nwmo

NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

Moving Forward Together: Process for Selecting a Site for Canada's Deep Geological Repository for Used Nuclear Fuel

MAY 2010

Contents

About the NWMO and its work

The Nuclear Waste Management Organization (NWMO) was created by Canada's nuclear energy generators in 2002 as a requirement of the ***Nuclear Fuel Waste Act***. The Act requires the NWMO to study, recommend and then implement a plan for the long-term management of used nuclear fuel in Canada.

The NWMO approaches its work with the following vision: the long-term management of Canada's nuclear waste in a manner that safeguards people and respects the environment, now and in the future.

The NWMO is guided by five fundamental values:

Integrity — We will conduct ourselves with openness, honesty and respect for all persons and organizations with whom we deal.

Excellence — We will pursue the best knowledge, understanding and innovative thinking in our analysis, engagement processes and decision-making.

Engagement — We will seek the participation of all communities of interest and be responsive to a diversity of views and perspectives. We will communicate and consult actively, promoting thoughtful reflection and facilitating a constructive dialogue.

Accountability — We will be fully responsible for the wise, prudent and efficient management of resources, and be accountable for all our actions.

Transparency — We will be open and transparent in our process, communications and decision-making, so that the approach is clear to all Canadians.

The work of the NWMO is subject to federal regulatory oversight and is regulated under the *Nuclear Safety and Control Act*. The NWMO's work is required to meet all applicable regulatory standards and requirements for protecting the health and safety of persons, the environment and national security, and to respect Canada's international commitments on the peaceful use of nuclear energy. For financial surety, its work is also required to be fully funded by the waste-producing organizations through independently managed trust funds.

1 The Purpose of this Document

This document is meant to lay out a process for identifying an informed and willing host community for a deep geological repository for the long-term management of used nuclear fuel in Canada. It reflects the ideas, experience and best advice of a broad cross-section of Canadians who participated in dialogues conducted over a two-year period and who shared their thoughts on what an open, transparent, fair and inclusive process for making this decision would include.

The site selection process is designed to ensure, above all, that the site which is selected is safe and secure and meets the highest scientific, professional and ethical standards. Reflecting the guidance we received from Canadians, the process is built on a set of principles that reflects the values and priorities of Canadians on this issue. The process also contains a number of steps that these Canadians told us need to be part of the decision-making process to ensure it is an appropriate one for Canada. The process builds upon the best knowledge and experience within Canada and internationally.

The long-term management of Canada's used nuclear fuel involves the construction of a large national infrastructure project which 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. The process contains a road map for communities considering hosting the project to explore and understand how their well-being could be affected, including what challenges they might face, how they might benefit, and what commitments they will have to make before deciding if they wish to be considered to host the facility.

Over the course of our dialogues, people were clear in their expectation that a process be outlined as the road map for decision-making. At the same time, it is understood that the road map does not in itself constitute the destination, nor identify every step that will need to be taken along the way. As Canada embarks upon the process of seeking and selecting a site for the long-term management of its used nuclear fuel with this process as a guide, it will take our best knowledge and expertise and all of us working together to implement Canada's plan. We invite all interested Canadians to join in this journey.

Canadians have a decision to make: Where should our used nuclear fuel be contained and isolated for the long term? Together we have designed a fair, ethical and effective process for making this decision.

2 A Matter of Responsibility

For decades Canadians have been using electricity generated by nuclear power reactors in Ontario, Quebec and New Brunswick. We have produced just over 2 million used fuel bundles. If used fuel bundles could be stacked like cordwood, all Canada's used nuclear fuel bundles could fit into six hockey rinks, from the ice surface to the top of the boards.

When used nuclear fuel is removed from a reactor, it is considered a waste product, is radioactive and requires careful management. Although its radioactivity decreases with time, chemical toxicity persists and the used fuel will remain a potential health risk for many hundreds of thousands of years. For this reason, used fuel requires careful management essentially indefinitely.

Canada's used nuclear fuel is now safely stored on an interim basis at licensed facilities located where it is produced. Like many other countries with nuclear power programs, Canada is planning for the future. Putting in place a plan for the long-term, safe and secure management of used nuclear fuel for the protection of people and the environment is an important responsibility we as Canadians share.

The NWMO has met with thousands of citizens from many parts of Canadian society to hear their advice and suggestions on how to proceed. We talked to people in their communities, local and national elected representatives, Aboriginal peoples, technical and social specialists, environmental and faith groups, and business people about the many social, technical, economic, environmental and ethical issues involved.

A strong sense of responsibility emerged from these conversations. This generation wants to move forward in dealing with our used nuclear fuel, believing it to be imprudent and unfair to future generations to wait any longer.

Used fuel bundles from Canada's CANDU nuclear reactors are approximately 0.5 metre long and weigh about 24 kilograms.

"You are building a social contract with generations in the future."
– Citizens' Panel Dialogues and Public Discussion Group Sessions

3 The Way Forward

How did we get here?

The NWMO was created by Canada's nuclear energy generators (Ontario Power Generation, New Brunswick Power and Hydro-Québec) in 2002 as a requirement of the *Nuclear Fuel Waste Act*. The Act requires the NWMO to study possible approaches, recommend and then implement a plan for the long-term management of used nuclear fuel in Canada.

In 2002, the NWMO began its work to develop collaboratively with Canadians a management approach for the long-term care of Canada's used nuclear fuel. The NWMO conducted a three-year study involving thousands of citizens, specialists and Aboriginal peoples in every province and territory to develop a long-term management approach that is socially acceptable, technically sound, environmentally responsible and economically feasible. The plan that emerged from this dialogue, Adaptive Phased Management, enables our generation to proceed in a deliberate and collaborative way to establish the foundation for the safe and secure stewardship of Canada's used nuclear fuel for the long term.

On June 14, 2007, the Government of Canada – based on the NWMO's recommendations – selected Adaptive Phased Management as the best plan for Canada for safeguarding both the public and the environment over the very long time in which used nuclear fuel must be managed. Following the decision by the Government of Canada, the NWMO's activities have most recently focused on collaboratively developing detailed processes and plans for the implementation of Adaptive Phased Management with Canadians.

Canadians said Canada's plan must:

Be fair—both to current and future generations—and the outcome must be safe and secure, for people, communities and the environment:

- Our generation needs to take active responsibility to achieve a safe, long-term response to our waste problem.
- The plan needs to have a definitive outcome, and it needs to provide flexibility along the way to take advantage of newer and better technologies when they are developed, or to adjust if people's values or priorities change over time.
- We need to provide the option to future generations to monitor the waste over an extended period.

Choosing a Way Forward — The Future Management of Canada's Used Nuclear Fuel (Final Study)

What options were considered?

The *Nuclear Fuel Waste Act* required the NWMO to study approaches based on three methods for the long-term management of used nuclear fuel: deep geological disposal in the Canadian Shield; storage at nuclear reactor sites; and centralized storage, either above or below ground. Through the study it became clear that each of these approaches possesses some unique strengths, but also some important limitations. This led to the search for an approach that would better meet the objectives Canadians said are important. Adaptive Phased Management is this approach.

Other options that had at some point received international attention were also reviewed. These options were found to not meet important criteria such as “proof of concept” (they could not be implemented today) or legality.

Over the course of the dialogues, members of the public asked about the potential to recycle or reuse used nuclear fuel, which would involve reprocessing of the material. Members of the public also asked about the possibility of reducing the volume and toxicity of the waste to be managed, involving processes such as partitioning and transmutation. After detailed study, these options were found to be prohibitively expensive for CANDU-type used fuel and unlikely to be practical or desirable in Canada. The NWMO keeps a watching brief on the development of these and other alternative used nuclear fuel management technologies as part of its ongoing effort to incorporate new learning and knowledge, and review and adjust the way in which Canada’s plan is implemented as needed. As part of this watching brief, we note that there is some international interest in reprocessing and that France, the country leading related research in the world today, has also identified the need for the construction of a deep geological repository as part of its long-term management plan and is in the process of selecting a site for it.

What is Canada’s plan?

Adaptive Phased Management was developed in dialogue with Canadians to reflect features considered important by citizens. It is consistent with the programs that have been developed in many other countries with nuclear power programs, such as Sweden, the United Kingdom, Finland and France. As a plan for the future, Adaptive Phased Management 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.

The plan requires that used nuclear fuel be contained and isolated in a deep geological repository in a suitable rock formation. Used fuel will be safely and securely contained and isolated from people and the environment in the repository using a multiple-barrier system. This approach is the culmination of more than 30 years of research, development and demonstration of technologies and techniques in Canada, the United States, Switzerland, Sweden, France, the United Kingdom and elsewhere. Deep geological repositories have been constructed and are operating around the world for various types of radioactive wastes. A deep repository for used nuclear fuel is under construction in Finland and similar repositories are planned for used fuel and high-level waste management in Sweden, the United Kingdom and France.

A fundamental tenet of Canada's plan is the incorporation of learning and knowledge at each step, to guide a process of phased decision-making. The plan builds in flexibility to adjust the plan if needed. For example, the plan includes an optional step of shallow storage at the repository site as a contingency. This may be helpful should there be a need to move the used fuel from one or several of the current interim storage facilities before the deep repository is ready. The optional shallow facility, which would be located at the central site to minimize additional transportation of the used fuel, might then be used to

safely and securely store this fuel in the interim period. The plan also builds in the potential for retrieval of the used fuel for an extended period, until such time as a future society makes a determination on the final closure, and the form and duration of post-closure monitoring.

The plan will be implemented over several decades. Over this period of time, we may experience changes in the values and preferences of Canadian society, advancements in knowledge and technologies, the use of nuclear technology and fuel volumes. Adaptive Phased Management is designed to be flexible to ensure new learning and social priorities are incorporated in Canada's plan and to allow this plan to adapt to other changes we may encounter along the way.

Adaptive Phased Management involves:

- centralized containment and isolation of used nuclear fuel in a repository deep underground in a suitable rock formation;
- moving to this goal through a series of steps and clear decision points, which can be adapted over time as may be required;
- providing opportunities for people and communities to be involved throughout the implementation process;
- allowing for optional temporary shallow storage at the central site, if needed;
- ensuring long-term stewardship through continuous monitoring of used fuel;
- maintaining the ability to retrieve the used fuel over an extended period should there be a need to access the waste or take advantage of new technologies that may be developed; and
- providing financial surety and long-term program funding to ensure the necessary money will be available for the long-term care of used nuclear fuel.

