secure long-term management of used nuclear fuel.

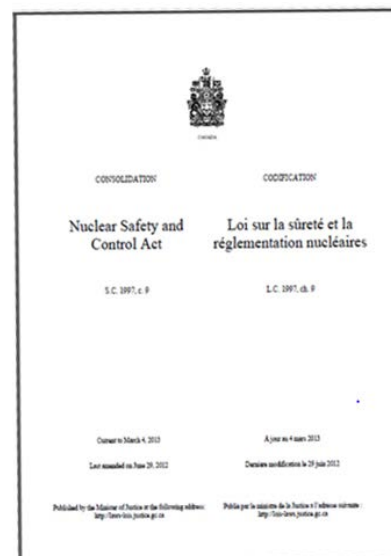
[Natural Resources Canada](#) (NRCan) is the lead government department responsible for developing and implementing federal nuclear energy policy across the nuclear supply chain – from uranium mining to the final disposition of waste. This includes the uranium and radioactive waste policy, legislation development and implementation, and the establishment and management of a nuclear civil liability and compensation regime. NRCan administers the *Nuclear Fuel Waste Act* and the Radioactive Waste Policy Framework on behalf of the Minister of Natural Resources.

The nuclear industry is also subject to the [Canadian Environmental Assessment Act, 2012](#), the [Canadian Environmental Protection Act](#), and the [Fisheries Act](#).

Regulatory framework for radioactive waste management

The [Nuclear Safety and Control Act](#) (NSCA) is the enabling legislation for the regulatory framework. The NSCA provides legislative authority that covers the nuclear sector regulatory developments. These developments include health and safety standards for nuclear energy workers, environmental protection measures, security regarding nuclear facilities and public input into the licensing process. Regulations made under the NSCA are legally binding under the Act.

The [Canadian Nuclear Safety Commission](#) (CNSC) is Canada's nuclear regulatory body, created under the NSCA. The CNSC's mandate is to regulate the use of nuclear energy and materials to protect health, safety, security and the environment; to implement Canada's international commitments on the peaceful use of nuclear energy; and to disseminate objective scientific, technical and regulatory information to the public. The CNSC reports to the Parliament of Canada through the Minister of Natural Resources. It is not part of Natural Resources Canada; however, the Minister of Natural Resources can seek information from the CNSC on its activities. Under the NSCA, the Governor in Council may issue to the Commission directives of general application on broad policy matters. The Governor in Council cannot give direction to the Commission on specific licensing matters.



The CNSC is a federal regulatory agency and an independent administrative tribunal set up at arm's length from the government, with no ties to the nuclear industry. To serve Canadians, the ultimate outcome of the CNSC's work must be the establishment of safe and secure nuclear installations and processes solely for peaceful purposes and public confidence in the nuclear regulatory regime's effectiveness.

The CNSC licenses, monitors and inspects nuclear facilities, including radioactive waste management facilities in order to protect the health, safety and security of Canadians and the environment. The CNSC operates within a modern and robust [legislative and regulatory framework](#). This framework consists of laws passed by the Parliament of Canada that govern the regulation of activities of Canada's nuclear industry. The regulatory framework also includes instruments such as regulations, licences and regulatory documents.

Consultation with the public, Indigenous communities and other stakeholders is an important part of the process for the CNSC in the development of [regulatory tools and the framework](#). All draft documents are made available for public feedback and all comments are posted on the CNSC website.

How does the CNSC regulate radioactive waste?

As Canada's nuclear regulator, the CNSC is responsible for licensing the management of radioactive waste, including its transport and storage. Since all nuclear substances associated with licensed activities will eventually become radioactive waste, the safe long-term management of that radioactive waste is considered during the review process for any licensed activity or facility.

The CNSC's regulatory approach for radioactive waste stems from the NSCA and is articulated in CNSC documents [P-299, *Regulatory Fundamentals*](#), [P-290, *Managing Radioactive Waste*](#), [RD/GD-370, *Management of Uranium Mine Waste Rock and Mill Tailings*](#), and [G-320, *Assessing the Long Term Safety of Radioactive Waste Management*](#). In developing these documents, the CNSC draws upon recommendations of the International Atomic Energy Agency (IAEA) and best practices from the international and national community.

CNSC staff actively participate in the development of international and national standards with respect to radioactive waste. CNSC experts sit on the IAEA's Waste Safety Standards Committee, the Nuclear Energy Agency's Radioactive Waste Management Committee, and the [CSA Group N292](#) technical committee on radioactive waste.

In July 2004, the CNSC issued regulatory policy P-290, *Managing Radioactive Waste*, following extensive consultation with the public and industry stakeholders. The policy outlines the philosophy and six principles that govern the CNSC's regulation of radioactive waste. It is fully consistent with the federal Radioactive Waste Policy Framework. P-290 identifies the need for long-term management of radioactive and hazardous waste arising from licensed activities.

