

PROCESS FOR SELECTING A SITE FOR CANADA'S DEEP GEOLOGICAL REPOSITORY FOR USED NUCLEAR FUEL

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ABSTRACT

The Nuclear Waste Management Organization (NWMO) is responsible for implementing Adaptive Phased Management, the approach selected by the Government of Canada for long-term management of used nuclear fuel waste generated by Canadian nuclear reactors. The ultimate objective of Adaptive Phased Management is the centralized containment and isolation of Canada's used nuclear fuel in a Deep Geological Repository in a suitable crystalline or sedimentary rock formation at a depth of about 500m. The repository will consist of a series of access and service shafts and a series of tunnels leading to placement rooms where used fuel will be placed and sealed in competent rock using a multi-barrier system which includes long lived specially designed containers, sealing materials such as bentonite and the rock itself. The used fuel will be monitored throughout all phases of implementation and will also remain retrievable for an extended period of time.

In May 2010, the NWMO published the site selection process that serves as the road map to decision-making on the location for the deep geological repository. NWMO initiated the process with a first stage that invites communities to learn more about the project and the site selection process. NWMO is actively building awareness of the project and, on request of communities, is delivering briefings, supporting community capacity building and undertaking high-level screenings of site suitability.

The paper provides a brief description of: Adaptive Phased Management including the deep geological repository which is its ultimate goal, and the design of the site selection process, and importantly the approach to assessing the suitability of sites from both a social and technical perspective. The paper will outline how NWMO sought to develop a socially-acceptable site selection process as a firm foundation for future decisions on siting. Through a two-year collaborative process, NWMO sought to understand the expectations of Canadians concerning key principles and elements of a fair and acceptable site selection process, and the experiences and lessons learned in siting large projects internationally. The paper will highlight the requirements identified by citizens, and outline the goals and principles associated with the site selection process that emerged from this process of collaboration.

NWMO will share its observations based on the lessons learned to date as the organization implements this community-driven site selection process. NWMO will reflect on challenges and opportunities encountered as the journey unfolds.

1. INTRODUCTION

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, 2002. 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 is called Adaptive Phased Management and was recommended as the preferred approach for the long-term management of Canada's used nuclear fuel in the NWMO's final study report, titled *Choosing a Way Forward. The Future Management of Canada's Used Nuclear Fuel* (2005).

In June 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. The NWMO is now working to implement Adaptive Phased Management. Since Adaptive Phased Management (APM) involves the centralization of Canada's used nuclear fuel at a single site, one of the first processes to be developed in implementing APM is the process to be used to seek and select this site.

2. ADAPTIVE PHASED MANAGEMENT

Adaptive Phased Management was developed in dialogue with Canadians to reflect features considered important by citizens. As a plan for the future, Adaptive Phased Management is designed to chart 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.

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. The plan also builds in the potential for retrieval of the used fuel and monitoring 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 is designed to be implemented over several decades. Over this period of time, it is expected that we may experience changes in the values and preferences of Canadian society, advancements in knowledge and technologies, and changes in 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 the plan to adapt to other changes we may encounter along the way.