Next steps

The NWMO is now working to implement Adaptive Phased Management. The first major task is to seek a site for this important national infrastructure initiative in an appropriate geological formation in an informed and willing community.

A partnership approach

This project will be implemented through a long-term partnership involving the host community, the larger region in which it is located and the NWMO. Only through engagement, dialogue and collaboration will we ensure that the needs of the community are addressed at each stage of the process, and trust and confidence are built and sustained.

4 Description of the Project

The long-term management of Canada's used nuclear fuel involves the construction of a large, high-technology project that will generate thousands of jobs in the host region and potentially hundreds of jobs in a host community for many decades.

What are the key components of the project?

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.

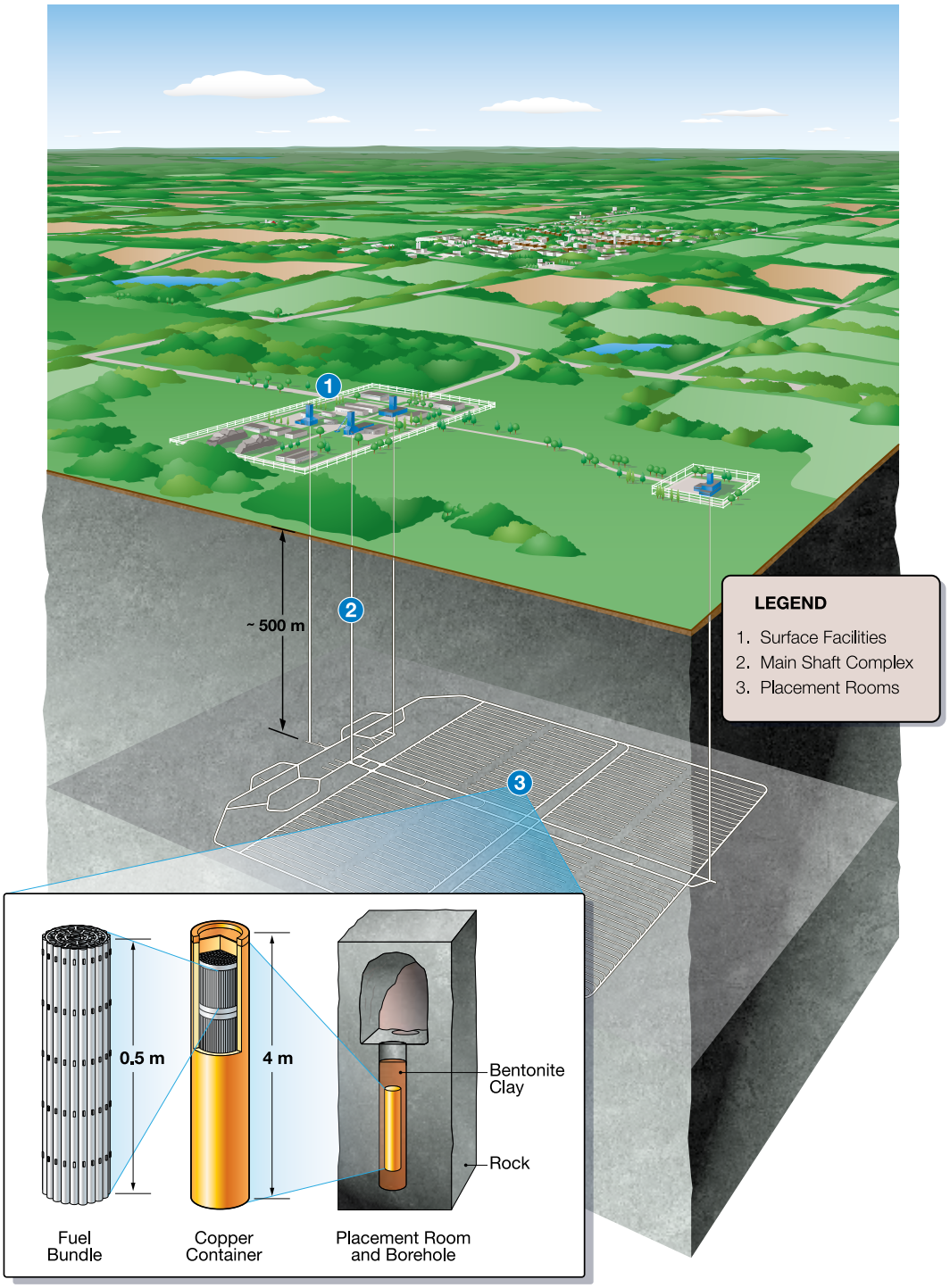
What does the Deep Geological Repository involve?

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 (see diagram on next page).

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.

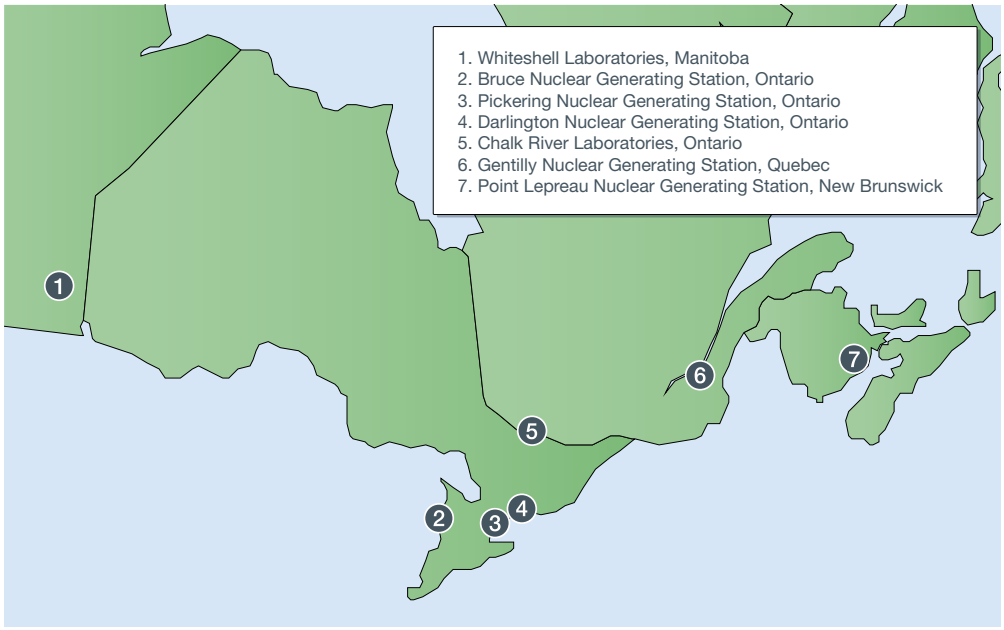
A robust safety case must be developed that demonstrates with confidence that the project can be safely implemented at the site, including transportation, and can meet or exceed the requirements of regulatory authorities and the community.


1
2
3
~ 500 m
LEGEND
1. Surface Facilities
2. Main Shaft Complex
3. Placement Rooms
0.5 m
4 m
Bentonite Clay
Rock
Fuel Bundle
Copper Container
Placement Room and Borehole

What does the transportation of used nuclear fuel involve?

Used nuclear fuel is currently safely stored in federally licensed storage facilities at sites where it is produced (see map). 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.



What is the Centre of Expertise?

At Step 4 in the site selection process (described later in this document), a centre of expertise will be established for each community in which a site is being considered. 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.

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.

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.

What is the project footprint?

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.

Have some areas been excluded?

Based on information available today, it is expected that large areas within Canada have the potential to safely and securely contain and isolate used nuclear fuel over the long term. However, detailed surface and subsurface investigations are needed to confirm whether a site is in fact suitable. The site evaluation process outlined in this document focuses this detailed assessment on sites in communities that are interested in hosting the project. The process is designed to ensure the community has early feedback on its potential suitability (Step 2 of the process as described on page 23) before beginning to assess its interest in earnest.

How much used fuel will be managed?

The *Nuclear Fuel Waste Act* requires the NWMO to manage all used nuclear fuel produced in Canada. To date, Canada has produced just over two million used fuel bundles. If Canada's existing reactors operate to the end of their planned current lives, including planned refurbishments, the number of used fuel bundles that will need to be managed in the facility could double. The repository will need to be large enough to contain and isolate the volume of used fuel from existing plants in Canada.

In the future, decisions regarding nuclear power generation made by provincial governments, nuclear plant operators and regulators may result in the creation of a larger volume and perhaps different type of used fuel which would need to be managed in Canada. For instance, the lives of existing reactors might be extended through additional refurbishment. Provincial governments may also decide to build new nuclear plants.

The specific volume of used fuel to be placed in the repository will be agreed with the community using the best information available at the time and an open and transparent consultation process involving surrounding communities and others who are interested and potentially affected (Step 6 as described on page 27). Regulatory review processes and approvals, which are required by law before the project can proceed (Step 7 as described on page 27), will be based on a specific fuel volume and will involve an open and transparent consultation process.

Will this facility manage foreign waste?

No. No foreign waste (used fuel from outside of Canada) will be placed in this facility. The *Nuclear Fuel Waste Act* establishes a mandate for the NWMO to manage Canada's used nuclear fuel. Adaptive Phased Management was developed collaboratively with Canadians to meet this mandate. Adaptive Phased Management was recommended by the NWMO and approved by the Government of Canada on this basis.

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. The NWMO has the responsibility for maintaining a funding formula and establishing the amount of deposits to trust funds required by each company on an annual basis. The funding formula, which specifies the funds each company needs to contribute on a yearly basis, was approved by the Minister of Natural Resources Canada in April 2009. Recognizing the funding formula may need to evolve over time, the Minister must review and approve the funding formula again after the NWMO has been granted a licence to construct the deep geological repository and associated facilities.

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 of 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)

5 A Fair Process: Principles and Steps

Canadians told us they want to be sure, above all, that the site for the deep geological repository is safe and secure for people and the environment now and in the future. The process for choosing the site must be grounded in the values and objectives that Canadians hold important. The process must be open, transparent, fair and inclusive. And the process must be designed in a way that assures citizens across the country that the highest scientific, professional and ethical standards will be met.