The policy statement in P-290 defines radioactive waste as any form of waste material containing a nuclear substance as defined in the NSCA. This definition is sufficiently comprehensive to include used fuel without any other special consideration. The policy indicates that, when making regulatory decisions about the management of radioactive waste, the CNSC will seek to achieve its objectives by considering certain key principles in the context of the facts and circumstances of each case, as follows:

- The generation of radioactive waste is minimized to the extent practicable by the implementation of design measures, operating procedures and decommissioning practices.
- The management of radioactive waste is commensurate with its radiological, chemical and biological hazard to the health and safety of persons, the environment and to national security.
- The assessment of future impacts of radioactive waste on the health and safety of persons and the environment encompasses the period of time in which the maximum impact is predicted to occur.
- 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.
- The measures needed to prevent unreasonable risk to present and future generations from the hazards of radioactive waste are developed, funded and implemented as soon as reasonably practicable.
- The transborder effects on the health and safety of persons and the environment, which could result from the management of radioactive waste in Canada, are not greater than the effects experienced in Canada.

Did you know?

- The CNSC's commitment to international standards and best practices ensures that the management of radioactive waste in Canada meets the highest standards for health, safety, security and environmental protection.
- The CNSC monitors and inspects nuclear waste sites and waste management facilities to ensure compliance with nuclear safety regulations.
- The CNSC ensures that proper security measures are in place for nuclear facilities and that nuclear sector workers' health is protected.

The principles contained in P-290 are consistent with those recommended by the International Atomic Energy Agency (IAEA). P-290 also recognizes the CNSC's commitment to optimizing regulatory efforts, stating that the CNSC should consult and cooperate with provincial, national and international agencies to:

- promote harmonized regulation and consistent national and international standards for the management of radioactive waste
- achieve conformity with the measures of control and international obligations to which Canada has agreed concerning radioactive waste

Under the CNSC's non-prescriptive approach to regulation, the applicant proposes a waste management approach, supported by scientifically defensible benchmarks. The CNSC then assesses the proposal against existing regulatory requirements to ensure the health, safety and security of the public and the protection of the environment.

Classification of radioactive waste in Canada

The CSA Group – in collaboration with industry, government and the CNSC – developed a standard that includes a radioactive waste classification system (CSA 292.0-14), which takes into account [IAEA safety guide GSG-1, Classification of Radioactive Waste](#), along with the needs of the Canadian industry. Published in 2014, CSA 292.0-14 recognizes four main classes of radioactive waste:

- high-level radioactive waste (HLW)
- intermediate-level radioactive waste (ILW)
- low-level radioactive waste (LLW)
- uranium mine and mill waste

The radioactive waste classification system is organized according to the degree of containment and isolation required to ensure safety in the short and long terms. The classification system also takes into consideration the hazard potential of different types of radioactive waste. In annex A (informative) of CSA N292.0-14, the CSA Group outlines the following radiological parameters for the classification of radioactive waste:

Limits	Low-level waste	Intermediate-level waste	High-level waste	Uranium mine and mill tailings
Examples	Contaminated equipment from operations and decommissioning	Ion exchange resins, radioactive sources used in radiation therapy	Used nuclear fuel, fission product waste from medical processes, waste generated from reprocessing	The wastes contain long-lived activity that does not decrease significantly over extended time periods
Alpha	< 400 Bq/g average, but not exceeding 4000 Bq/g for individual packages	No limit	No limit	
Long-lived beta/gamma	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	
Thermal power	negligible	< 2 kW/m ³	No limit	

Regulatory framework for decommissioning

In accordance with CNSC regulatory guide [G-219, Decommissioning Planning for Licensed Activities](#), Class I nuclear facilities and uranium mines and mills licensees are required to keep decommissioning plans up to date throughout the lifecycle of a licensed activity. In addition, the CNSC requires that all licensees implement [financial guarantees](#) to cover the cost of decommissioning work resulting from the licensed activities. Decommissioning plans that assume the need for

post-closure licensing, monitoring, surveillance and maintenance of the decommissioned activities must include financial provisions for these actions.

The CNSC requires licensees to prepare a preliminary decommissioning plan (PDP) and a detailed decommissioning plan (DDP) for approval. The PDP must be filed with the CNSC as early as possible in the lifecycle of the activity or facility and must be reviewed and updated:

- every five years
- when operational experience is gained or technological advancements are made
- when requested by the Commission or a person authorized by the Commission

In the case of nuclear facilities, specific requirements for decommissioning planning are set out in the CNSC regulations for Class I and Class II nuclear facilities and for uranium mines and mills.

The PDP documents the preferred decommissioning strategy – whether it is prompt decommissioning, deferred decommissioning or *in situ* confinement – along with objectives at the end of decommissioning. The plan should be sufficiently detailed to assure the proposed approach is technically and financially feasible. It must also be in the interests of health, safety, security and environmental protection. The plan defines areas to be decommissioned, the general structure and the sequence of the principal decommissioning work envisioned, and it includes proposed strategies for managing all waste. The licensee's financial guarantee must cover the projected cost of the waste management option proposed.

The DDP is filed with the CNSC prior to decommissioning and is required for appropriate licensing action (i.e., licence to authorize decommissioning). The DDP refines and adds procedural and organizational details to the PDP.