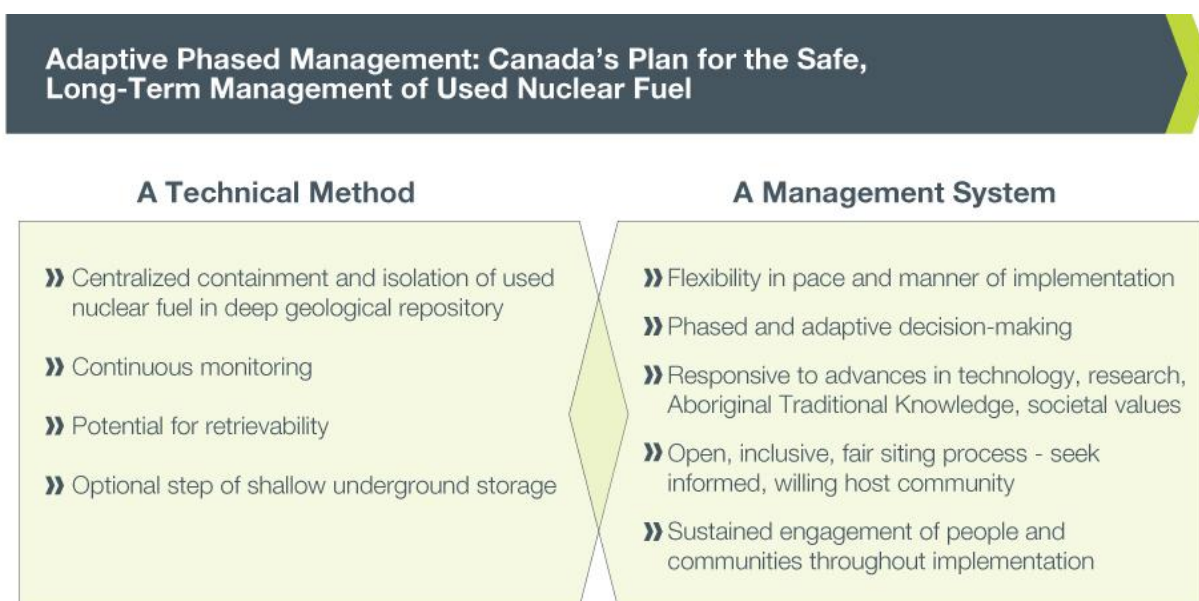


Figure 1. Adaptive Phased Management: Canada's plan for the safe, long-term management of used nuclear fuel.