The process is designed to address the broad range of issues and protections that people told us are important for any appropriate siting process in Canada. It draws from experiences and lessons learned from past work and processes developed in Canada to site facilities for the management of hazardous material. It also draws from similar projects in other countries pursuing the development of a deep geological repository.

What are the goals of the process?

The site selection process is designed to use a partnership-based approach to:

- help ensure that any community that is selected to host this facility is both informed about the project and willing to host it;
- help ensure that any site that is selected to host this facility will safely contain and isolate used nuclear fuel for a very long period of time, in an appropriate geological formation, and that there is an acceptable way of transporting used fuel to the site;
- help the potentially interested host community to consider carefully and thoroughly the project's potential benefits and risks when deciding whether to express interest, and ultimately, willingness to host the project;
- involve surrounding communities, regions and other jurisdictional levels potentially affected by the project and the transportation of used fuel in the identification and assessment of health, environmental, social, economic and cultural effects of the project as part of a broader regional assessment and sustainability planning initiative;
- involve First Nations, Métis and Inuit who will potentially be affected by the implementation of this project; and
- help foster an ongoing public conversation on questions to be answered and issues to be addressed throughout the site selection process.

Ensuring the siting process is adaptable

The process is built on a set of guiding principles and includes key steps. We anticipate that over the course of implementing the site selection process, there will be opportunities to learn along the way and incorporate this learning in the implementation of subsequent steps in the process. For this reason, the pace and manner of moving through these steps will need to be flexible and adaptive. Adaptability will also help ensure that the individual needs of communities are addressed through the process. This may mean that different communities are at different points in the process at any given time, either because they decided to enter the process on different dates or because each took their own time at a given step.

Guiding principles

In conversations with Canadians, it was clear that the siting process needs to be grounded in a set of principles that reflects the values, concerns and priorities of Canadians. The NWMO has identified five fundamental values, described at the beginning of this document (Integrity, Excellence, Engagement, Accountability, Transparency), and an ethical and social framework that informs all its work. The following principles have been identified in dialogue with Canadians and build upon this framework.

FOCUS ON SAFETY. Safety, security and protection of people and the environment are central to the siting process. Any site selected must address scientific and technical site evaluation factors that will acknowledge precaution and ensure protection of present and future generations and the environment for a very long period of time.

MEET OR EXCEED REGULATORY REQUIREMENTS. The outcome of the site selection process, as for all aspects of Adaptive Phased Management, must meet, and if possible exceed, all applicable regulatory standards and requirements for protecting the health, safety and security of humans and the environment, and respect Canada's international commitments on the peaceful use of nuclear energy. These regulatory standards and requirements must be used as a starting point for the siting process and a critical component of the standard to be met throughout.

INFORMED AND WILLING HOST COMMUNITY. The host community, the local geographic community in which the facility is to be located, must be informed and willing to accept the project. The local community must have an understanding of the project and how it is likely to be impacted by the project. As well, the local community must demonstrate that it is willing to accept the project.

FOCUS ON THE NUCLEAR PROVINCES. As identified by Canadians involved in the NWMO study, fairness is best achieved with the site selection process focused within the provinces directly involved in the nuclear fuel cycle.

RIGHT TO WITHDRAW. Communities that decide to engage in the process for selecting a site as potential hosts must have the right to end their involvement in the siting process at any point up to and until the final agreement is signed, subject to all regulatory requirements being met and regulatory approval received.

SITING PROCESS LED BY INTERESTED COMMUNITIES. The steps in the siting process must be driven or triggered by communities expressing interest in exploring their potential suitability as host. A community will proceed to the next step only if it chooses to do so. Potentially interested communities may explore their interest in the project in the way they see fit, with the support of the NWMO, and with funding available to seek independent advice and peer review, and to involve residents in the community, at each stage.

ABORIGINAL RIGHTS, TREATIES AND LAND CLAIMS. The siting process will respect Aboriginal rights and treaties and will take into account that there may be unresolved claims between Aboriginal peoples and the Crown. The NWMO recognizes the Crown's duty to consult and accommodate if necessary when potential Aboriginal and treaty rights may be adversely affected by proposed Crown conduct when the NWMO selects a site. Prior to that, the NWMO must continue to engage with Aboriginal peoples and encourage potentially interested communities, including Aboriginal communities, to engage with First Nations, Métis and Inuit in the area.

SHARED DECISION-MAKING. The site selection decision will be made in stages and will entail a series of decisions about whether and how to proceed. Each potential host community, and later the selected host community, must be involved in decision-making throughout the process. For example, criteria and procedures to assess the effects of the project on the community must be collaboratively developed and assessed with the NWMO.

INCLUSIVENESS. In addition, the NWMO must respond to, and address where appropriate, the views of others who are most likely to be affected by implementation, including the transportation that would be required of used nuclear fuel. Full opportunity must be provided to surrounding communities, provincial governments, Aboriginal communities and transportation communities as a large group with a shared interest to have their questions and concerns heard and taken into account in decision-making on a preferred site.

SUPPORT CAPACITY BUILDING. The site selection process must assist the potential host community in thinking carefully and thoroughly about the potential benefits and impacts to its community associated with this project when assessing its interest, and ultimately, willingness. The NWMO must provide the forms of assistance communities potentially affected by the implementation of the project need to participate in the process.

INFORMING THE PROCESS. The selection of a site must be informed by the best available knowledge—including science, social science, Aboriginal Traditional Knowledge and ethics—relevant to making a decision or formulating a recommendation throughout the process. Consistent with the NWMO's commitment to transparency in its work, the information that is collected and used to assess the potential suitability of a site must be published on the NWMO website for public review and scrutiny and be the subject of third-party review at major milestones.

COMMUNITY WELL-BEING. Any community that agrees to host the facility has a right to benefit from doing so. The project must be implemented in a manner that fosters the long-term well-being or quality of life of the community and region in which it is implemented.

ONGOING ENGAGEMENT OF GOVERNMENTS. While this national initiative is federally mandated, the NWMO must involve all potentially affected provincial governments in the siting decision.

Key definitions

How is 'community' defined?

Throughout the siting process, we must ensure that people and communities can participate in all aspects of the site selection decision that affect them. It is important to identify what constitutes a 'community' and who can best speak on its behalf. Should a community be defined narrowly and by political boundaries, such as the confines of a town, or should it be based on patterns of economic activity and include the surrounding area? In the site selection process, each is important and forms the basis of involvement at different points in the siting process.

For the purpose of expressing interest in Step 2 of the siting process as described later in this document, "interested community" refers to a community—defined as a political entity such as a city, town, village, municipality, region or other municipal structure—that is interested in the siting process. Interested communities may also include Aboriginal governments. An interested community may also be made up of a combination of these. Private land owners interested in this project will be encouraged to work with the community and its accountable authorities.

Municipal or Aboriginal communities interested in exploring the suitability of surrounding Crown land would be considered an "interested community" in collaboration with the provincial government. The provincial government could also be considered an interested community in the case of Crown land and unorganized territory in consultation with potentially affected Aboriginal peoples and nearby municipalities.

As the siting process proceeds, a more regional perspective will become a focus. The deep geological repository and centre of expertise involves a large project which has the potential to both benefit and negatively impact a large area. Planning at a regional scale will ensure benefits associated with the project are maximized and negative effects are minimized and systematically managed. This is the intent of the regional study, which is an important component of the siting decision-making process at Step 4, and will help ensure that those who are potentially affected by locating the project at a particular site will have the capacity and the opportunity to be involved in planning how the project will be implemented.

How will willingness be ensured?

It is fundamental to the siting process that only an informed and willing community be sought and selected to host this project. Several components of the siting process are designed to help ensure this outcome:

- Only communities that are interested in the project, and express this interest, will be considered.
- The siting process involves a number of steps. A community will proceed from one step to the next only if it chooses to do so and if the work to assess the suitability of the site supports it.
- Potentially interested communities may explore their interest in the project in the way they see fit, with the support of the NWMO, and with funding available to seek independent advice and peer review, and to involve residents in the community, at each stage.
- Although accountable authorities will speak for communities in the initial stages of the siting process, ultimately a compelling demonstration of willingness will be required involving residents of the community in order to host this project. Best practice suggests that much time is required for people to learn about the project, to ask questions and to assess their interest in it. For this reason, accountable authorities will be encouraged to engage their citizens early in the siting process, ensuring the involve-

ment of a broad cross-section of citizens, and sustain their involvement throughout the process. Funding will be provided by the NWMO to support this engagement.

- Best practice and experience suggest there are a range of approaches a community may use to demonstrate its willingness in a compelling way. These include documented support expressed through open community discussions or town hall meetings, a telephone poll, online meetings or surveys and/or a formal referendum. New approaches may also emerge over the intervening years as societal expectations and decision-making processes continue to evolve. Communities will be encouraged to identify processes which both meet the specific needs of the community and demonstrate clearly to the NWMO whether the project has the support of residents.
- The concerns and expectations of surrounding communities and region(s) as well as transportation communities as a large group with a shared interest will be identified and addressed by involving these communities in the conduct of a regional study whose outcome will help shape any path forward. The NWMO will provide support to these communities to assist their participation.

Steps in the process

The decision about an appropriate site will be made over a series of steps. These steps are outlined at a glance in the table that follows, and then in more detail. It is expected that individual communities will proceed through the process at a pace and in a manner that reflect their needs and preferences. The process is designed to be flexible and adaptive and to allow individual communities to be at different points in the process at any given time.

