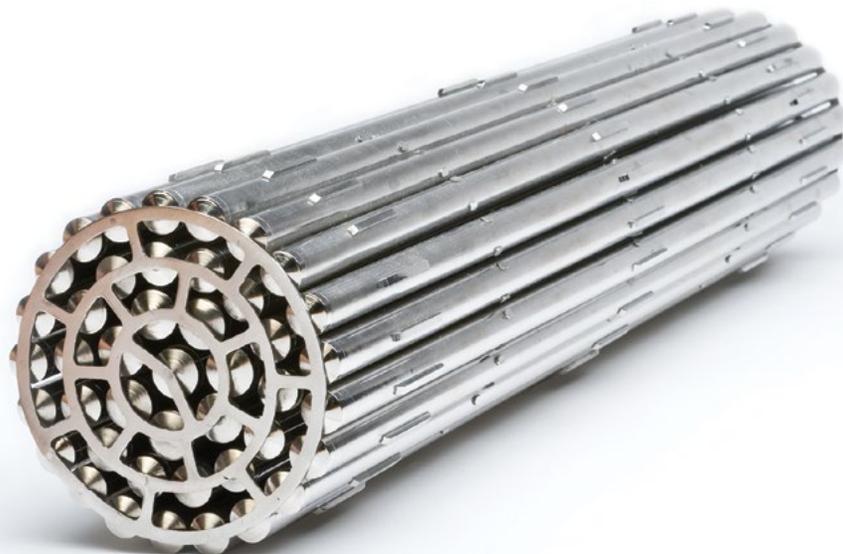


Canada's used nuclear fuel

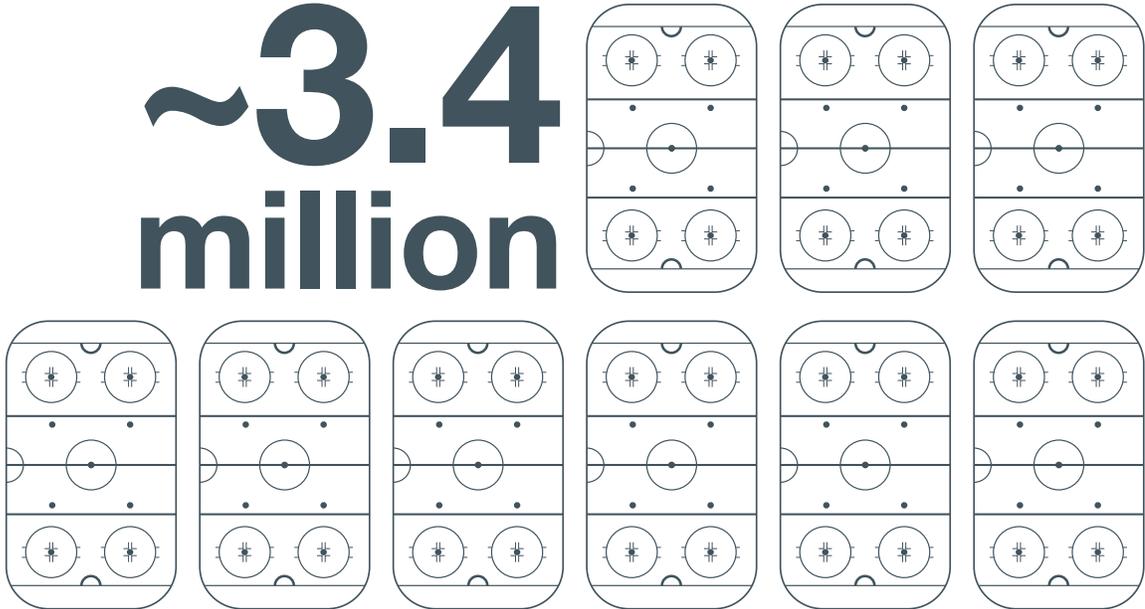
For decades, Canadians and Indigenous Peoples have been using electricity generated by CANDU nuclear power reactors. The Canadian nuclear sector is also actively exploring new nuclear reactors, ranging from large-scale to small modular reactors and advanced reactors.