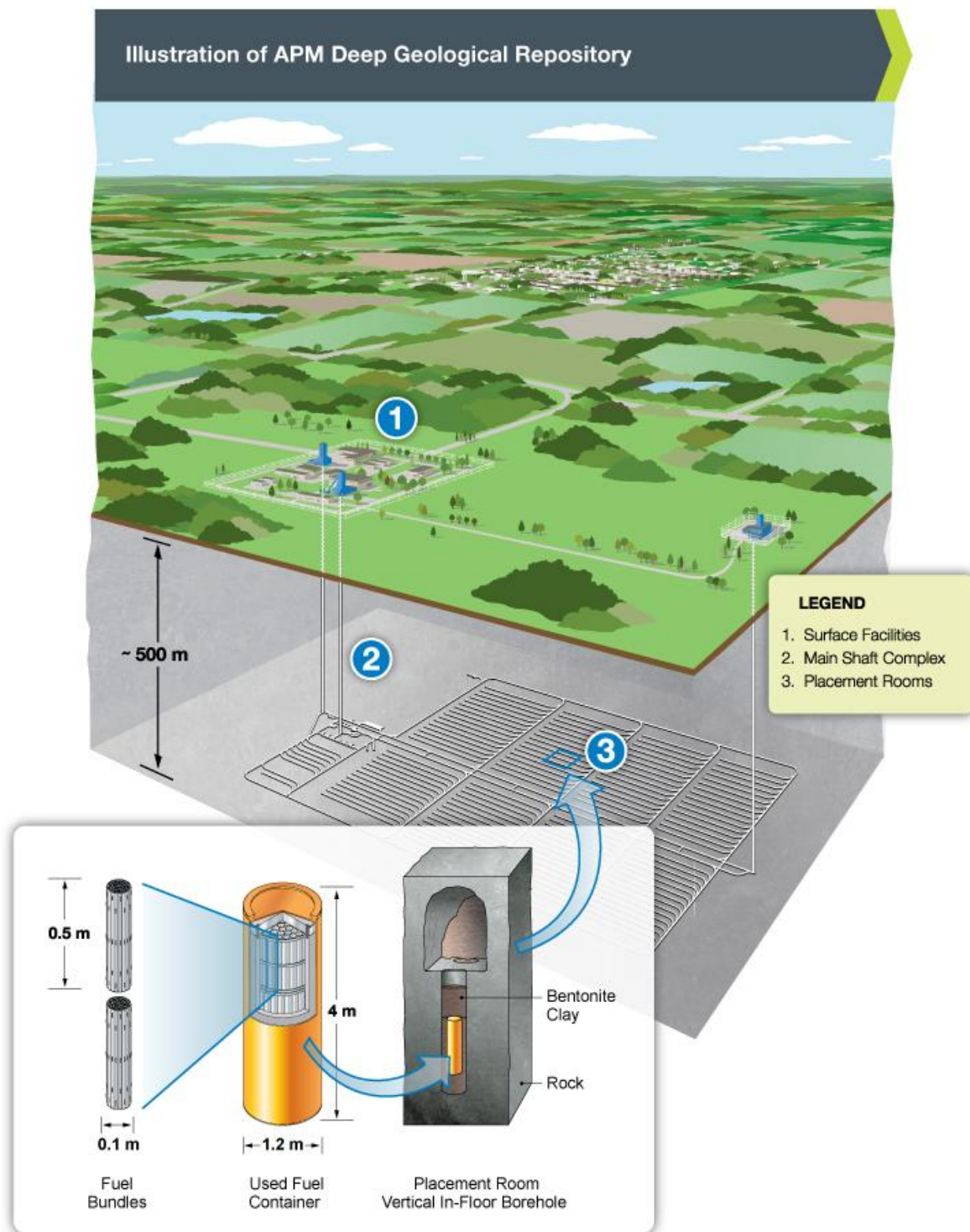


Figure 2. Illustration of APM Deep Geological Repository.

3. DEVELOPING THE SITE SELECTION PROCESS

As part of the design of APM, the NWMO committed to collaboratively developing with Canadians the process for siting a deep geological repository for the safe, long-term management of used nuclear fuel in an informed and willing host community.

Over the course of two years of dialogue with Aboriginal peoples, the public and specialists, the NWMO received direction on what an appropriate site selection process for the long term management of used nuclear fuel in Canada would look like. This direction was the foundation for the design of the site selection process.

To begin the dialogue about the site selection process, the NWMO captured the questions, concerns and expectations expressed during the NWMO Study (2002-2005) in a discussion document. Although the study focused on the development of a preferred management approach, many had spoken about the requirements of a site selection process as a necessary component of an appropriate management approach. The discussion document, titled *Moving Forward Together: Designing the Process for Selecting a site*, was published in August 2008. Its purpose was to seek the involvement of a broad cross-section of Canadians in the design of the process for selecting a site. The document drew from the experience of other countries and encouraged readers to think through the challenges and opportunities to be addressed. Release of the document launched the two year collaborative development of the siting process, briefly described in Figure 3.

The NWMO also engaged experts to help understand the possibilities and to respond to requirements which citizens identified. Papers were commissioned in a number of areas to build upon and supplement the growing body of knowledge in reports published on the NWMO website since 2002.

The direction received from dialogues and direct submissions was used to develop a site selection process, composed of principles and steps that incorporated, to the best of the NWMO's ability, what had been heard. This was then reflected back to Canadians in the form of a draft site selection process, to test whether the NWMO had heard Canadians well, incorporated their direction appropriately in the design of the process, and to identify the further refinements to the process which were needed. The proposal for a siting process, titled, *Moving Forward Together: Designing the Process for Selecting a Site – Invitation to Review a Proposed Process for Selecting a Site*, was published in May 2009. This discussion document was widely distributed and was the basis for engagement activities throughout 2009. Canadians were invited to consider the proposed process and to share their thoughts. Information materials prepared to support the dialogue included a corporate video about APM and the NWMO, poster boards, a workbook outlining key components of the proposed process, and backgrounders and fact sheets on commonly asked questions and topics. The corporate video was also produced in eight Aboriginal languages. All this material was available on the NWMO website or through the mail upon request.