Steps in the Process – At a Glance

Getting Ready	**The NWMO publishes the finalized siting process, having briefed provincial governments, the Government of Canada, national and provincial Aboriginal organizations, and regulatory agencies on the NWMO's activities.** The NWMO will continue briefings throughout the siting process to ensure new information is made available and requirements which might emerge are addressed.
Step 1	**The NWMO initiates the siting process with a broad program to provide information, answer questions and build awareness among Canadians about the project and siting process.** Awareness-building activities will continue throughout the full duration of the siting process.
Step 2	**Communities identify their interest in learning more, and the NWMO provides detailed briefing. An initial screening is conducted.** At the request of the community, the NWMO will evaluate the potential suitability of the community against a list of initial screening criteria (outlined on page 30).
Step 3	**For interested communities, a preliminary assessment of potential suitability is conducted.** At the request of the community, the NWMO will conduct a feasibility study collaboratively with the community to determine whether a site has the potential to meet the detailed requirements for the project. Interested communities will be encouraged to inform surrounding communities, including potentially affected Aboriginal communities and governments, as early as possible to facilitate their involvement.
Step 4	**For interested communities, potentially affected surrounding communities are engaged if they have not been already, and detailed site evaluations are completed.** In this step, the NWMO will select one or more suitable sites from communities expressing formal interest for regional study and/or detailed multi-year site evaluations. The NWMO will work collaboratively with these communities to engage potentially affected surrounding communities, Aboriginal governments and the provincial government in a study of health, safety, environment, social, economic and cultural effects of the project at a broader regional level (Regional Study), including effects that may be associated with transportation. Involvement will continue throughout the siting process as decisions are made about how the project will be implemented.
Step 5	**Communities with confirmed suitable sites decide whether they are willing to accept the project and propose the terms and conditions on which they would have the project proceed.**
Step 6	**The NWMO and the community with the preferred site enter into a formal agreement to host the project.** The NWMO selects the preferred site, and the NWMO and community ratify a formal agreement.
Step 7	**Regulatory authorities review the safety of the project through an independent, formal and public process and, if all requirements are satisfied, give their approvals to proceed.** The implementation of the deep geological repository will be regulated under the *Nuclear Safety and Control Act* and its associated regulations to protect the health, safety and security of Canadians and the environment, and to respect Canada's international commitments on the peaceful use of nuclear energy. Regulatory requirements will be observed throughout all steps in the siting process. The documentation produced through previous steps, as well as other documentation that will be required, will be formally reviewed by regulatory authorities at this step through an Environmental Assessment and then licensing hearings related to site preparation and construction of facilities associated with the project. Various aspects of transportation of used nuclear fuel will also need to be approved by regulatory authorities.
Step 8	**Construction and operation of an underground demonstration facility proceeds.** The NWMO will develop the centre of expertise, launched in Step 4, to include and support the construction and operation of an underground demonstration facility designed to confirm the characteristics of the site before applying to regulatory authorities for an operating licence. Designed in collaboration with the community, it will become a hub for knowledge-sharing across Canada and internationally.
Step 9	**Construction and operation of the facility.** The NWMO begins construction of the deep geological repository and associated surface facilities. Operation will begin after an operating licence is obtained from regulatory authorities. The NWMO will continue to work in partnership with the host community in order to ensure the commitments to the community are addressed throughout the entire lifetime of the project.

Description of Steps

Getting Ready

The NWMO publishes the finalized siting process, having provided information and opportunities to brief provincial governments, the Government of Canada, national and provincial Aboriginal organizations, and regulatory agencies on the NWMO's activities.

In preparation to begin the siting process, the NWMO will engage in the following activities and will continue with these activities throughout the site selection process and in parallel with subsequent steps:

- Publish the finalized *Process for Selecting a Site* document which takes into account the suggestions and advice received over the course of the public dialogue. The NWMO will review this process periodically with Canadians throughout the implementation of the siting process to ensure it continues to meet needs and expectations.
- Create a dedicated website to describe activities related to the siting process and post information on progress throughout the process.
- Provide information and opportunities to brief provincial governments and the Government of Canada on the NWMO's activities.
- Provide information and opportunities to brief national and provincial Aboriginal organizations on the NWMO's activities.
- Brief the Canadian Nuclear Safety Commission (CNSC) and other federal and provincial regulatory agencies on the process design, including the approach to site assessment and engagement of citizens. Briefings will be designed to help anticipate the requirements of the licensing processes, including requirements for an environmental assessment, even as new information and requirements may emerge over time.

Step 1

The NWMO initiates the siting process with a broad program to provide information, answer questions and build awareness among Canadians about the project and the siting process.

The NWMO initiates the siting process with a program of information mailings, briefings and activities designed to help build awareness and understanding of the NWMO, the project, steps in the siting process and the criteria to assess suitability of potential host communities.

The NWMO will ensure opportunities to learn more and will both seek opportunities to provide information and respond to requests for information. It will focus its outreach activities on nuclear provinces, including municipalities, the broad public, interested individuals and organizations, and First Nations, Métis and Inuit who have expressed interest in learning more. The information shared in the outreach program will be posted on the NWMO website for broad public access and review.

Activity of this nature is expected to continue throughout the site selection process and in parallel with subsequent steps.

Step 2

Communities identify their interest in learning more, and the NWMO provides detailed briefing. An initial screening is conducted.

A. A community expresses interest in learning more about the process.
A community expresses interest in learning more about the project and steps in the process with a request to the NWMO. For the purpose of expressing interest, "community" is defined as a political entity such as a city, town, village, municipality, region or other municipal structure, Aboriginal government or a combination of these. The request must be made by accountable authorities (for example, elected representative bodies). This may involve existing municipal council of a community, Aboriginal government, the community establishing a new group involving community leaders, or other group as deemed appropriate by the community for learning more about the project.

B. The NWMO evaluates potential suitability of the community against a list of initial screening criteria (outlined on page 30).
Initial screening of the potential suitability of the community based on readily available information and a short list of initial screening criteria will be completed over a **period of 2 to 3 months**. Unless all initial screening criteria can be met at this early point, the community will be excluded from further consideration. Third-party review (described on page 42) is optional, to be initiated upon request of the community.

C. The NWMO provides a detailed briefing to community.
The NWMO provides a detailed briefing, or series of briefings, about the project and the steps in the process to accountable authorities in communities that are interested and not excluded by the initial screening.

D. Communities with potentially suitable sites assess whether they are interested in continuing to preliminary assessment.

Support to community beginning with this step: Should initial screening suggest the community has potential to be suitable for the project and beginning with this step, the community may request and receive resources (funding and information, if desired) from the NWMO for: 1) seeking independent expert advice concerning the project and/or the results of the various site screening and site evaluation stages; 2) augmenting or developing a long-term vision for sustainability; and 3) conducting activities to inform residents and assess interest in the project in the community.

The nature of resources provided will be outlined in a memorandum of understanding between the community and the NWMO.

Step 3

For communities that continue to be interested, a preliminary assessment of potential suitability is conducted.

A. The community informs the NWMO of its interest in a preliminary assessment of its potential suitability.
A community, through its accountable authorities, contacts the NWMO to request preliminary information (in the form of a feasibility study) about whether a geographic area or specific sites in the community have the potential to meet the more detailed requirements for the project. No commitment from the community to participate in the project beyond conduct of the preliminary assessment (feasibility studies) is required. For communities uninterested in proceeding, their involvement in the siting process ceases.

B. The NWMO conducts feasibility studies in collaboration with the community to assess whether the community contains potentially suitable sites.
The NWMO and accountable authorities from the community develop a memorandum of understanding outlining the scope of work, the means by which the NWMO and the community will work together throughout the feasibility studies, the approach to and terms of reference for the third-party review process (described on page 42), the way that citizens will be engaged, and the nature of the funding provided by the NWMO to the community to support the process.

The NWMO, working with the community, will conduct feasibility studies, using pre-established geoscientific and community well-being related criteria, as outlined in Section 6, over a period of **approximately 1 to 2 years** depending on availability of existing information.

The NWMO will provide resources to the community to support the exploration of its interest. The NWMO will publish on its website the results of the feasibility studies, the results of the third-party review and its conclusions on the extent to which sites within the proposed areas are considered suitable should the community decide to proceed to the next step in the process.

C. Communities with potentially suitable sites assess whether they are interested in continuing to detailed site evaluation.
Communities with potentially suitable sites assess whether they are interested in continuing to detailed site evaluation.

Support to communities beginning with this step: The NWMO will encourage interested communities to inform and involve surrounding communities, the region and potentially affected Aboriginal communities and governments as early as possible in conversations about the potential suitability of the community and the site, and interest in hosting the project to help ensure that their issues and concerns are addressed. This engagement will continue throughout the siting process. Beginning with this step, the community (accountable authorities) may request and receive resources (funding and information, as desired) from the NWMO for: 1) establishing a community office for the project; and, 2) conducting activities to inform residents and assess interest in surrounding areas, including First Nations, Métis and Inuit as appropriate.

Beginning with this step, the NWMO will also begin to make funding available to accountable authorities in potentially affected surrounding areas, including First Nations, Métis and Inuit, as appropriate, to support their participation.

The nature of funding provided will be outlined in a memorandum of understanding between the community(ies) involved at this stage and the NWMO.

Step 4

For communities that continue to be interested, potentially affected surrounding communities are engaged if they have not been already, and detailed site evaluations are completed.

A. Communities with potentially suitable sites inform the NWMO of their interest in continuing to detailed site evaluation.
Communities with potentially suitable sites, as represented by accountable authorities, express formal interest in being considered for the project and request detailed evaluation of their suitability. For potentially suitable communities not interested in proceeding, involvement in the siting process ceases.

B. The NWMO selects one or more suitable sites from communities expressing formal interest for regional study and/or detailed site evaluations.
At a point to be determined during the siting process, the NWMO will announce the closing of the formal expression of interest phase, ensuring a minimum of six months notice in advance of the closing date. The NWMO will then select one or more sites from communities that have expressed formal interest, using the criteria identified in Section 6 as the basis for a decision-making process that will be developed with the participation of the communities involved. Results of this process will be shared with the communities and then published on the NWMO website.

C. Several activities will take place in the course of completing this step if not already initiated earlier. These activities may be undertaken in parallel or sequentially.

» The NWMO and the community engage surrounding communities, potentially affected municipal and/or Aboriginal governments, and the provincial government in a study of environmental, social, economic and cultural effects of the project at the broader regional level (Regional Study).

At this point in the process, the NWMO will work with the community to engage potentially affected surrounding communities, regions and jurisdictional levels, and the provincial government, if not already involved, in discussions concerning the potential environmental, social, economic and cultural effects at the broader regional level associated with locating the project. This would include effects that may be associated with transportation and potential transportation modes and routes. The NWMO will identify preferred transportation modes and potential routes and will welcome communities along the transportation route as a large group with a shared interest to raise questions or concerns to be addressed in the process. A report will be produced and published on the NWMO website should the community decide to proceed to the next step in the process.

