



Waste Storage Facilities

- ❖ Radioactive waste requires interim storage until solutions for permanent disposal are in place.
- ❖ While storage can be long-term, it is not considered a permanent solution.
- ❖ In Canada, waste owners are responsible for the funding, organization, management and operation of disposal and other facilities required for their radioactive wastes.
- ❖ The key considerations when determining the type and location of storage facility for an operator's waste are based on domestic and international guidance, protection of human and environmental health, safety and security, and implementation of Canada's international commitments.
- ❖ As you read this discussion paper, please focus on and consider the following questions:
 1. What are your views on how radioactive waste is currently stored in Canada?
 2. What should be the roles and responsibilities of government, the regulator, and waste owners with respect to radioactive waste storage?

Why is storing radioactive waste important?

There are various reasons for storing radioactive waste for different periods of time including:

- To allow for the decay of short-lived radionuclides to clearance levels as stipulated in the [*Nuclear Substances and Radiation Devices Regulations*](#);
- To accumulate enough material to make it economically worthwhile for transport to another facility for treatment, conditioning or disposal;
- To reduce the heat generation of the waste prior to predisposal management or disposal; or
- To provide long-term storage pending the development and operation of a disposal facility.

The physical, chemical and biological characteristics as well as the activity of radioactive waste can vary greatly. For the various types of waste, there are internationally-accepted methods of storage that ensure the protection of health, safety, security and the environment. Many of these storage options are already being deployed in Canada.

Radioactive Waste Storage in Canada

In Canada, all radioactive wastes are currently managed in interim storage facilities that are safe, secure and environmentally sound. Licensees are responsible for the operation of their facilities and must comply with established safety requirements under the regulatory oversight of the Canadian Nuclear Safety

Commission (CNSC); the CNSC licences, regulates and monitors the facilities. Canada recognizes that enhanced, long-term management approaches will be required for all of its used nuclear fuel (or “nuclear fuel waste”, as defined in the [Nuclear Fuel Waste Act](#)) and radioactive waste, and is progressing towards solutions.

Storage of High-Level Waste (used nuclear fuel)

The storage of used nuclear fuel in Canada differs significantly from the storage of other radioactive waste. In Canada, used nuclear fuel is stored in wet and dry states. When the fuel first exits a power reactor, it is placed in water-filled bays. Water cools the fuel and shields the radiation. After six to 10 years in the bays, depending on site-specific needs and organizational administrative controls, and when the associated heat generation has diminished, the used nuclear fuel can be transferred to a dry storage facility. These dry storage facilities employ large, reinforced concrete canisters.

Storage of Low- and Intermediate-Level Waste

The method of storage for radioactive waste can differ greatly depending on the radioactivity and heat generation of the waste. Typically, long-lived low-level waste is stored above ground at licensed facilities in bins and bags. Intermediate-level waste is stored in shielded above-ground or in-ground storage silos at licensed waste facilities.

The Canadian Standards Association (CSA) Group’s standard, CSA N292, [General Principles for the Management of Radioactive Waste and Irradiated Fuel](#) provides guidance and best practices with respect to waste storage facilities including:

- The design of the waste storage facility shall consider relevant requirements for nuclear safety, radiological safety, industrial safety, security, and safeguards;
- The design of the waste storage facility shall adopt a defence-in-depth approach, providing an appropriate number of barriers between the waste and the environment; and
- The waste storage facility shall be divided into radiological control zones as needed to prevent the spread of contamination and shall be equipped with radiation monitors.

The standard also provides a number of other design considerations as guidance for operators.

Design considerations require that the radioactive waste is safely stored in a manner that provides for the protection of people, the environment and national security, and is in accordance with regulatory requirements. This is carried out by including the following criteria:

- A safety case for the entire lifecycle of the radioactive waste storage facility that is developed, implemented and maintained in accordance with applicable regulations;
- Consideration of the impact of any modification to these activities on the safety of the stored waste; and
- The waste is stored in a manner where it can be inspected, monitored, retrieved and preserved in a condition suitable for its subsequent management.

Current storage facilities

To date, Canadian radioactive waste owners have put in place a number of storage facilities for their waste. Canada’s operating storage facilities are shown in Figure 1 – a map of used nuclear fuel (known in the nuclear community as “spent fuel”) and radioactive waste facilities in Canada:



FIGURE 1: LOCATION OF RADIOACTIVE WASTE MANAGEMENT SITES IN CANADA

International Context

Around the world, there is approximately 250,000 tonnes of used nuclear fuel and 68 million cubic metres of radioactive waste in storage. All countries with nuclear power programmes have access to waste processing and storage facilities for all of their waste. Most countries have multiple sites for the storage of their waste, usually located at nuclear power plants; however, in some cases, countries have opted to centralize the storage of some waste types. The International Atomic Energy Agency (IAEA) document providing guidance on the topic of waste storage is IAEA Safety Standards Safety Guide No. WS-G-6.1, [Storage of Radioactive Waste](#). Below, is a summary of its key points:

- The storage of radioactive waste must ensure that both human health and the environment will be protected, both now and in the future, without imposing undue burdens on future generations.
- Discharges to the environment from storage facilities should be controlled in accordance with IAEA guidance and any facility specific conditions imposed by the regulatory body.
- The adequacy of control measures taken to limit the exposure to workers should be verified by means of individual monitoring and area monitoring.

- The document outlines specific guidance on waste storage for each of the responsible parties (Government, Regulator, and Operator) as well as guidance on the degree of shielding, ventilation, fire protection systems, radiation protection, maintenance, testing, inspection, security, and decommissioning of storage facilities at each stage of the facility lifecycle.

As an IAEA member state and in keeping with international requirements, Canada is committed to developing policies based on international best practices and IAEA guidance for radioactive wastes in Canada, including waste storage.

We need to know

1. What are your views on how radioactive waste is currently stored in Canada?
2. What should be the roles and responsibilities of government, the regulator, and waste owners with respect to radioactive waste storage?