Through the two-year dialogue and engagement activities, the NWMO met with thousands of citizens from many parts of Canadian society to hear their advice and suggestions on how to proceed. In response to the questions, comments and suggestions received, the NWMO made refinements to the siting process and published *Moving Forward Together: Process for Selecting a Site for Canada's Deep Geological Repository for Used Nuclear Fuel*, in May 2010 which marked the initiation of the siting process.



Figure 3. Two-year collaborative development of a process to select a site, 2008 to 2010.

4. ENSURING SAFETY AND FOSTERING COMMUNITY WELL-BEING

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.

Through the dialogues, Canadians said 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.

Canadians said that fairness is best achieved with the site selection process focused within the provinces directly involved in the nuclear fuel cycle, although communities in other provinces may also apply. Also important to Canadians is that communities have the ability to withdraw from the siting process. Communities are required to trigger each step in the process in order to proceed; in this way communities are able to end their involvement at any point up to and until the final agreement is signed. 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 built on a set of guiding principles (Figure 4) and includes a series of steps (Figure 5). The siting process begins with a period of learning and capacity building for communities. Screening and feasibility studies of potential sites will be conducted in partnership with communities as they express interest. A community may end its involvement in the process at any point up to and until the final agreement is signed.

Successful implementation of the siting process is expected to require a good understanding of regional priorities, politics and key players. Throughout the site selection process the NWMO will assist interested communities in engaging surrounding communities, the region, and provincial and Aboriginal governments, in a regional study of environmental, social, cultural and economic effects, and detailed site investigation. Involvement of regional representatives is designed to help ensure that the broad range of potential effects associated with implementation at a particular site are recognized and considered.

It is fundamental to the siting process that only an informed and willing community be sought and selected to host this project. Although accountable authorities can 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 the project. It is expected 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 are encouraged to engage their citizens early in the siting process, ensuring the involvement of a broad cross-section of citizens, and sustain their involvement throughout the process. The concerns and expectations of surrounding communities and region(s) as well as transportation communities will be identified and addressed by involving these communities in the conduct of a regional study whose outcome will help shape any path forward.

It is anticipated 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 is 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.