» The NWMO conducts multi-year detailed site evaluations in collaboration with the community to further assess and, if appropriate, confirm the suitability of sites.

The NWMO and accountable authorities will develop a memorandum of understanding outlining the scope of work, the means by which the NWMO and community will work together throughout the detailed site evaluation, the approach to and terms of reference for the third-party review process (described on page 42), the way that citizens will be engaged, and the nature of the funding provided by the NWMO to the community to support the process. The NWMO will conduct detailed field investigations involving geophysical surveys, characterization of the existing environment, drilling and sampling of boreholes, field and laboratory testing and monitoring activities over a **5-year period** at the site. The NWMO will also conduct studies to identify and assess the potential environmental, social, economic and cultural effects associated with implementing the project in the community. The NWMO will publish on its website the results of the detailed investigations and its conclusions on the extent to which proposed sites are suitable should the community decide to proceed to the next step in the process.

» A centre of expertise is established at or near the potential site.

A centre of expertise will be established in each community with a site under consideration, or nearby as determined with the community, to support the multi-year testing and assessment of the site on technical safety and community well-being dimensions. It will be home for an active technical and social research and technology demonstration program involving researchers and other experts in a wide variety of disciplines including geoscience, engineering, and environmental, social, economic and cultural impact assessment. The centre of expertise will also be 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. As determined with the community, the centre of expertise could be designed to include a small science centre focused on the design, construction and implementation of a deep geological repository and the wide variety of related activities, a meeting place and learning centre for the community, and a destination for interested visitors from the region and beyond.

D. Communities with confirmed suitable sites assess whether they are willing to accept the project.
Communities with confirmed suitable candidate sites assess whether they are willing to accept the project, including engaging the community to assess and demonstrate this willingness.

Support to communities beginning with this step: Beginning with this step, the NWMO will make funding available to communities along the transportation route as a large group with a shared interest to seek independent advice to assist them in formulating questions or concerns to be addressed in the process.

The nature of funding provided will be outlined in a memorandum of understanding between the community(ies) involved at this stage and the NWMO.

Step 5

Communities with confirmed suitable sites decide whether they are willing to accept the project and propose the terms and conditions on which they would have the project proceed.

A. Communities with confirmed suitable sites express willingness to accept the project.
The NWMO requires formal expression of interest from an accountable decision-making body, supported by a compelling demonstration of willingness among those living in the local area. Communities that are unwilling or cannot demonstrate willingness in a compelling manner will cease involvement in the siting process.

B. The community develops and proposes to the NWMO the terms and conditions on which they would have the project proceed.
This may include the means by which the NWMO and community will work together through the regulatory approval process and through the implementation of the project; the need for and nature of provision of resources for technical review and other assistance; the need for and nature of any decision-making and/or advisory bodies to support the process; mechanism to be used for dispute resolution; approach to ensuring the long-term sustainability and well-being of the community through the project, outlining specific inclusions; and approach to managing impacts associated with the project.

Step 6

The NWMO and the community with the preferred site enter into a formal agreement to host the project.

A. The NWMO selects preferred site.
The preferred site will be one that can be demonstrated to be able to safely contain and isolate used nuclear fuel, protecting humans and the environment over the very long term. Locating the facility at the preferred site will also help foster the well-being of the local community. The preferred site will be selected using the criteria outlined in Section 6, aided by a decision-making process that will be developed with the participation of communities involved.

B. The NWMO and community ratify formal agreement to host the project.
The accountable decision-making body enters into a formal agreement with the NWMO as to the conditions under which the project will proceed, subject to all regulatory requirements being met and regulatory approval received.

C. Representatives nominated by local and regional governments and Aboriginal organizations that are affected are appointed to the NWMO Advisory Council.

Step 7

Regulatory authorities review the results of the assessment of the site and the safety of the project through an independent, formal and public process and, if all requirements are satisfied, give their approvals to proceed.

Prior to construction, the NWMO will have to demonstrate that the project meets or exceeds strict regulatory criteria to protect the health, safety and security of Canadians as well as the environment, respecting Canada's international commitments on the peaceful use of nuclear energy. The requirements set by regulatory authorities for this project will have been included in the criteria used to assess the suitability of potential sites from the inception of the siting process. The documentation produced in addressing earlier steps in the siting process, as well as other documentation that will be required, will be the foundation of the regulatory review. The project will proceed only after all regulatory approvals are obtained.

The regulatory process may evolve over time. It currently includes the following components in assessing the safety and acceptability of the project. Every step offers the public an opportunity to participate:

- The implementation of the deep geological repository will be regulated under the *Nuclear Safety and Control Act* and its associated regulations. The project will be subject to the Canadian Nuclear Safety Commission's (CNSC) comprehensive licensing system which covers the entire lifetime of the deep geological repository – from site preparation through construction, operation and decommissioning. This step-wise approach will require a licence for each phase of the project.
- Once a site has been selected as the preferred site, as a first step, the NWMO will submit to the CNSC an application for a licence to prepare the site, or both prepare the site and construct.

- A licensing decision by the CNSC can only be taken after the successful completion of the environmental assessment process. The environmental assessment, involving public hearings, would be conducted under the *Canadian Environmental Assessment Act* to ensure the project will not cause significant adverse environmental effects over the life of the project.
- Upon successful issuance of a licence, the regulator will oversee the project through site inspections and audits to verify regulatory compliance.
- Once the facility is constructed, the NWMO will need to submit an application for an operating licence to the CNSC, involving a public hearing.
- Various aspects of the transportation of used nuclear fuel will also need to be approved by regulatory authorities.

Step 8

Construction and operation of an underground demonstration facility proceeds.

With the granting of a construction licence, the NWMO will begin implementing the project, starting with construction and operation of an underground demonstration facility designed to confirm the characteristics of the site before beginning construction of the deep geological repository. The NWMO will develop the centre of expertise to include and support the construction and operation of the underground demonstration facility. As has been the case for deep geological repositories for nuclear waste constructed in other countries, it will become a hub for knowledge-sharing across Canada and internationally. The design details of the centre of expertise will be developed with the community and the surrounding region with their preferences in mind.

Step 9

Construction and operation of the facility begins.

The NWMO begins construction of the deep geological repository and associated surface facilities, followed by operation after an operating licence is obtained. The NWMO will continue to work in partnership with the host community in order to ensure the needs of the community and the terms of the agreement continue to be met throughout the entire period of construction, operation and closure of the facility.

In brief, what activities are required to assess the suitability of a site?

Over the course of the nine steps, a potential site will be assessed through the following activities:

1. **Initial screening:** At the request of communities, the NWMO will complete a review of available information on the geographic area (Step 2) against a short list of initial screening criteria. Approximately 2 to 3 months will be required to complete this work.

2. **Feasibility studies:** At the preliminary assessment stage (Step 3), the NWMO working with the community will conduct feasibility studies using a list of pre-established criteria identified later in this document. Work will involve desktop studies using available technical and community well-being related information on the geographic areas of potential interest in order to assess, in a preliminary way, whether the community contains sites that may be suitable for developing a safe, underground repository. Work may also involve limited field investigations depending on the extent of existing available information. Approximately 1 to 2 years will be required to complete scientific and technical work at a site, depending on availability of existing information.

3. **Detailed site evaluations:** More detailed site evaluations (Step 4) will involve working with the community to conduct detailed field investigations at selected sites and perform safety assessments. Work will involve geophysical surveys, characterization of the existing environment, testing involving drilling and sampling of deep boreholes, field and laboratory testing and monitoring activities. Approximately 5 years will be required to complete scientific and technical work at a site.

4. **Transportation studies:** The NWMO will identify preferred transportation modes and potential routes associated with each interested community under consideration (Step 4) and will welcome communities along the transportation route as a large group with a shared interest to raise questions or concerns to be addressed in the process.

5. **Local and regional study of the environmental, social, economic and cultural effects of the project:** The NWMO will work with the community and potentially affected surrounding communities, regions and jurisdictional levels (Step 4) in discussions concerning the potential environmental, social, economic and cultural effects associated with locating the project in the community that has expressed interest and has potentially suitable sites. This will include effects that may be associated with transportation.

6. **Regulatory review of a licence to prepare the site and construct the facility:** Regulatory authorities will conduct an independent review of the health, safety and security of persons as well as the environment, and respect for Canada's international commitments on the peaceful use of nuclear energy. The project will proceed only after this work has been completed and all regulatory approvals obtained.

7. **Underground Demonstration Facility:** The NWMO will construct an underground demonstration facility supported by a centre of expertise to provide final confirmation of the characteristics of the site.

6 Ensuring the Safety of a Site and Fostering Community Well-Being

The safety and appropriateness of any potential site will be assessed against a number of factors, both technical and social in nature. The site will be assessed in a series of steps. Each step is designed to evaluate the site in greater detail than the step before. A site may be found to be unsuitable at any stage of evaluation, at which point work at that site would cease and the site would no longer be considered for a deep geological repository.

The community will need to meet a minimum set of criteria in order to enter into the site selection process. These criteria will be the first applied in an initial screening step conducted by the NWMO (Step 2) using readily available information. If these criteria cannot be met, the proposed site will be excluded from the more detailed evaluation process and from further consideration. The initial screening criteria are as follows:

- The site must have available land of sufficient size to accommodate the surface and underground facilities.
- This available land must be outside of protected areas, heritage sites, provincial parks and national parks.
- This available land must not contain known groundwater resources at the repository depth that could be used for drinking, agriculture or industrial uses, so that the repository site is unlikely to be disturbed by future generations.
- This available land must not contain economically exploitable natural resources as known today, so that the repository site is unlikely to be disturbed by future generations.
- This available land must not be located in areas with known geological and hydrogeological characteristics that would prevent the site from being safe, considering the outlined safety factors beginning on page 33.

Available land or individual sites that meet these initial criteria and are identified by communities for potential consideration by the NWMO will be the subject of a progressively more detailed evaluation in two primary areas:

- First, ensuring safety—that is, the ability of the site to protect people and the environment, now and in the future.
- Second, beyond safety—the effect of the project on the sustainability and well-being of the host community.

