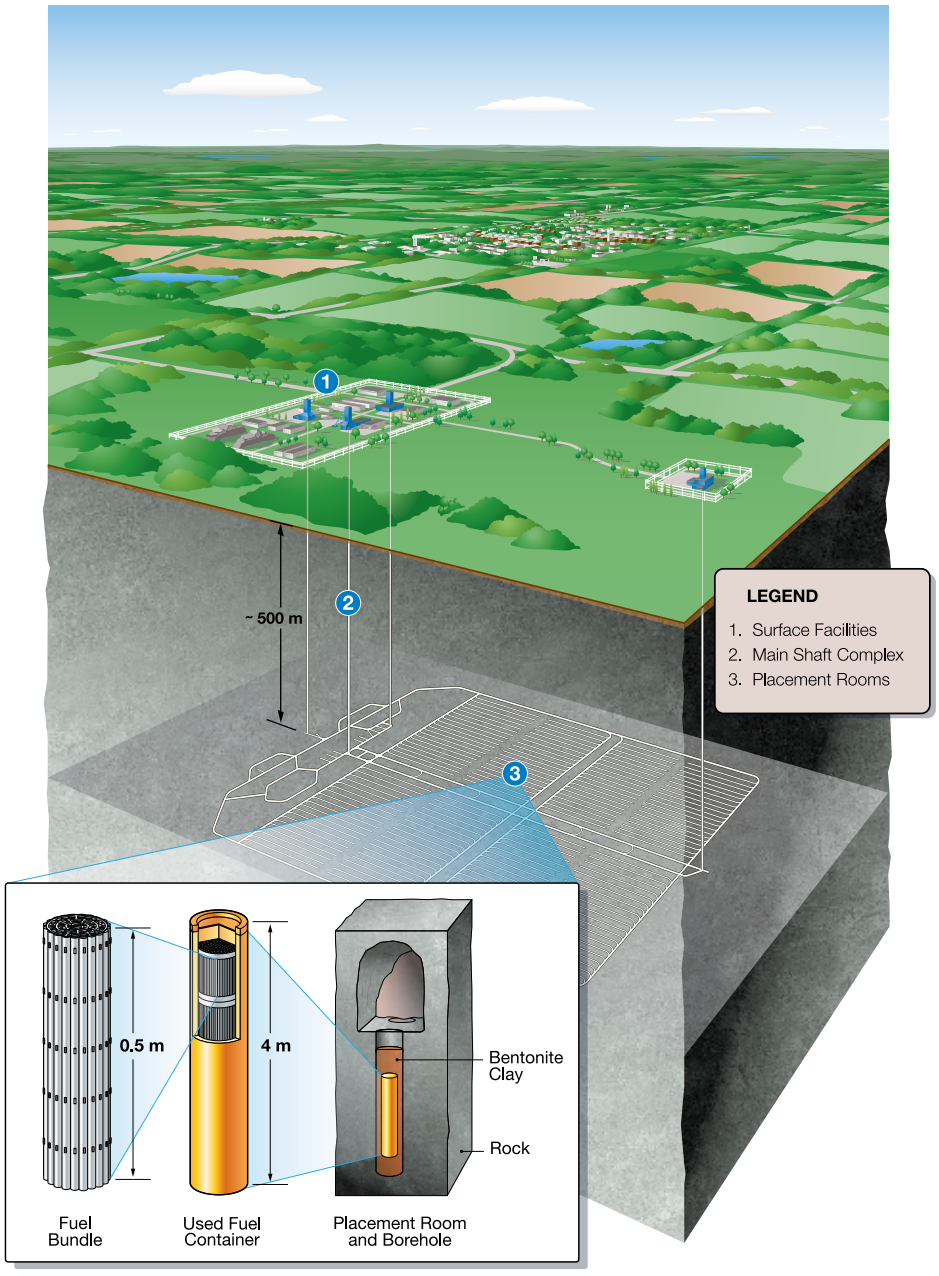
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

Project Description



Overview

The long-term management of Canada's used nuclear fuel involves the construction of a large, national infrastructure project that will generate thousands of jobs in the host region and potentially hundreds of jobs in a host community for many decades. This project is designed to be implemented through a long-term partnership involving the community, the larger region in which it is located and the NWMO. The project will be implemented in a way that will help the host community foster its long-term well-being and sustainability.