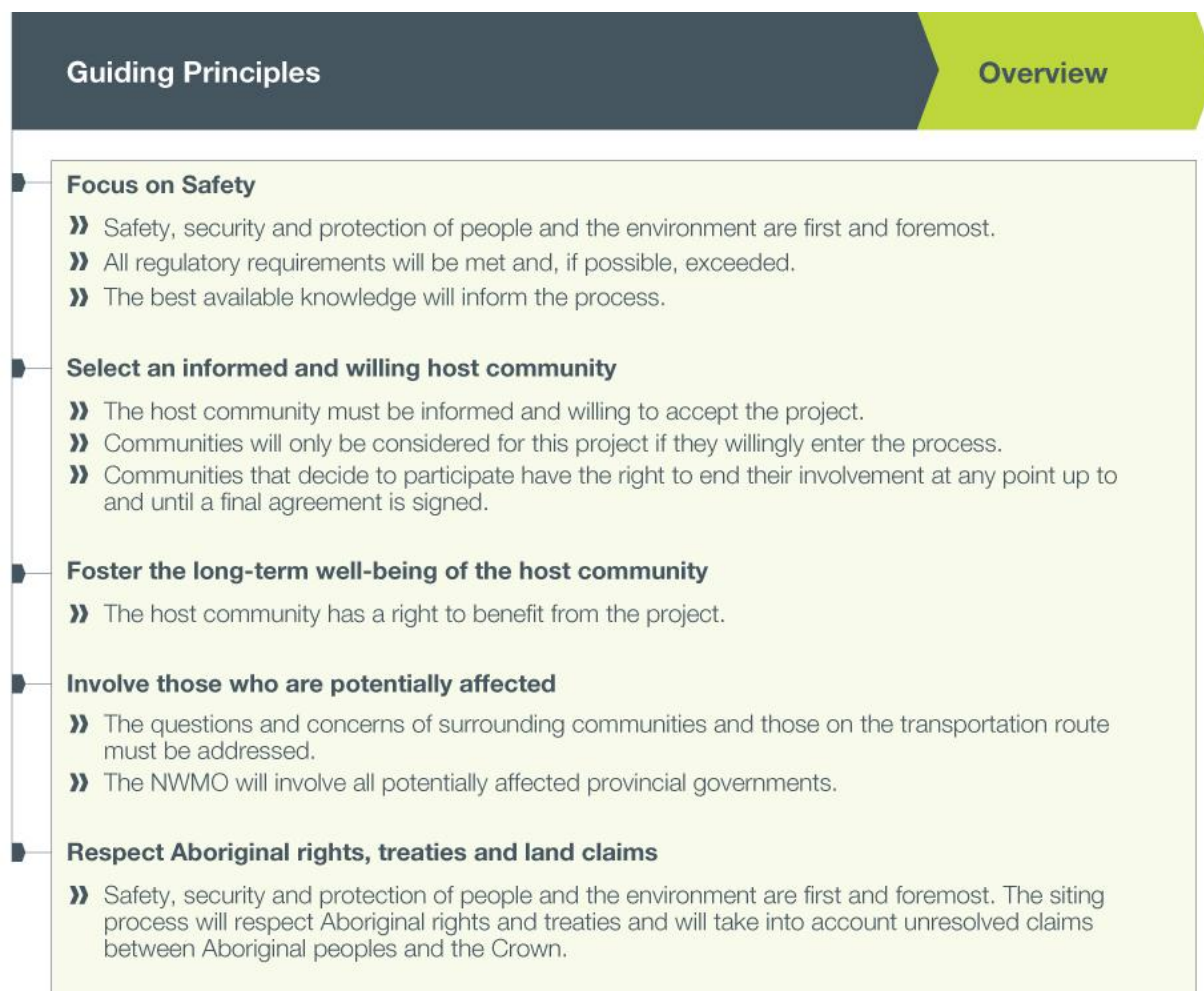


Figure 4. Guiding principles.