Used nuclear fuel is a byproduct of nuclear power generation. Currently, used nuclear fuel is safely stored on an interim basis at federally licensed facilities in Canada. The current storage method is safe, but temporary.

The Nuclear Waste Management Organization (NWMO) is responsible for the safe, long-term management of all Canada's used nuclear fuel by containing and isolating it in deep geological repositories.



~3.4 million



If stacked like cordwood, Canada's existing inventory of about 3.4 million used nuclear fuel bundles could fit into about nine hockey rinks from the surface of the ice to the top of the boards.

Currently, Canada produces about 90,000 used nuclear fuel bundles per year. As of June 30, 2025, there are about 3.4 million used fuel bundles in Canada. If stacked like cordwood, all this used fuel could fit into about nine hockey rinks from the surface of the ice to the top of the boards.

At this time, the NWMO is anticipating a total volume of 5.9 million used fuel bundles that will need to be managed in a first repository. This projection is based on the operation of Canada's existing nuclear reactors.

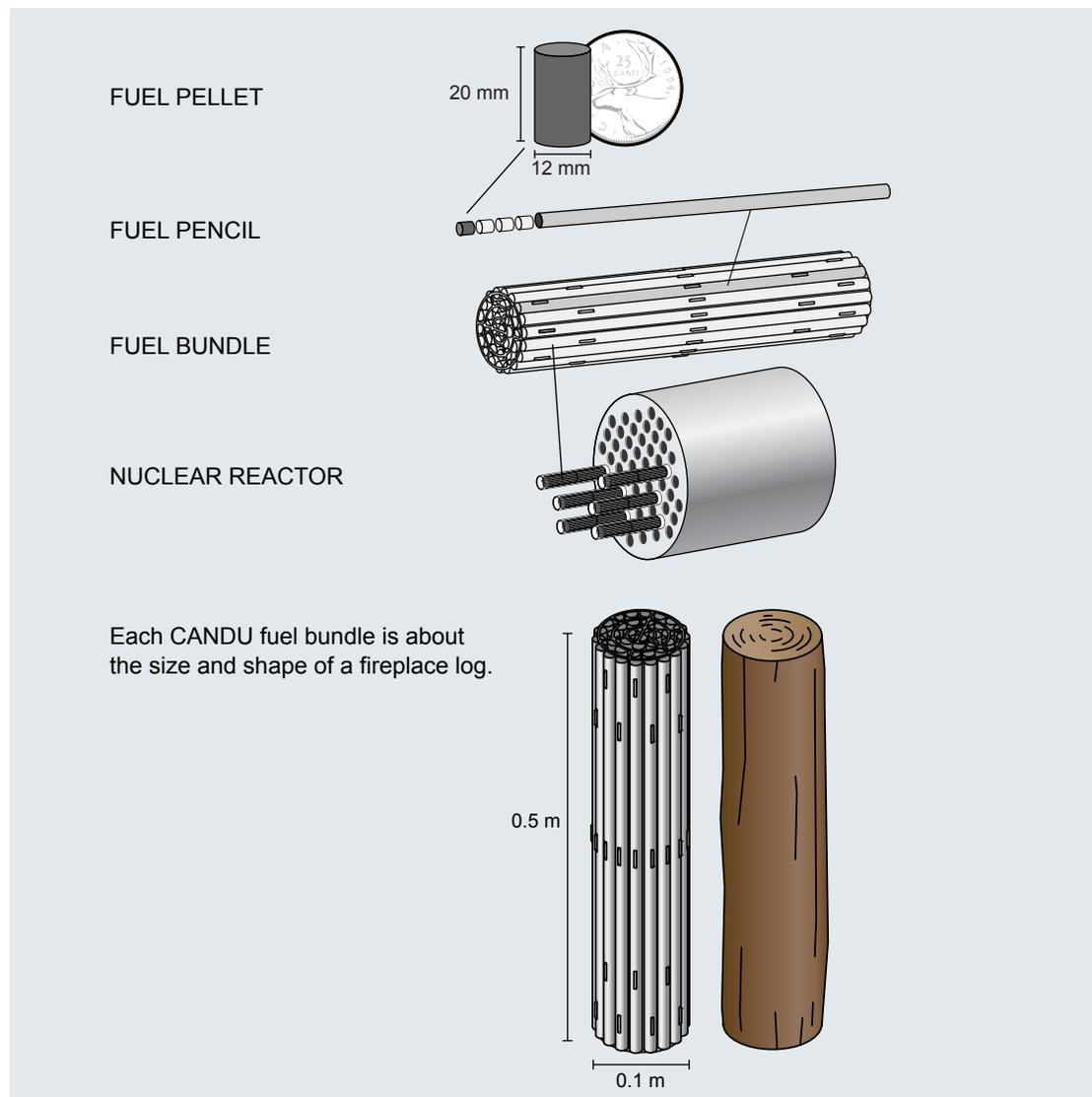
There is potential to extend the life of existing nuclear plants and to build new nuclear reactors. The Canadian nuclear sector is actively exploring emerging technologies, and there are multiple new nuclear energy projects under consideration. New nuclear developments would increase the used fuel volume and may result in different types of used fuel.