This $16- to $24-billion national infrastructure project will involve the development of a deep geological repository and used fuel transportation system for the long-term management of used nuclear fuel and a national centre of expertise.

What does the Deep Geological Repository involve?

The deep geological repository is a multiple-barrier system designed to safely contain and isolate used nuclear fuel over the long term. It will be constructed at a depth of approximately 500 metres, depending upon the geology of the site, and will consist of a network of placement rooms for the used fuel.

Used nuclear fuel will be loaded into specially designed and certified containers at the reactor sites and transported to the repository site where it will be repackaged in corrosion-resistant containers for placement in the repository. The containers will be lowered through a shaft and transported underground to one of many placement rooms. The containers will be placed in vertical or horizontal boreholes drilled into the rock. They will then be sealed using bentonite clay, a proven-effective sealing material.

The used fuel will be monitored throughout all phases of implementation. It will also be retrievable at all times. The access tunnels and shafts will be backfilled and sealed only when the community, the NWMO and regulators agree that it is appropriate, and post-closure monitoring will then be implemented. A robust safety case must be developed that demonstrates with confidence that the project can be safely implemented at the site, including transportation, and can meet or exceed the requirements of regulatory authorities and the community.

Where is used nuclear fuel currently stored?

Used nuclear fuel is currently safely stored in federally licensed storage facilities at sites where it is produced. Placing all Canada's used nuclear fuel in a single central location will require moving it from these interim storage facilities to the centralized site of the deep geological repository. Depending on the location of the site, this may involve the use of road, rail or water (that is, truck, train or ship) or a combination of the three.

The NWMO will need to demonstrate the safety and security of any transportation system to the satisfaction of regulatory authorities, and citizens, before transportation of used nuclear fuel to the repository can begin. Transportation of this material will need to meet the stringent requirements laid out by Transport Canada and the Canadian Nuclear Safety Commission prior to an operating licence being issued, and will be the subject of ongoing compliance monitoring once the licence is issued.

Where is used nuclear fuel currently stored?

1. Whiteshell Laboratories, Manitoba
2. Bruce Nuclear Generating Station, Ontario
3. Pickering Nuclear Generating Station, Ontario
4. Darlington Nuclear Generating Station, Ontario
5. Chalk River Laboratories, Ontario
6. Gentilly Nuclear Generating Station, Quebec
7. Point Lepreau Nuclear Generating Station, New Brunswick

How is used nuclear fuel currently stored on an interim basis?

Used nuclear fuel dry storage containers at Ontario Power Generation's Western Waste Management Facility

What should a community and surrounding area expect?

This project comprises a large infrastructure development involving scientists, engineers, professionals, tradespeople and many others. It will have a significant impact on any community and region in which it is located.

It is a multi-generational project that will be developed in phases. The deep geological repository will be sited and constructed over two to three decades; waste will be placed there over a period of three decades or more after that, and then monitored for an extended period of time prior to closure. The site will become a national centre of expertise for technical, environmental and community studies associated with the implementation of deep geological repositories, and bring together a multidisciplinary core group of scientists, researchers and others.

The construction and operation of facilities and the infrastructure associated with the project are expected to have significant economic benefits for a community over many decades. The project also offers significant employment and income revenue to the host region and host province, including the opportunity for the creation of transferable skills and capacities.

With a project of this size and nature, there is also the potential to contribute to social and economic pressures that will need to be carefully managed to ensure the long-term health and sustainability of the community. For example, pressures may arise with the potential influx of temporary workers associated with the construction phase of the repository, possibly increasing demand for social and physical infrastructure services. In order to avoid or minimize social costs of this type, and to help communities to adapt to the opportunities and challenges linked to the project, the need for assistance in areas such as job training, affordable housing and needed infrastructure would be examined.

Centre of Expertise

A centre of expertise will be established for each community in which a site is being considered at the detailed characterization stage of work. The centre will be located in or near the community, as determined with the community. Its purpose will be to support the multi-year testing and assessment of the site on technical safety and community well-being related dimensions which are key components of the site selection process. It will be the home for an active technical and social research and technology demonstration program during this period, involving scientists and other experts in a wide variety of disciplines including geoscience, engineering, and environmental, socio-economic and cultural impact assessment.