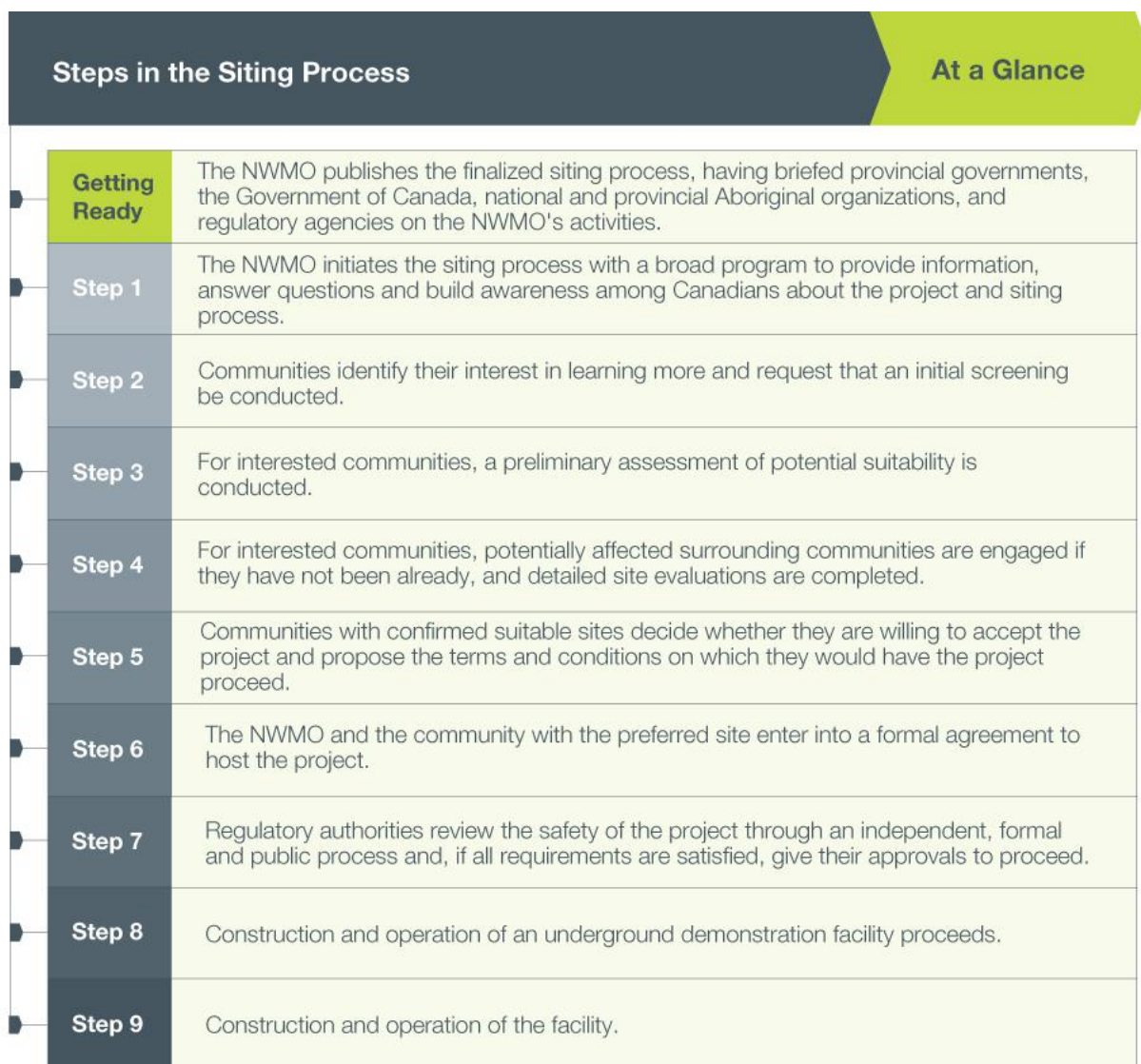


Figure 5. Steps in the siting process at a glance.

5. APPROACH TO ASSESSING SUITABILITY

The safety and appropriateness of any potential site will be assessed against a number of factors, both technical and social in nature. 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. Any site selected will need to address scientific and technical siting factors that will acknowledge precaution and ensure protection for present and future generations. Evaluation factors designed to ensure safety are briefly outlined in Figure 6.

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.

Communities are encouraged, early in the site selection process, to consider this project in the context of their long-term interests. Such a broad approach is expected to 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. The site selection process looks to Aboriginal peoples as practitioners of Traditional Knowledge to be active participants, 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. Evaluation factors designed to foster community well-being are briefly outlined in Figure 6.