No matter the source of the fuel, safety will always be our top priority.

CANDU nuclear fuel

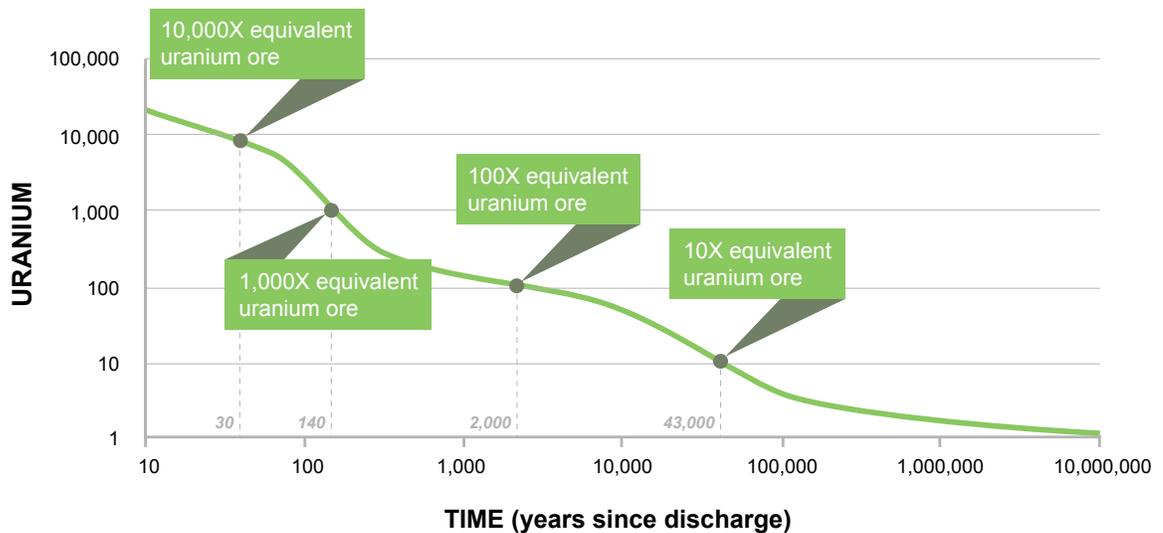
In Canada, most used nuclear fuel that exists today is CANDU fuel. This fuel is not a liquid or a gas — it is a stable solid. Under Canadian and international regulations, it is not classified as a flammable, explosive or fissile material.