The CSA Group standard, *Decommissioning of Facilities Containing Nuclear Substances*, states that strategies for waste management must consider and prioritize the recycling or reuse of equipment and materials to reduce the volume of radioactive waste. Minimizing radioactive waste is also a key principle in the CSA standard on the management of low- and intermediate-level radioactive waste which specifically refers to the development of a waste management program to reduce the overall volume of radioactive waste requiring long-term management. The program may include features such as delay and decay, as well as conditional and unconditional clearance.

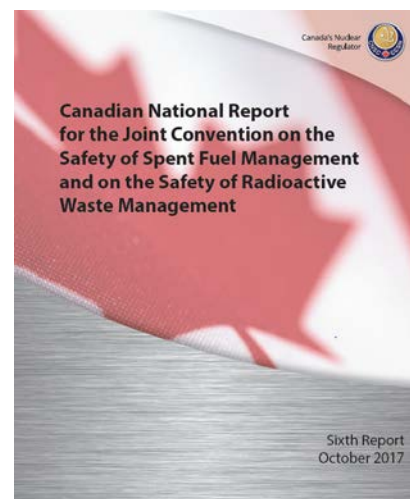
Decommissioning strategies are not prescribed by the CNSC. Proponents must propose their preferred strategy as part of their PDP and must support it with a safety case. Any proposed decommissioning strategy will be assessed by the CNSC against regulatory requirements to ensure the protection of health and safety of the public and the environment.

The following preliminary decommissioning plans for nuclear power plants and associated waste management facilities are available to the public and posted on the licensees' websites:

- Ontario Power Generation - [Darlington Nuclear Generating Station](#)
- Ontario Power Generation - [Pickering Nuclear Generating Station](#)
- Ontario Power Generation - [Bruce Nuclear Generating Station](#)

International obligations

Canada is a signatory to the [Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management](#) (Joint Convention), an international agreement governing all aspects of spent fuel and radioactive waste management. The Joint Convention is a legally binding treaty that aims to ensure worldwide safe management of radioactive waste. It represents the participating countries' commitment to achieving and maintaining a consistently high level of safety in the management of spent fuel and radioactive waste as part of the global safety regime for ensuring the protection of people and the environment. The Joint Convention allows for the peer review of a country's radioactive waste management programs. Prior to the peer review, Canada submits a national report demonstrating the measures taken to implement the agreement's obligations. [Canada's national reports for the Joint Convention](#) are published every three years.



Other organizations involved in the nuclear industry

In addition to Natural Resources Canada and the CNSC, the major Government of Canada organizations involved in the Canadian nuclear industry include:

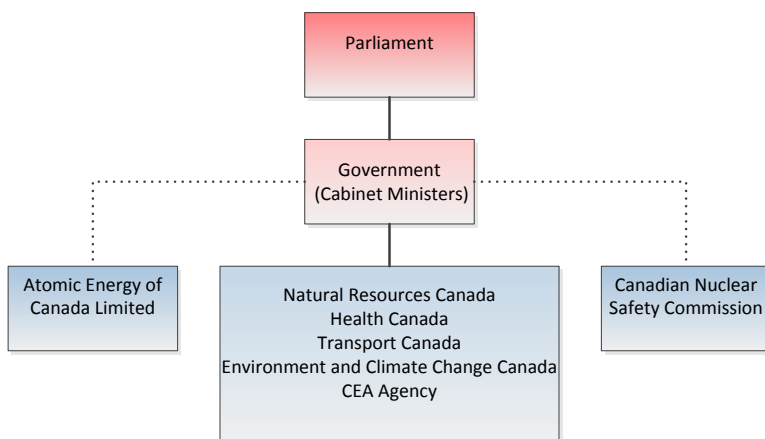
Atomic Energy of Canada Limited (AECL) – AECL is a Crown corporation whose sole shareholder is the Government of Canada. AECL is the owner of the federal nuclear sites, facilities, assets and liabilities

Health Canada - Health Canada recommends radiological protection standards and monitors occupational radiological exposures

Transport Canada - Transport Canada develops and administers policies, regulations and services for the Canadian transportation system, including the transportation of dangerous goods

Environment and Climate Change Canada (ECCC) – ECCC contributes to sustainable development through pollution prevention to protect the environment and human health from the risks associated with toxic substances. ECCC is responsible for the administration of the *Canadian Environmental Protection Act*

Canadian Environmental Assessment Agency (CEA Agency) – The CEA Agency is responsible for the administration of the *Canadian Environmental Assessment Act, 2012* (CEAA 2012), the primary federal legislation that defines requirements for assessing the environmental effects of planned projects



Government departments and agencies responsible for the management of radioactive waste in Canada

Additional Resources

- Feature Article: [Deep geological repositories](#)
- Fact Sheet: [Regulating Canada's Geological Repositories](#)
- [CNSC research on geologic repositories](#)
- Video: [What is Radioactive Waste?](#)
- Infographic: [Classifications of Radioactive Waste](#)
- [Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management](#)

For more information:

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