The preferred site will be one that can be demonstrated to be able to safely contain and isolate used nuclear fuel, protecting humans and the environment over the very long term. Locating the facility at the preferred site will also help foster the well-being, or quality of life, of the local community and region in which it is implemented. Should more than one site be suitable, the preferred site will be selected using the criteria outlined in the discussion that follows, aided by a decision-making process that will be developed with the participation of the communities involved.

Protecting humans and the environment

Any site that is selected to host this facility must be demonstrated to be able to safely contain and isolate used nuclear fuel for a very long period of time. Any site selected will need to address scientific and technical siting factors that will acknowledge precaution and ensure protection for present and future generations.

The ability of a deep geological repository to safely contain and isolate used nuclear fuel relies on the form and properties of the waste, the human-made or engineered barriers placed around the waste, and the natural barriers provided by the host rock formation in which the repository will be located.

The preferred site will be in a rock formation with desirable characteristics (geological, hydrogeological, chemical and mechanical), that support containment and repository performance to meet or exceed the regulatory expectations of the Canadian Nuclear Safety Commission, the guidance of the International Atomic Energy Agency and experience in other countries with nuclear waste management programs.

Six key safety-related questions will be asked of any site:

1. Are the characteristics of the rock at the site appropriate to ensuring the long-term containment and isolation of used nuclear fuel from humans, the environment and surface disturbances caused by human activities and natural events?
2. Is the rock formation at the site geologically stable and likely to remain stable over the very long term in a manner that will ensure the repository will not be substantially affected by geological and climate change processes such as earthquakes and glacial cycles?
3. Are conditions at the site suitable for the safe construction, operation and closure of the repository?
4. Is human intrusion at the site unlikely, for instance through future exploration or mining?
5. Can the geologic conditions at the site be practically studied and described on dimensions that are important for demonstrating long-term safety?
6. Can a transportation route be identified or developed by which used nuclear fuel can safely and securely be transported to the site from the locations at which it is stored?

These key safety-related questions must be addressed through the development of a robust safety case. The site will be evaluated through a series of progressively more detailed scientific and technical assessments over a series of steps, as described in Chapter 5. The safety case will need to demonstrate with confidence that the project can be safely implemented at the site and can meet or surpass the requirements of regulatory authorities.

Transportation

Transportation is an important consideration in the assessment of the safety of any site. As described in the safety questions outlined earlier, in order for a site to be considered technically safe, a transportation route must be identified, or be capable of development, by which used nuclear fuel can safely and securely be transported to the site from the locations at which it is currently stored. Beyond safety, transportation is also an important consideration in identifying and assessing effects on community well-being.

Security and safeguards

In addition to the protection of human health and the environment, physical security aspects of the project and site will be assessed and monitored by the Canadian Nuclear Safety Commission (CNSC) to ensure effective measures are implemented to prevent malevolent acts that could compromise national security. The project will have to comply with the CNSC *Nuclear Security Regulations,* which require the implementation of stringent physical protection measures for security in sensitive areas of the repository and activities such as transportation, handling and storage of used fuel.

The project will also have to comply with the safeguards agreements between Canada and the International Atomic Energy Agency (the *Canada/IAEA Safeguards Agreement and Additional Protocol*) which are administered by the CNSC. The purpose of the safeguards agreements is to enable the IAEA to verify that Canada is meeting its obligations under the *Treaty on the Non-Proliferation of Nuclear Weapons*.

How were the safety criteria identified?

These safety criteria were selected in order to ensure that the requirements of Canadian regulators, as outlined in legislation and guidance documents, will be addressed through the site assessment process. Regulatory authorities will independently review the project and site, including transportation plans, to ensure safety and the protection of people and the environment before the project can proceed. This review is Step 7 in the process. The safety criteria also reflect the best knowledge and experience of other countries and are comparable to the criteria used by them as well as international agencies such as the International Atomic Energy Agency.

Criteria to Ensure Safety

FACTORS AFFECTING SAFETY	PERFORMANCE OBJECTIVES	EVALUATION FACTORS TO BE CONSIDERED
Containment and isolation characteristics of the host rock	1. The geological, hydrogeological, chemical and mechanical characteristics of the site should: » promote long-term isolation of used nuclear fuel from humans, the environment and surface disturbances; » promote long-term containment of used nuclear fuel within the repository; and » restrict groundwater movement and retard the movement of any released radioactive material.	1.1 The depth of the host rock formation should be sufficient for isolating the repository from surface disturbances and changes caused by human activities and natural events. 1.2 The volume of available competent rock at repository depth should be sufficient to host the repository and provide sufficient distance from active geological features such as zones of deformation or faults and unfavourable heterogeneities. 1.3 The mineralogy of the rock, the geochemical composition of the groundwater and rock porewater at repository depth should not adversely impact the expected performance of the repository multiple-barrier system. 1.4 The hydrogeological regime within the host rock should exhibit low groundwater velocities. 1.5 The mineralogy of the host rock, the geochemical composition of the groundwater and rock porewater should be favourable to retarding radionuclide movement. 1.6 The host rock should be capable of withstanding natural stresses and thermal stresses induced by the repository without significant structural deformations or fracturing that could compromise the containment and isolation functions of the repository.

FACTORS AFFECTING SAFETY	PERFORMANCE OBJECTIVES	EVALUATION FACTORS TO BE CONSIDERED
Long-term stability of the site	2. The containment and isolation functions of the repository should not be unacceptably affected by future geological processes and climate changes, including earthquakes and glacial cycles.	2.1 Current and future seismic activity at the repository site should not adversely impact the integrity and safety of the repository system during operation and in the very long term. 2.2 The expected rates of land uplift, subsidence and erosion at the repository site should not adversely impact the containment and isolation functions of the repository. 2.3 The evolution of the geomechanical, hydrogeological and geochemical conditions at repository depth during future climate change scenarios such as glacial cycles should not have a detrimental impact on the long-term safety of the repository. 2.4 The repository should be located at a sufficient distance from geological features such as zones of deformation or faults that could be potentially reactivated in the future.
Repository construction, operation and closure	3. The surface and underground characteristics of the site should be favourable to the safe construction, operation, closure and long-term performance of the repository.	3.1 The strength of the host rock and in-situ stress at repository depth should be such that the repository could be safely excavated, operated and closed without unacceptable rock instabilities. 3.2 The soil cover depth over the host rock should not adversely impact repository construction activities. 3.3 The available surface area should be sufficient to accommodate surface facilities and associated infrastructure.

FACTORS AFFECTING SAFETY	PERFORMANCE OBJECTIVES	EVALUATION FACTORS TO BE CONSIDERED
Human intrusion	4. The site should not be located in areas where the containment and isolation functions of the repository are likely to be disrupted by future human activities.	4.1 The repository should not be located within rock formations containing economically exploitable natural resources such as gas/oil, coal, minerals and other valuable commodities as known today. 4.2 The repository should not be located within geological formations containing groundwater resources at repository depth that could be used for drinking, agriculture or industrial uses.
Site characterization	5. The characteristics of the site should be amenable to site characterization and site data interpretation activities.	5.1 The host rock geometry and structure should be predictable and amenable to site characterization and site data interpretation.
Transportation	6. The site should have a route that exists or is amenable to being created that enables the safe and secure transportation of used fuel from storage sites to the repository site.	6.1 The repository should be located in an area that is amenable to the safe transportation of used nuclear fuel. 6.2 The repository should be located in an area that allows appropriate security and emergency response measures during operation and transportation of the used nuclear fuel.

Fostering community well-being

Beyond ensuring safety, the NWMO's commitment to any host community and region is that its long-term well-being or quality of life will be fostered through its participation in this project.

The NWMO encourages communities, early in the site selection process, to consider this project in the context of their long-term interests. Such a broad approach would help highlight the resources (social, economic, environmental) of the community and pave the way for thinking about how the project may affect the community in a variety of ways.

Ultimately, the vision for the community and the extent to which the project contributes to this vision in an acceptable way is a matter for the community to discuss and assess. Although there is no single definition of community well-being, communities often include in their consideration elements relating to such things as economic health, the environment, safety and security, spiritual dimensions, social conditions, and enhancing opportunities for people and communities.

The project offers significant employment and income to the host community, region and province, including the opportunity for the creation of transferable skills and capacities. However, with a project of this size and nature there is the potential to contribute to social and economic pressures that must be carefully managed to ensure the long-term health and sustainability of the community and region.

In order to identify what processes and supports the NWMO would need to put in place in order to ensure that the project helps foster well-being, the NWMO proposes to consider a range of factors. The NWMO would evaluate and work with potentially interested communities, and their surrounding regions, to identify a plan to address the factors outlined in the table that follows. A plan to foster the well-being of the community through the implementation of the project would be outlined in an agreement (Step 6). Low performance on any of these factors would not exclude a community from consideration, although the ability of the community to benefit from the project, and the resources that would be required from the NWMO to support the community in achieving this benefit, would be a consideration in the selection of a site after all safety considerations have been satisfied.

How were community well-being criteria identified?

The community well-being criteria identified here reflect understanding of the factors that can contribute to the well-being of a community from growing experience in implementing large projects such as this one. Best practice suggests that well-being can only be defined by the community itself, and for this reason, these criteria are considered a starting point for discussion with a community.