CANDU nuclear fuel consists of uranium dioxide (UO_2) made from natural uranium. During fabrication, UO_2 powder is pressed into solid pellets and then baked into a ceramic form. The ceramic pellets are placed inside a tube made of a zirconium-tin alloy, with the completed assembly called a fuel element or fuel pencil. These fuel pencils are welded together into bundles the shape and size of a fireplace log. Each CANDU fuel bundle is about 0.5 metre long, has a diameter of about 0.1 metre, contains about 20 kilograms of uranium, and has a total mass of about 24 kilograms.



Radioactive decay over time in used CANDU fuel

USED FUEL RADIOACTIVITY RELATIVE TO EQUIVALENT AMOUNT OF URANIUM



Although its radioactivity level decreases rapidly with time, residual radioactivity (together with some chemical toxicity) persists, and the used fuel remains a potential health risk for many hundreds of thousands of years.

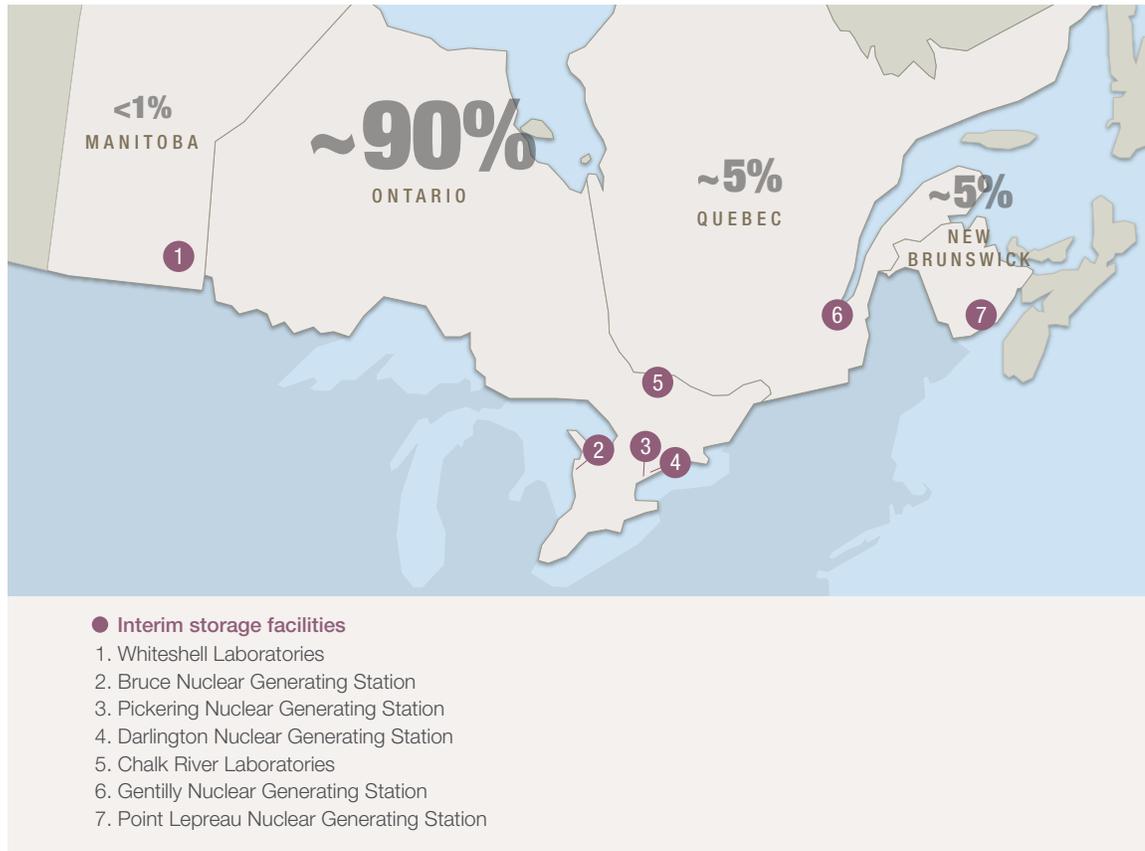
When CANDU fuel is removed from the reactor at the end of its useful life, it is considered a waste product. Used fuel is highly radioactive and requires careful management. Although its initial radioactivity level decreases rapidly with time, residual radioactivity (together with some chemical toxicity) persists, and the used fuel remains a potential health risk for a very long period of time.