The design details of the centre of expertise would be developed with the community and the surrounding region, with their preferences in mind. The centre of expertise could be designed as a focus for engaging members of the community to learn more about the project, and to view the scientific and engineering work involved in site assessment in progress, through public viewing galleries and interactive displays. The centre could be created as a small science centre, highlighting and demonstrating the science and technology being used to determine whether the site is suitable. It may be developed as a meeting place and learning centre for the community and a destination that welcomes interested visitors from the region and beyond.

Should the site ultimately be selected to host the deep geological repository, the centre of expertise would be expanded to include and support the construction and operation of an underground facility designed to confirm the characteristics of the site. As has been the case for deep geological repositories for nuclear waste constructed in other countries, the centre of expertise would become a hub for knowledge-sharing across Canada and internationally.

Community Well-Being

This project will be implemented through a long-term partnership involving the community, the larger region in which it is located and the NWMO. It is important that the project be implemented in a way that will help foster long-term well-being and sustainability.

Implementation of the project will deliver significant economic benefits to the host community, region and province from the construction and operation of the facilities and associated centre of expertise, extending over many decades. A project of this size may also contribute to social and economic pressures in the community that will need to be managed by the NWMO and the community as part of implementation. The process for selecting a site encourages communities, and others potentially affected, to carefully consider their interest in the project in light of their long-term plans and aspirations.

How much land is required?

In order to be considered, a site will need to have available land to accommodate the surface and underground facilities. This project requires a dedicated surface area of about 100 hectares (250 acres) for the surface buildings and associated facilities. As well, there may be a need to limit activities in the immediate area surrounding the surface facilities in order to meet regulatory or other requirements.

The underground repository requires a subsurface area in suitable host rock of approximately 2.5 kilometres by 1.5 kilometres (375 hectares/930 acres) at a depth of approximately 500 metres. The NWMO would need to have rights to the land above the underground repository, although alternative uses would be considered, with the community, for portions of this land.

How will the project be funded?

The planning, development and implementation of the project is funded by the major owners of used nuclear fuel in Canada: Ontario Power Generation, NB Power, Hydro-Québec and Atomic Energy of Canada Limited. The *Nuclear Fuel Waste Act* requires each of these four companies to establish independently managed trust funds and make annual deposits to ensure the money to fund this project will be available when needed.

About the Project

The project will be implemented in phases and will operate for many decades. It has an estimated cost of $16 billion to $24 billion. [1] [2]

SITE EVALUATION AS PART OF THE SITE SELECTION PROCESS (10 YEARS OR MORE)

- In collaboration with the community, the NWMO will conduct detailed studies and evaluations at the site to confirm whether it is suitable in terms of safety and community well-being and to support the regulatory approval process. This work will be conducted as part of the site selection process outlined in this document. Work will involve detailed field and laboratory investigations, testing through the drilling of boreholes to the proposed repository depth, monitoring and safety analyses as well as socio-economic studies. The NWMO will establish a centre of expertise at the site, which will involve dozens of workers with a wide range of skills, including technical and social scientists, equipment operators and other skilled workers and technicians. Overall spending by the NWMO to complete work during this phase will be tens of millions of dollars per year.

- During this phase, the NWMO will provide funding to assist potentially interested communities to build understanding of the project, participate fully in the site assessment process, and engage their citizens in evaluating and ultimately demonstrating interest in hosting the project.

REGULATORY APPROVALS (5 YEARS OR MORE)

- Once a location has been selected as the preferred site, the NWMO must successfully complete an environmental assessment, as required by the *Canadian Environmental Assessment Act* and obtain a licence from the Canadian Nuclear Safety Commission (CNSC) for site preparation and construction. This will involve a thorough, formal and public evaluation of safety. The NWMO will continue its work at the site throughout this period in order to be ready for site preparation and construction once the licences for these activities have been received.

CONSTRUCTION OF THE UNDERGROUND DEMONSTRATION FACILITY AND DEEP GEOLOGICAL REPOSITORY (10 YEARS OR MORE)

- After receiving appropriate licences, the NWMO will begin construction of an underground demonstration facility, which will confirm the characteristics of the site before applying for an operating licence. This work will involve several hundred workers at the site per year to build and staff the underground facility as well as the expansion of the centre of expertise to become a knowledge centre of national scope, which will operate throughout construction and operation of the project. Overall spending by the NWMO during this phase would be in the order of $100 million each year for a period of about 5 years.

- The NWMO will construct the deep geological repository at a depth of approximately 500 metres. The repository will consist of a series of access and service shafts and a network of tunnels leading to placement rooms where long-lived used fuel containers will be safely sealed into the rock. The NWMO will also construct surface facilities to receive transported used fuel, repackage this used fuel and prepare clay-based sealing materials. These construction activities will involve about 600–800 workers per year at the site, with a wide

range of skills including equipment operators, engineers, scientists, mining personnel, tradespeople, social researchers, financial administrators and public communication professionals. The NWMO will work with the community to develop infrastructure which may be required to support these workers either in the community or, if the community prefers, outside the community in the surrounding region. Overall spending by the NWMO during this phase would be several hundreds of millions of dollars each year for a period of about 5 years.

- In addition to the on-site employment, the construction of the project will create significant direct employment opportunities in the host community for a variety of support services such as transportation, catering and equipment supply. Depending on the host economic region, the construction phase will create wealth in the form of business profits and personal income throughout the region amounting to hundreds of millions of dollars.

- The NWMO will work with the community, and potentially others, to construct the project in a way that helps foster the long-term well-being and sustainability of the community and of the larger region in which it is located.

OPERATION OF THE FACILITIES (30 YEARS OR MORE)

- After receiving an operating licence from the CNSC, operation of the facility will begin. In operating the facility, the NWMO will transport used nuclear fuel from the interim storage sites in specially designed transportation casks, repackage this used fuel in long-lived containers and place these containers in the deep repository along with sealing material as appropriate. This work would involve hundreds of workers with a wide range of skills, including equipment operators, engineers, scientists, safety specialists, mining personnel, tradespeople, financial analysts and community engagement professionals. Overall spending by the NWMO during this phase would be in the order of $200 million each year. The operation of the facility will also create annual employment in the host community by the many businesses that will be required to support direct ongoing operations at the facility. Depending on the host economic region, the operation of the facility will create wealth in the form of business profits and personal income throughout the host region during the operation phase, amounting to hundreds of millions of dollars per year.

- The NWMO will work with the community, and potentially others, to operate the project in a way that helps foster the long-term well-being and sustainability of the community and of the larger region in which it is located, as outlined in an agreement with the community.

EXTENDED MONITORING (POTENTIALLY 100 YEARS OR MORE)

- The NWMO will work with the community, and potentially others, to conduct monitoring of the repository to support data collection and to confirm the long-term safety and performance of the repository system. Future society will make a determination on the appropriate form and duration of monitoring. The regulator will be involved in all decisions made about how monitoring will be conducted at the site.

DECOMMISSIONING THE FACILITY

» The NWMO will work with the community, and potentially others, to decommission the facilities. Future society will make a determination on the manner of final closure of the repository. Once a decision is made to close the facility, the NWMO will apply to the CNSC for a decommissioning licence. A decommissioning licensing decision by the CNSC on this project can only be taken after the successful completion of the environmental assessment process. The NWMO will remove underground equipment and backfill and seal the access tunnels and shafts, and surface facilities will also be dismantled, at a pace and in a manner determined collaboratively with the community, regulators and other interested individuals.

POST-CLOSURE MONITORING

» Future society will make a determination on the form and duration of monitoring to take place after the repository is closed. The regulator will be involved in all decisions about how monitoring will be conducted at the site.

(1) The final cost of the project will depend on such factors as the number of fuel bundles to be managed, timing of construction and the geology at the site.
(2) For estimates of project costs and for estimates of labour and dollar figures (reflecting cash flows), see: AECOM. A Preliminary Assessment of Illustrative Generic Community Economic Benefits from Hosting the APM Project. 2010. (published on the NWMO website at www.nwmo.ca/sitingprocess)

Conclusion

The NWMO is working with Canadians to ensure the long-term management of Canada's nuclear waste in a manner that safeguards people and respects the environment, now and in the future. Adaptive Phased Management was developed in dialogue with Canadians. It charts a course for the safe, secure long-term management of used nuclear fuel, in line with best international practice and the expectations of Canadians.

Interested individuals, organizations and communities may contact the NWMO to learn more about Canada's plan for the long-term management of used nuclear fuel, the activities of the NWMO, and the process the NWMO will use to select an informed and willing community to host this project. The NWMO will respond to briefing requests of communities, and will provide resources to support early capacity building and participation as communities begin to consider their interest.

For more information, please contact:

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