Criteria to Assess Factors Beyond Safety

FACTORS BEYOND SAFETY	EVALUATION FACTORS TO BE CONSIDERED
Potential social, economic and cultural effects during the implementation phase of the project, including factors identified by Aboriginal Traditional Knowledge	Sites will be evaluated against the extent to which positive and negative effects on the host community can be addressed during the implementation phase of the project, including the following areas: » Health and safety of residents and the community » Sustainable built and natural environments » Local and regional economy and employment » Community administration and decision-making processes » Balanced growth and healthy, livable community
Potential for enhancement of the community's and the region's long-term sustainability through implementation of the project, including factors identified by Aboriginal Traditional Knowledge	Sites will be evaluated against the extent to which positive and negative effects of the project on long-term sustainability of the host community and region can be addressed in the following areas: » Health, safety and inclusiveness/cohesion of the community » Sustainable built and natural environments » Dynamic resilience of the economy » Community decision-making processes » Balanced growth and healthy, livable community
Potential to avoid ecologically sensitive areas and locally significant features, including factors identified by Aboriginal Traditional Knowledge	Sites will be evaluated for the following: » Ability to avoid ecologically sensitive areas and locally significant features
Potential for physical and social infrastructure to adapt to changes resulting from the project	Sites will be evaluated for the following: » The availability of physical infrastructure required to implement the project » The ability of the community, and the social infrastructure it has in place, to adapt to changes resulting from the project » The NWMO resources required to put in place physical and social infrastructure needed to support the project
Potential to avoid or minimize effects of the transportation of used nuclear fuel from existing storage facilities to the repository site	Sites will be evaluated for the following: » The availability of transportation routes (road, rail, water) and the adequacy of associated infrastructure and potential to put such routes in place » The availability of suitable safe connections and intermodal transfer points, if required, and potential to put them in place » The NWMO resources (fuel, people) and associated carbon footprint required to transport used fuel to the site » The potential for effects on communities along the transportation routes and at intermodal transfer points

Traditional Knowledge

Aboriginal peoples have a special relationship with the natural environment and have unique stewardship responsibilities that are part of this relationship. The knowledge that comes from this relationship with the land brings special understanding to the broad range of factors that should be considered, and the processes that should be used, in assessing the appropriateness of any site. This includes both the assessment of technical safety as well as factors beyond safety or community well-being.

Aboriginal Traditional Knowledge includes important knowledge about the land and ecology stemming from long contact with the land. It also includes knowledge about developing and maintaining effective and meaningful relationships between generations and within and between communities.

Traditional Knowledge systems assume that people are part of the land, not that they own the land, and are guardians of Mother Earth. Aboriginal Traditional Knowledge emphasizes the interrelationships between components of the environment.

Traditional Knowledge provides rules for: protecting the land while using it; clarifying and enhancing relationships amongst users; assisting in the development of technologies to meet the subsistence, health, trade and ritual needs of local people; and helping to create a world view that incorporates and makes sense of all of these in the context of a long-term, holistic perspective in decision-making.

Appropriate consideration and respect must be given to factors such as:

- spiritual and physical aspects of the land, people, wildlife and their habitat;
- the relationships between various aspects of the environment, including humans;
- the aboriginal sense of responsibility and stewardship;
- the health, trade and spiritual needs of people;
- aspects of traditional community life such as culturally oriented activities, the wide range of volunteer activities, recreational activities, housework and subsistence activities; and
- the impact of our actions seven generations or more in the future.

Aboriginal Traditional Knowledge is a complex and sophisticated system of knowledge drawing on centuries of wisdom and experience. It constantly grows and changes with new information. The wisdom derived from this philosophy can be used when planning for the future. For example, the ‘seven generation’ teachings require decision makers to consider the impact of their choices on future generations.

The NWMO will look to Aboriginal peoples as practitioners of Traditional Knowledge to be active participants in the site selection process, and to share that knowledge with the NWMO to the extent they wish to in order to help guide the decisions involved in site selection and ensure safety and the long-term well-being of the community. The NWMO will seek to engage in discussions with Traditional Knowledge holders to ensure that the factors and approaches used to assess the site appropriately interweave Traditional Knowledge and western science throughout the steps in the siting process.

7 Partnership and Community Support

Towards a partnership with a willing community

It is the community's decision whether it will enter the site selection process and then proceed through the steps. The community can decide at any time to cease its involvement in the process up to and until the signing of a formal agreement immediately prior to the launch of the regulatory review process and subject to its successful completion. For each major phase of the assessment, the terms and conditions for the conduct of the work are to be jointly developed by the NWMO and the community as represented by an accountable body in a memorandum of understanding. This memorandum would outline the parameters of the partnership for the phase of work, including the agreed scope of work, the means by which the NWMO and community will work together, the approach to and terms of reference for third-party review, and the nature of the resources provided by the NWMO to the community to support its participation.

In order to ensure that the project is implemented in partnership with the community, and before the regulatory approvals process is initiated, the NWMO will require a formal expression of willingness from the community (Step 5). This is expected to include a formal expression of interest from an accountable decision-making body, supported by a compelling demonstration of willingness among those living in the local area. The NWMO will encourage any community interested in hosting this project to engage citizens in assessing interest in the project at multiple points leading up to Step 5, ensuring the involvement of a broad cross-section of citizens. Resources will be provided by the NWMO for this purpose.

A community's willingness is expected to be formally confirmed with the development and ratification of a formal agreement between the NWMO and the community. This agreement is expected to include the means by which the NWMO and the community will work together to seek regulatory approval to proceed to implement the project; the need for, and nature of, provision of resources and funding for technical and other assistance; the need for, and nature of, any decision-making and/or advisory bodies to support the process; the mechanism to be used for dispute resolution; the approach for ensuring the long-term sustainability and well-being of the community through the project, outlining specific inclusions; and the approach to managing the impacts associated with the project.

Involving surrounding communities and regions

The NWMO will encourage any community interested in hosting this project to involve surrounding communities, regions and potentially affected Aboriginal governments as early as possible in conversations about the potential suitability of the community and site.

Potentially affected surrounding communities, regions and jurisdictional levels will be engaged by the NWMO and the community in discussion concerning the potential environmental, social, economic and cultural effects of the project at the broader regional level associated with locating the project (Step 4). In order to support involvement, the NWMO will make resources available to elected representative bodies or their delegates in surrounding areas, including First Nations, Métis and Inuit as appropriate, as described in Section 5 of this document.

Involving communities along potential transportation routes

As part of the regional study, the NWMO will identify preferred transportation modes and potential routes associated with each interested community under consideration. Communities along the transportation route will be invited to raise questions or concerns that will be documented and then addressed as appropriate and factored into decision-making. Communities along the transportation route, as a large group with a shared interest, might request funds to seek independent advice to assist them in formulating questions or concerns to be addressed in the process.

Involving Aboriginal peoples

Aboriginal communities will have available to them the resources described above to participate in the process as an interested and potentially willing community or a community that is nearby an interested community (as one of the surrounding communities). Aboriginal peoples, rights and treaty rights, and land claim and self-government agreement negotiations may be impacted in the area or region where the project is being proposed. The NWMO will encourage and help facilitate early involvement and agreement with Aboriginal groups in the planning and design phases of the project. In all instances, the siting process will respect Aboriginal rights and treaties and will take into account that there may be unresolved claims between Aboriginal peoples and the Crown. Aboriginal and treaty rights are protected under Section 35 of the *Constitution Act, 1982*. Aboriginal peoples also have a unique cultural, traditional and social connection to the land and have a special interest in preserving and protecting the environment while providing a sustainable future for generations to come.

Engagement of potentially affected Aboriginal peoples will take place supported by agreements developed for this purpose. These agreements will be developed in conjunction with the Aboriginal peoples in the area and will include support to help build capacity to participate, conduct independent research and develop culturally appropriate communication vehicles. The NWMO will work with the Crown in fulfilling its duty to consult with, and accommodate if necessary, all those Aboriginal communities impacted by the development of the site.

Aboriginal Traditional Knowledge includes important knowledge about the land and ecology, stemming from long contact with the land. It also includes knowledge about developing and maintaining effective and meaningful relationships between generations and within and between communities. The NWMO will look to Aboriginal peoples to share that knowledge with the NWMO to the extent that they wish to. The NWMO will ensure that Aboriginal intellectual property is protected, as agreed with the Aboriginal people who choose to share that knowledge with us.

Fostering public conversations and discussion

Throughout the site selection process, the NWMO will encourage any community, interested individual or group to become involved by learning more and sharing their thoughts. The NWMO will provide briefings upon request to share information, answer questions and engage those interested in learning more about the project being sited, the site selection process or the phases of work being completed to assess the suitability of potential sites. A package of materials designed to help build awareness of the project and support small group conversations among interested citizens will be available on the NWMO website or will be mailed upon request. Throughout the site selection process, Canadians will be encouraged to review progress and share their thoughts by activities such as participating in an online forum, completing a survey on the website or making a submission that will be posted on the NWMO website.

The NWMO will encourage any community, interested individual or group to contribute to shaping the knowledge platform on which this project will proceed. Research proposals that contribute to building understanding of important issues related to the site selection process, and that are general in nature rather than site-specific, will be considered.

8 Role of Third-Party Review in the Process

Third-party review and advice will be important components of the process to ensure safety of the site and the project overall. Third-party review will ensure that the NWMO process is thorough and incorporates the best available scientific, engineering and social science knowledge throughout. Third-party review is included in the process to review and confirm site evaluations, and review and confirm adherence to site selection principles and process.

Review of site evaluation results

A review group will be established to review assessments conducted of the potential suitability of a site at each major stage of the process (Steps 3 and 4). Third-party review is optional at Step 2 in the process and will be initiated upon request of the community.

The review group will be formed in collaboration with the communities that express interest early in the site selection process and who wish to have sites in their community assessed. Both the process for selection of review group members and the terms of reference for the review will be developed in collaboration with these communities.

As the suitability of any site will need to be assessed on both technical and non-technical dimensions, the review group will be multidisciplinary and include specialists in both technical and social scientific disciplines. The findings, advice and reports of the review group will be available to all those involved in the siting process, and to the public through the NWMO website should the community decide to proceed in the process.

The potential host community will also be funded to seek independent expert advice throughout the process.

Review of adherence to site selection principles and process

The NWMO Advisory Council, which was formed in 2002 to meet the requirements of the *Nuclear Fuel Waste Act*, will review the NWMO's adherence to the site selection principles and process.

The Advisory Council is required by the *Nuclear Fuel Waste Act* to report every three years to the Government of Canada on its assessment of the activities of the NWMO, including the results of the NWMO's public consultations and analysis of any significant socio-economic effects of its activities. The Advisory Council's review of the integrity of and adherence to the site selection principles and process will be an important component of this reporting. The Advisory Council's review will be published on the NWMO website, as are the minutes of its meetings. Note that once a community has been selected to host the repository and centre of expertise and the host region is known, Advisory Council membership will be expanded to include representatives nominated by affected local and regional governments and Aboriginal organizations.