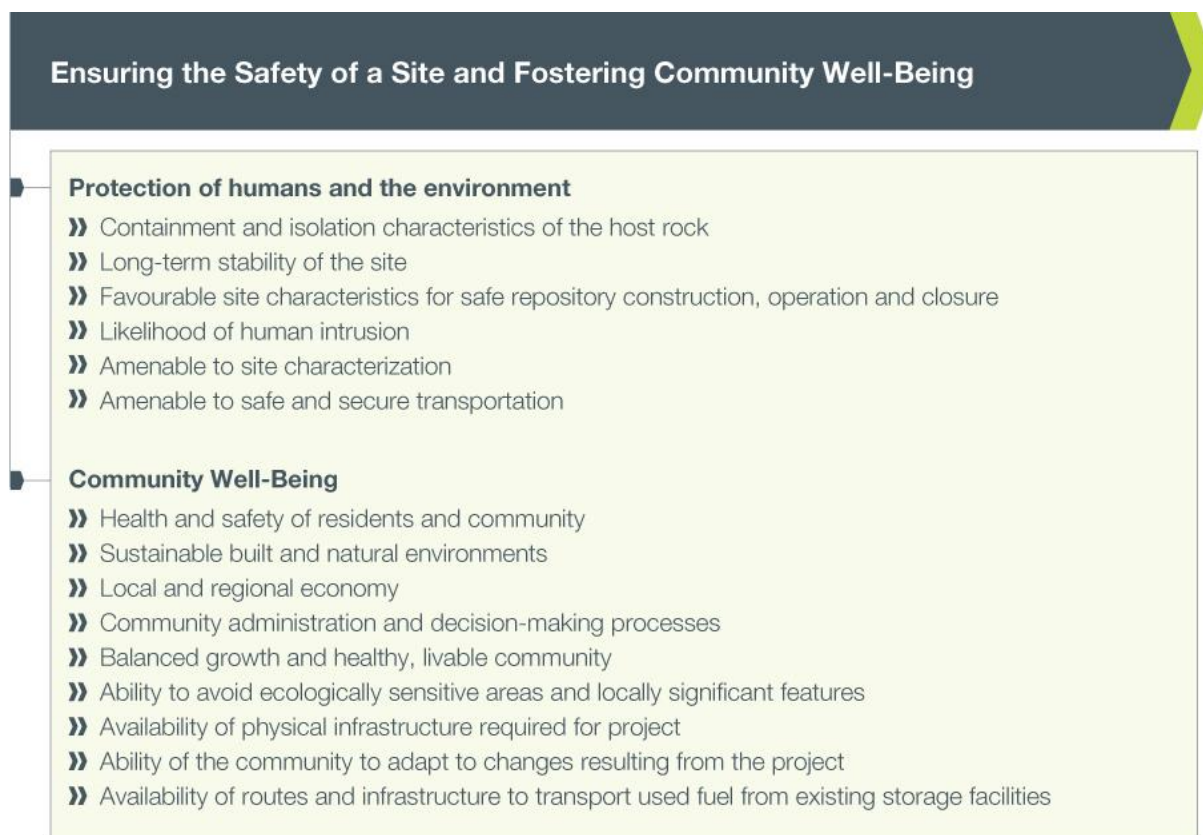


Figure 6. Ensuring the safety of a site and fostering community well-being.

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 three main evaluation steps are briefly outlined in Figure 7.

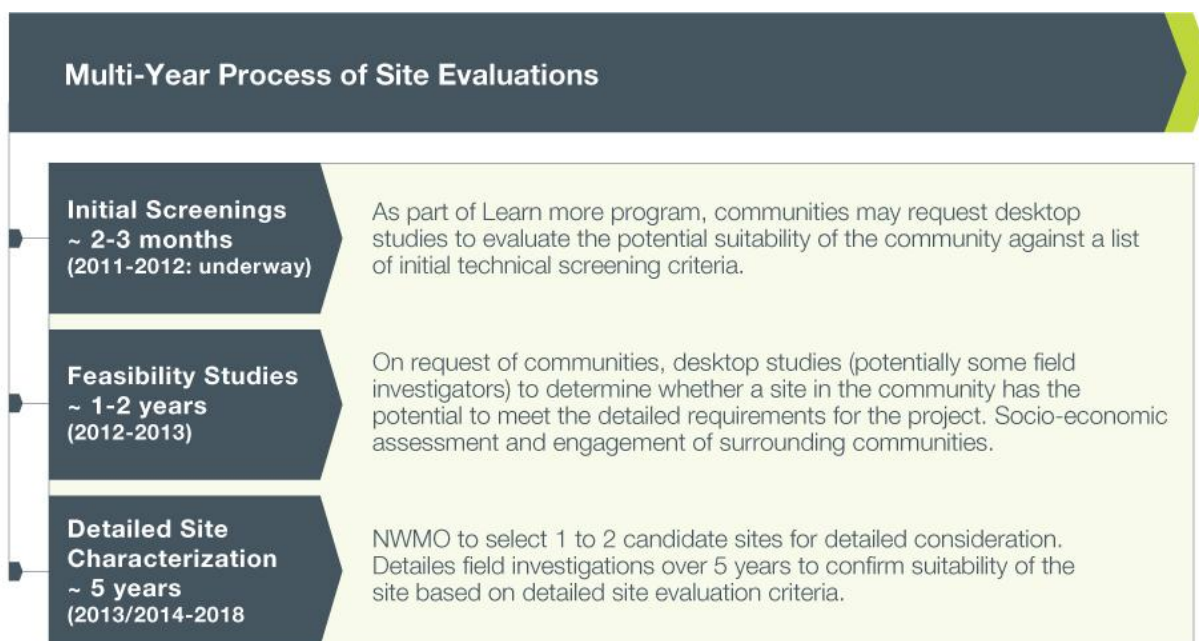


Figure 7. Multi-year process of site evaluations.

6. EARLY IMPLEMENTATION ACTIVITIES

NWMO is in the early days of implementing the site selection process. Early activities have focused on the following.

Building broad awareness and understanding: Early awareness building activities have involved a range of activities. For instance, the NWMO has participated in individual briefings and annual conferences and tradeshows of municipal associations. Hundreds of elected representatives and municipal officials at these events have expressed interest in being kept apprised of NWMO activities and some have expressed interest in learning more on behalf of their community. The NWMO has also sought to build media awareness through meetings with reporters and editorial boards. The NWMO website serves as a repository of information and communication materials. It is an important resource for communication with the public about the long-term management of used nuclear fuel. Efforts in all of these areas will continue throughout the site selection process.

Development of Communication material: In order to effectively participate in implementation, people need to understand the issues, what the NWMO is doing and why. Several DVDs have been produced introducing the NWMO, explaining Adaptive Phased Management and its implementation, and the collaborative design of a process to identify an informed and willing community to host a deep geological repository. Other DVDs are designed to address areas of particular public interest, such as the transportation of used nuclear fuel and the nuclear fuel cycle.

The NWMO has published backgrounders and information sheets on a range of topics, including: the project to construct and operate a deep repository; climate change; transportation of used nuclear fuel; and, regulatory oversight. The NWMO has also developed an interactive exhibit

that is designed to engage visitors and provide learning experiences that make concepts related to the long-term management of used nuclear fuel tangible.

Ongoing briefing of Federal and Provincial Government and Regulatory authorities: The NWMO keeps government officials and elected representatives fully aware of its work and plans through regular meetings. Since the implementation of APM touches on the mandates of many government departments, the NWMO has worked to support coordination of engagement across relevant ministries and across various levels of management in the public service. The NWMO has scheduled information sessions attended by officials from a number of provincial and federal ministries and departments with an interest in long term nuclear waste management.

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. 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.

Engaging with communities expressing interest in the site selection process: The NWMO has met with a number of communities which have expressed interest in learning more about Adaptive Phased Management and the site selection process. Briefing sessions have been conducted with communities at their request as part of the NWMO's "Learn More" program. The briefing material used is published on the NWMO website. Initial screenings have also been conducted in a number of communities as part of Step 2 engagement activities. These initial screenings are designed to give communities an early sense of whether they are potentially suitable and further exploration of the project is warranted.

7. THE PATH AHEAD

In May 2010, after a two-year process of collaborative development with citizens, the NWMO published a site selection process. This process serves as the road map for decision-making on the location for the deep geological repository and associated facilities required by Canada's plan, Adaptive Phased Management.

The site selection process was designed to reflect the values and priorities of Canadians and to ensure that the process used to seek and select a site is fair, ethical and effective as judged by Canadians.

The site selection process was designed to build, through a series of steps, a long-term partnership involving the community, the larger region in which it is located and the NWMO to implement APM. The site selection process attempts to ensure communities considering hosting the project, and surrounding communities and regions, fully 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. The pace and manner of moving through the site selection process will be directed by the communities which choose to participate in the process.

Since the initiation of the site selection process in May 2010, the NWMO has begun to engage communities which are interested in the project. The NWMO expects to continue to learn, and to refine the site selection process going forward, as we continue to implement the site selection process together with communities.

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All publications available at www.nwmo.ca.