It will take about one million years for the radioactivity level to reach about that of an equivalent amount of natural uranium.

How used nuclear fuel is stored today

When used nuclear fuel bundles are removed from a reactor, they are placed in a water-filled pool to reduce their heat and radioactivity. After seven to 10 years, the bundles are placed in dry storage containers, silos or vaults. Dry storage is a proven technology that has been in use around the world since the 1980s.





Today, used nuclear fuel is safely stored near or at the sites where it is produced, in facilities licensed by the national regulator — the Canadian Nuclear Safety Commission. There are also small quantities of used research and development fuels in licensed facilities at Atomic Energy of Canada Limited's Canadian Nuclear Laboratories.

Canada has a robust regulatory framework that governs the handling of used nuclear fuel. Used nuclear fuel is carefully managed and shielded to ensure that no one is exposed to an unshielded bundle.

What is the long-term plan for used nuclear fuel?

Canada's plan, known as Adaptive Phased Management (APM), is both a technical method (what we plan to build) and a management approach (how we will work with people to get it done).

Technical method

- Centralized containment and isolation of used nuclear fuel in a deep geological repository
- Continuous monitoring
- Potential for retrievability
- *Optional* step of temporary storage (not included in current implementation plan)¹

¹ We do not expect to need the optional step of temporary storage as used fuel will remain at interim storage facilities until the repository is operational.

Management approach

- Flexibility in pace and manner of implementation
- Phased and adaptive decision-making
- Responsive to advances in technology, research, Indigenous Knowledge and societal values
- Open, inclusive and fair siting process to seek informed and willing hosts
- Sustained engagement of people and communities throughout implementation

The end point of the technical method is the containment and isolation of Canada's used nuclear fuel in a deep geological repository, in an area with suitable geology and informed and willing hosts. APM also involves the development of a transportation system to move the used CANDU fuel from the facilities where it is currently stored to the new site.

The management approach involves realistic, manageable phases, each marked by explicit decision points. It allows for flexibility in the pace and manner of implementation, and fosters the sustained engagement of people and communities throughout its implementation.

Canada's plan emerged through dialogue with Canadians, Indigenous Peoples and experts, and best meets the key priorities considered important by citizens. It was selected as Canada's plan by the federal government in June 2007.

The repository for Canada's used nuclear fuel is designed to meet rigorous safety standards throughout all aspects of its design and implementation. The plan is consistent with the long-term management approach adopted by other countries with nuclear power programs such as Finland, Sweden, Switzerland, the United Kingdom and France.

Canada's plan was developed for managing Canada's used nuclear fuel. No foreign used fuel will be placed in a Canadian repository.

To select a site for the first deep geological repository — which will contain used nuclear fuel — the NWMO worked together with Canadians and Indigenous Peoples over two years to develop a site selection process. We made a commitment to only proceed at a site that is both safe and has informed and willing host communities. The process guided us and the communities we worked with in arriving at the important decision of where to locate the repository.

That site selection process was launched in 2010 and culminated in 2024 in the selection of a site in northwestern Ontario near the Township of Ignace in the territory of Wabigoon Lake Ojibway Nation. This project has now entered the regulatory decision-making process, which will independently verify its safety before the NWMO can proceed to construction.

As we advance our work, we are maintaining flexibility and remaining ready to be adaptive. In case we need additional capacity in the future, we are exploring the potential to include used fuel from new nuclear projects in a second repository project that will be designed to manage intermediate-level and non-fuel high-level waste. This project is in the early stages of development. The NWMO is gathering input on a proposed site selection process, which we expect to launch around 2028.

**For more information,
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