Other review

Other review will also be sought throughout the process. For instance, while regulatory approvals will be sought only after a preferred site in a willing host community has been identified, the NWMO will begin discussions with regulatory agencies early in the process to ensure it understands, and is on the path to meeting, regulatory requirements as they may evolve over time. The NWMO will request preliminary reviews and feedback at critical stages of the siting process, and safety evaluations from regulatory and policy agencies, such as Natural Resources Canada, the Canadian Nuclear Safety Commission (CNSC) and the Canadian Environmental Assessment Agency (CEAA).

Peer reviews will be conducted on the preliminary safety case by independent international experts such as the Nuclear Energy Agency (NEA) of the Organisation for Economic Co-operation and Development and/or the International Atomic Energy Agency (IAEA) of the United Nations. Such peer reviews are among the services these organizations provide to their member countries. The NEA provides peer reviews as part of its mandate to help improve and harmonize the technical basis for dealing with nuclear waste issues in its member countries. The IAEA provides peer reviews as part of its mandate to perform services useful in research on, and development or practical application of, nuclear energy for peaceful purposes, and to establish international standards of safety and provide for their application. These reviews will be published on the NWMO website.

9 Regulatory Review

The project will be subject to a thorough and comprehensive regulatory review process covering the entire life cycle of the repository and associated facilities. The regulatory review will ensure that the project will be implemented in a manner that protects the safety of people and the environment. Security of the repository and activities such as transportation, handling and storage of used fuel will also be part of the review process.

Regulatory review will formally, independently and publicly assess and confirm that the project can be safely implemented at the site. The review process will take place over a number of successive steps, from site preparation and construction to operation and then closure. The safety of the project will be assessed and confirmed at each step. Citizens will be invited to participate in the regulatory process through the open public hearings that will be conducted at each step.

The formal regulatory review process will be initiated once an agreement has been developed between a community and the NWMO to host a site. However, the regulatory requirements for this project will inform the site assessment activities and approach to engagement of citizens from the inception of the siting process, as outlined in this document. Over the eight-year period (or more) of site assessments, learning may increase, and expectations and best practices may evolve. For this reason, the NWMO will seek regulatory guidance throughout the siting process to ensure that its work remains consistent with regulatory expectations.

Regulatory review will involve a number of federal and provincial regulatory agencies, and some municipal agencies as well.

Regulatory review at the federal level

Regulatory oversight by the Government of Canada involves a number of agencies.

The Government of Canada, through Natural Resources Canada, monitors the NWMO on an ongoing basis to ensure compliance with the *Nuclear Fuel Waste Act*, including the full funding of the project and performance with respect to managing socio-economic effects. As outlined in the Act, the NWMO must submit an annual report to the Minister of Natural Resources, who in turn releases a public statement and tables the report in Parliament.

The Canadian Nuclear Safety Commission (CNSC) is mandated, under the *Nuclear Safety and Control Act*, to regulate all nuclear facilities and nuclear-related activities in Canada, including a deep geological repository facility for used nuclear fuel. Under this mandate, the CNSC regulates the nuclear sector while protecting the health, safety and security of Canadians as well as the environment, and respecting Canada's international commitments on the peaceful use of nuclear energy.

The CNSC will review and assess the project and site locations, and ultimately will be responsible for issuing licences authorizing the project to proceed to different phases of its life cycle development. Successful completion of the environmental assessment process is required to ensure that the project is considered in a careful and precautionary manner such that it will not cause significant adverse effects to health, safety, security and the environment over the life of the project. Licensing requirements are designed to demand that the safety case be clearly demonstrated.

Various aspects of the transportation of used nuclear fuel will also need to be approved by regulatory authorities.

Physical security aspects of the project and site will be assessed and monitored by the CNSC to ensure effective measures are implemented to prevent malevolent acts that could compromise national

security. The project will have to comply with CNSC *Nuclear Security Regulations,* which require the implementation of stringent physical-protection measures for security in sensitive areas of the repository and activities such as transportation, handling and storage of used nuclear fuel.

The project will also have to comply with the safeguards agreements between Canada and the International Atomic Energy Agency (IAEA) to verify that Canada is meeting its obligations under the nuclear non-proliferation treaty.

As part of a harmonized review process, other agencies may also be involved in assessing this project, including Environment Canada, Fisheries and Oceans Canada, Health Canada and Natural Resources Canada.

The CNSC continually reviews its regulatory framework. New knowledge and understanding could result in an adjustment to the regulatory framework. The regulatory requirements that this project will need to meet, and the process that will be used to review the project, may evolve in the years leading up to the review and will need to be addressed as the siting process proceeds. The major steps in the Canadian regulatory process as they exist today are outlined in the following table and should be considered the minimum points at which the project will be assessed.

Review at the provincial and municipal levels

Although implementation of the deep geological repository falls within federal jurisdiction, some aspects of the project may be governed by provincial legislation. Federal and provincial governments also work cooperatively in several areas, including nuclear emergency preparedness and transportation.

Although the CNSC is the main licensing authority, there may be some ancillary provincial approvals required, such as for environmental protection and water resources protection. Provincial occupational health and safety laws may apply during the construction phase of the project. It is also expected that the project would be subject to provincial property value assessment laws and municipal property taxation.

International treaties and agreements

Canada has in place a comprehensive safeguards agreement with the International Atomic Energy Agency (IAEA) pursuant to the *Treaty on the Non-Proliferation of Nuclear Weapons*, as well as an additional protocol to this agreement (the '*Additional Protocol*'), aimed at ensuring the peaceful nature of Canada's nuclear activities. The CNSC is responsible for the implementation of measures to which Canada has agreed in these safeguards agreements. Through its regulatory framework, the CNSC ensures that all relevant licensees have in place programs and procedures to comply with licence conditions related to safeguards. Safeguards are intended to provide assurance to the international community that Canada is not using nuclear material for the production of nuclear weapons or other nuclear explosive devices.

The NWMO, under the coordination of the CNSC, will also be required to demonstrate how it continues to meet the applicable obligations under the terms of the *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*. Under the Convention, Canada must demonstrate that it is meeting international commitments to manage radioactive waste and spent fuel safely.

Steps in the Canadian Regulatory Process (2010)

ENVIRONMENTAL ASSESSMENT

The project will be the subject of an environmental assessment under the *Canadian Environmental Assessment Act*, for facilities related to this project, involving a public hearing:

- the shallow underground storage facility, if a decision is made to construct this optional facility
- the deep geological repository and associated surface facilities

SITE PREPARATION LICENCE [3]

Upon successful completion of an environmental assessment, a site preparation licence, involving a public hearing, would be required from the Canadian Nuclear Safety Commission (CNSC) before work could begin at the site.

Upon successful issuance of a licence, the CNSC performs oversight through site inspections and audits to verify regulatory compliance.

CONSTRUCTION LICENCE

A construction licence, involving a public hearing, would be required from the Canadian Nuclear Safety Commission to construct:

- the shallow underground storage facility, if a decision is made to construct this facility
- the underground demonstration facility
- the deep geological repository and associated surface facilities

Upon successful issuance of a licence, the CNSC performs oversight through site inspections and audits to verify regulatory compliance.

OPERATING LICENCE

An operating licence, involving a public hearing, from the Canadian Nuclear Safety Commission will be required for the operation of:

- the shallow underground storage facility, if a decision is made to construct and operate this optional facility
- the deep geological repository and associated surface facilities

Upon successful issuance of a licence, the CNSC performs oversight through site inspections and audits to verify regulatory compliance.

TRANSPORTATION OF USED FUEL

Responsibility for the regulation of the transportation of radioactive material is shared by Transport Canada and the Canadian Nuclear Safety Commission:

- Transportation plans will need to be reviewed by Transport Canada against requirements to promote public safety during the transport of radioactive material, and Emergency Response Assistance Plans will need to be approved prior to transport.
- Transport Canada is primarily responsible for establishing and enforcing any transportation requirements of carriers, vehicles or other conveyances except for the radiation protection program for the carriers. The CNSC's primary responsibilities in this area are related to security and establishing and enforcing radiation protection associated with the packaging and transport of nuclear substances. The CNSC approves the design of the package and issues transport licences to cover these shipments. The CNSC also enforces these regulations through compliance verifications.

DECOMMISSIONING THE FACILITY

A licence will be required to:

- close the underground shallow storage facility, if built
- close the deep geological repository
- decommission surface facilities

The decommissioning of the facility would be the subject of an environmental assessment under the *Canadian Environmental Assessment Act*.

Upon successful issuance of a licence, the CNSC performs oversight through site inspections and audits to verify regulatory compliance.

LONG-TERM MONITORING

The Canadian Nuclear Safety Commission will be involved in all decisions made about how monitoring will be conducted at the site.

[3] A licence to prepare the site and a licence to construct may be sought at the same time.

10 Learn More

In this document, the NWMO has laid out a process to identify an informed and willing host community for Canada's used nuclear fuel. The Site Selection Process was developed openly and transparently in collaboration with Canadians over the course of the past two years. The NWMO will review this process periodically with Canadians throughout the implementation of the siting process to ensure it continues to meet needs and expectations.

We invite you to learn about Canada's plan for the long-term management of used nuclear fuel, the project and the strong public policy principles underlying the siting process.

For more information, please contact:

Jamie Robinson
Director, Communications

Nuclear Waste Management Organization
22 St. Clair Avenue East, 6th Floor
Toronto, ON M4T 2S3
Canada

Tel: 647.259.3012 Fax: 647.259.3692
Email: learnmore@nwmo.ca
Website: www.nwmo.ca/sitingprocess

Additional Resources

The NWMO has published a variety of backgrounders to help those interested learn more about the siting process, Adaptive Phased Management and the range of considerations that will need to be addressed in its implementation. These backgrounders are available on the NWMO website (www.nwmo.ca/sitingprocess_backgrounders) or by mail upon request.

For more information, please contact:

Jamie Robinson Director, Communications
Tel 647.259.3012 Fax 647.259.3692
Email learnmore@nwmo.ca
www.nwmo.ca/sitingprocess

Nuclear Waste Management Organization

22 St. Clair Avenue East, Sixth Floor
Toronto, Ontario M4T 2S3 Canada
Tel 416.934.9814 Toll Free 1.866.249.6966
www.nwmo.ca

NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES