

Implementing Adaptive Phased Management 2020 to 2024

MARCH 2020



nwmo

NUCLEAR WASTE
MANAGEMENT
ORGANIZATION

SOCIÉTÉ DE GESTION
DES DÉCHETS
NUCLÉAIRES

The Nuclear Waste Management Organization (NWMO) welcomes all suggestions and ideas about our work and how we can help you learn more about Canada's plan for the safe, long-term management of used nuclear fuel.

Please share your thoughts on this plan by June 10, 2020. We look forward to hearing from you.

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Vision, mission and values

Vision

Our vision is the long-term management of Canada’s nuclear waste in a manner that safeguards people and respects the environment, now and in the future.

Mission

The purpose of the NWMO is to develop and implement, collaboratively with Canadians, a management approach for the long-term care of Canada’s used nuclear fuel that is socially acceptable, technically sound, environmentally responsible, and economically feasible.

Values

<p>SAFETY</p> <p>We place all aspects of public and employee safety – including environmental, conventional, nuclear, and radiological safety – first and foremost in everything we do.</p>	<p>INTEGRITY</p> <p>We act with openness, honesty and respect.</p>	<p>EXCELLENCE</p> <p>We use the best knowledge, understanding, and innovative thinking, and seek continuous improvement in all that we do in our pursuit of excellence.</p>
<p>COLLABORATION</p> <p>We engage in a manner that is inclusive, is responsive, and supports trust, constructive dialogue, and meaningful partnership.</p>	<p>ACCOUNTABILITY</p> <p>We take responsibility for our actions, including wise, prudent and efficient management of resources.</p>	<p>TRANSPARENCY</p> <p>We communicate openly and responsibly, providing information about our approach, processes and decision-making.</p>

Welcome

Welcome to *Implementing Adaptive Phased Management 2020 to 2024*. This is the five-year strategic plan for the NWMO.

Committed to transparency

The NWMO is committed to transparency, and our annual implementation plans are one way we demonstrate that commitment. These plans are living documents. They evolve and grow over time. Each year, we update our plans to reflect progress in our work, input from communities, advances in science and technology, insight from Indigenous Knowledge, and evolving societal values and public policy.

This planning period is the first to look beyond our expected site selection date of 2023. Identifying a single, preferred site for used nuclear fuel represents a transformative milestone for the NWMO. This decision will bring to an end the site selection process we initiated in 2010. It will also mark the beginning of a new series of activities, such as implementing partnership agreements with host communities; furthering the safety case for the identified site; constructing a Centre of Expertise; preparing for and participating in regulatory processes; and getting ready to move our operations to the site that is selected.

The work outlined in this plan covers this important transition. We have updated our work plans to reflect our continuing efforts to identify a preferred site, as well as the preparation we are beginning to undertake to ensure readiness for all activities that follow. While we navigate this change, we will maintain our organizational commitment to fairness, transparency and a dialogue-driven process.

Your input and feedback help inform our work, and now is an important time for us to hear from you. Included at the back of this document is a summary of the comments we received after publishing last year's plan in March 2019. We invited comments until July 12, 2019.

If you would like to comment on the latest plan as outlined in these pages, please get in touch with us by mail, email, or fax, or through our website or social media platforms, any time through to June 10, 2020. To help you share your thoughts with us, we have included a questionnaire on the last page.

This is Canada's plan. This is your plan. We welcome your suggestions and ideas.

Introduction to the NWMO and Canada's plan

Canada has been generating electricity from nuclear power – to light our homes, businesses and towns – for more than half a century. A byproduct of this process is used nuclear fuel, which remains radioactive for hundreds of thousands of years, and is a potential health and safety hazard unless properly managed.

The NWMO has an important role that completes the fuel cycle. We are the guardians who will be entrusted to ensure used nuclear fuel is safely managed in the very long term, in a manner that protects people and the environment.

In 2002, the Government of Canada, through the *Nuclear Fuel Waste Act (NFWA)*, assigned responsibility for the long-term management of Canada's used nuclear fuel to the NWMO. The organization was established in accordance with the *NFWA* by Canada's major nuclear fuel waste owners – Ontario Power Generation, Hydro-Québec and New Brunswick Power Corporation – and operates on a not-for-profit basis.

The plan we are implementing emerged through a three-year dialogue with Canadians (2002 to 2005), including Indigenous peoples. Details of those conversations were outlined in *Choosing a Way Forward – The Future Management of Canada's Used Nuclear Fuel (Final Study)*, issued in November 2005.

Canadians told us they want to move forward now on managing used nuclear fuel – and not leave it as a burden for future generations. The NWMO was created to do just that. Our plan is Canada's plan. It reflects the values and priorities citizens identified as important.

Technical method

- Centralized containment and isolation of used nuclear fuel in a deep geological repository
- Continuous monitoring
- Potential for retrievability
- Optional step of temporary shallow underground storage (not currently included in the NWMO's implementation plan)

Management system

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

Known as Adaptive Phased Management (APM), Canada's plan involves both a technical method (what we plan to build) and a management system (how we will work with people to get it done). The technical method involves developing a deep geological repository in a suitable rock formation to safely contain and isolate used nuclear fuel. The management system involves phased and adaptive decision-making, supported by public engagement and continuous learning.

A safe and secure transportation system will be developed to transport used nuclear fuel from facilities where it is currently stored on an interim basis to the repository site. The project also involves developing a Centre of Expertise on or near that site, where the NWMO will continue technical, environmental and community studies.

Planning timelines

The following graphic provides a snapshot of milestones achieved to date, as well as estimated planning timelines for the future.

Developing Canada's plan	2002	The NWMO is created.
	2005	The NWMO completes three-year study with interested individuals, including specialists, Indigenous peoples and the Canadian public.
	2007	Government of Canada selects APM and mandates the NWMO to begin implementation.
Developing the siting process	2008 to 2009	Work takes place with citizens to design a process for selecting a central, preferred site for the deep geological repository and Centre of Expertise.
Identifying a site using the siting process	2010	The siting process is initiated, with a program to provide information, answer questions and build awareness.
	2010 to 2013	Twenty-two communities initially express interest. In collaboration with interested communities, the NWMO conducts initial screenings.
	2012 to 2015	Preliminary desktop studies are initiated to further assess suitability. Areas with less potential to meet project requirements are eliminated from further consideration.
	2015 to 2023	The NWMO expands assessment to include field investigations. Areas with less potential are eliminated from further consideration as the narrowing down process continues.
	2023	A single, preferred site is identified. The transportation planning framework is finalized. The impact assessment project description is submitted. The Licence to Prepare Site application is submitted.
Towards construction	2024	Detailed site characterization begins. Impact assessment studies are submitted. The federal regulatory process is triggered. The application to begin construction of the Centre of Expertise is submitted.
	2026	The impact assessment is approved (estimate). The Licence to Prepare Site is granted (estimate).
	2028	The construction licence application is submitted.
	2032	The construction licence is granted (estimate).
	2033	Design and construction begin.
Beginning operations	2040 to 2045	Operations of the deep geological repository begin.

Selecting a site

The NWMO site selection process is community-driven, and underpinned by safety, fairness, collaboration, and shared decision-making. Fundamental to the process is the understanding that the APM Project will only proceed with the involvement of the interested community, First Nation and Métis communities in the area, and surrounding communities, working together to implement it.

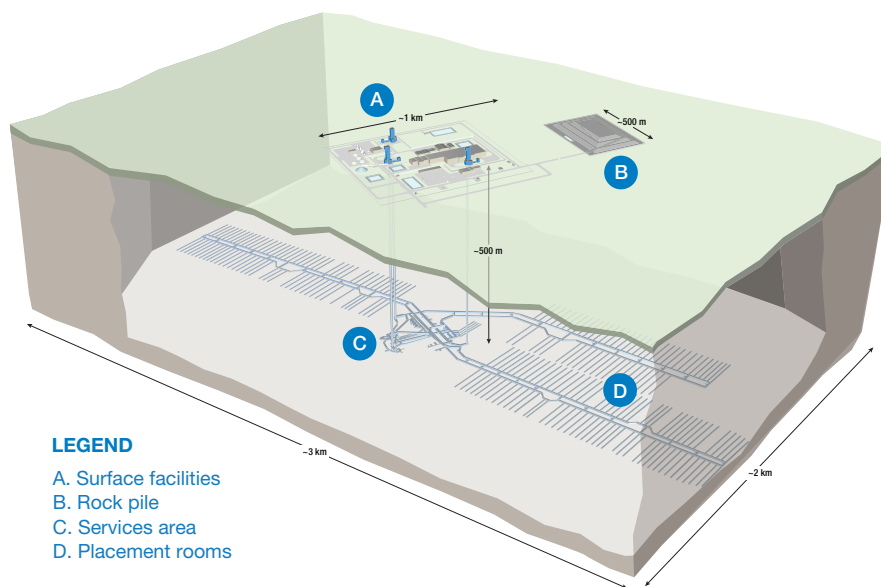
When we initiated the site selection process in 2010, 22 municipalities and Indigenous communities expressed interest in learning more and exploring their potential to host the project. As of January 2020, we had gradually narrowed our focus to two areas (Ignace and South Bruce) through technical site evaluations and social engagement to assess safety and the potential to build supportive and resilient partnerships, key criteria to evaluate the suitability of each area. At the same time, we have expanded learning and engagement activities beyond each of the communities that expressed interest, also involving their Indigenous and municipal neighbours. We remain on track to identify a single, preferred site by 2023.

Once the site is selected, we will move forward together with host communities to implement partnership agreements, develop the Centre of Expertise, finalize the safety case, and prepare for the regulatory processes we must complete before construction and operations can begin.

More information about the site selection process is available at www.nwmo.ca/sitingprocess.

Key components of the repository

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 consists of a series of tunnels leading to a network of placement rooms where the used nuclear fuel will be contained using a multiple-barrier system. This approach aligns with international best practices.



This diagram reflects the latest conceptual layout for the surface facilities, and the underground services area and placement rooms. This concept will continue to become more detailed as the project progresses.

Surface facilities will provide processes and equipment for receiving, inspecting, repackaging, and moving used fuel to the main shaft to transfer underground, as well as for emplacement in the repository.

Before being transported underground to the repository, the used fuel will be placed into specialized, long-lived containers and encased in a buffer box made of bentonite clay. Once underground, these buffer boxes are to be arranged (e.g., two high) in the horizontal placement room, and any spaces backfilled with bentonite pellets. The current conceptual design of the underground layout assumes a footprint of about two kilometres by three kilometres, but the actual required footprint will be influenced by factors such as the geological setting and the ultimate number of fuel bundles to be managed.

By the time construction begins, a robust safety case will have been developed to demonstrate the project can be safely implemented, including transportation, and that it meets or exceeds the requirements of regulatory authorities.

For a more comprehensive description of the project, please see *Description of a Deep Geological Repository and Centre of Expertise for Canada's Used Nuclear Fuel* at www.nwmo.ca/backgrounders.

Centre of Expertise

A Centre of Expertise will be established on the surface, in or near the area selected to host the deep geological repository. The design and use of the centre will be developed collaboratively with those living in the area, including First Nation and Métis communities. The centre's key purpose initially will be to support a multi-year program of technical testing and verification, and to support ongoing planning and discussion with community members. It would later be expanded to support construction and operation of the deep geological repository. If appropriate and based on feedback and input, the centre may also serve as a hub for sharing Indigenous culture, history, traditions, and knowledge.

The Centre of Expertise will be home to an active technical and social research and technology demonstration program. It will involve scientists and other specialists in a wide variety of disciplines, including geoscience, engineering, and environmental, socio-economic, and cultural impact assessment. The centre will become a hub for knowledge sharing across Canada and internationally, both about Canada's plan, and possibly, about the local area. It could also, for example, highlight the area's unique history or characteristics or serve to sustain or enhance the natural environment.

The design and use of the centre will be developed collaboratively with those living in the area as the NWMO works to draft partnership agreements with potential host communities in the coming years. The NWMO plans to select a single, preferred site for the repository by 2023 and begin construction of the Centre of Expertise at or near this location in 2024.



An artist's rendering portrays one example of how the Centre of Expertise could look. The final design will be developed collaboratively with those living in the area.

Reconciliation and Indigenous Knowledge

The NWMO has been committed to working with First Nation and Métis communities since our founding. This commitment is reflected in Canada's plan in many ways, from oversight by our Indigenous Relations team, advice from the NWMO's Council of Elders and Youth, cultural awareness training for all NWMO staff and contractors, to guidance drawn from the NWMO's groundbreaking Indigenous Knowledge Policy and new Reconciliation Policy, and regular engagement with First Nation and Métis communities.

Over the next five years, the NWMO will work to implement our new Reconciliation Policy and continue to incorporate Indigenous Knowledge into our work. This policy affirms our commitment to acting on the Truth and Reconciliation Commission's call to action #92.

Truth and Reconciliation Commission's call to action #92

We call upon the corporate sector in Canada to adopt the United Nations Declaration on the Rights of Indigenous Peoples as a reconciliation framework and to apply its principles, norms, and standards to corporate policy and core operational activities involving Indigenous peoples and their lands and resources. This would include, but not be limited to, the following:

- i. Commit to meaningful consultation, building respectful relationships, and obtaining the free, prior, and informed consent of Indigenous peoples before proceeding with economic development projects.
- ii. Ensure that Aboriginal peoples have equitable access to jobs, training, and education opportunities in the corporate sector, and that Aboriginal communities gain long-term sustainable benefits from economic development projects.
- iii. Provide education for management and staff on the history of Aboriginal peoples, including the history and legacy of residential schools, the United Nations Declaration on the Rights of Indigenous Peoples, Treaties and Aboriginal rights, Indigenous law, and Aboriginal-Crown relations. This will require skills-based training in intercultural competency, conflict resolution, human rights, and anti-racism.

Reconciliation

In late 2019, the NWMO released our Reconciliation Policy, a concrete series of commitments that will see the words in our Reconciliation Statement put into action. Based on advice from the Council of Elders and Youth, and First Nation and Métis communities, the policy commits to an implementation strategy to measure annually the organization's progress on Reconciliation. It mandates that the NWMO, including our Board of Directors, move forward in the spirit of Reconciliation and hold staff accountable for their actions under the policy.

The policy ensures the NWMO will continue to recognize the truth of the historic wrongs that brought us to Reconciliation and seek to move forward together. The NWMO recognizes that protection of Mother Earth for future generations is, in itself, a foundational commitment to Reconciliation and is a responsibility of all people.

The formal policy also requires that all NWMO staff receive both cultural awareness and Reconciliation training, in addition to education about Indigenous history, the United Nations Declaration on the Rights of Indigenous Peoples, Treaties, and Aboriginal rights, and other topics. Over the next five years, the NWMO will continue to work with communities to offer more Reconciliation events in their area. We will continue our work to meaningfully engage with First Nation and Métis communities and organizations as we work to implement Canada's plan.

NWMO RECONCILIATION STRATEGY

2020 and beyond

Assess corporate Reconciliation baseline and develop additional activities

Enhance human resources practices and procedures to address Reconciliation

Develop an Indigenous youth strategy to include a scholarship program and recruitment strategy

Enhance procurement program to include an Indigenous strategy

2018

85 per cent of NWMO staff received cultural awareness training

Reconciliation Statement finalized through Indigenous ceremony

2019

Published Reconciliation Policy

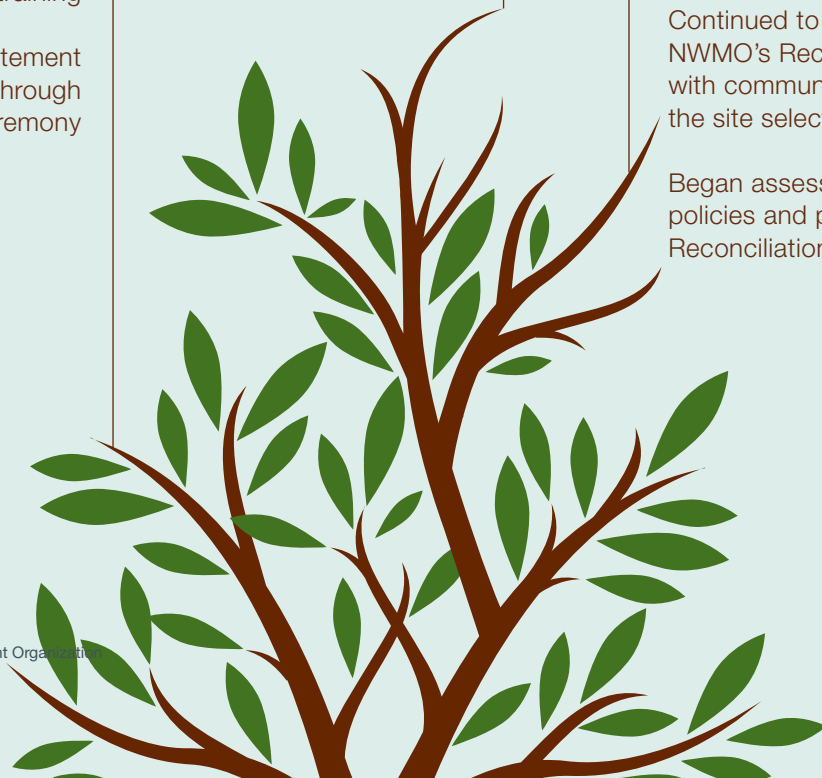
Developed and delivered Reconciliation training program

Developed a corporate Reconciliation baseline assessment tool

Enhanced sponsorships and donations program to include a focus on Reconciliation

Continued to communicate the NWMO's Reconciliation program with communities involved in the site selection process

Began assessment of the NWMO's policies and procedures against Reconciliation assessment tool



Indigenous Knowledge

Respectful inclusion of Indigenous Knowledge is an essential element of the NWMO's work.

Through these conduits, we learn to see with fresh eyes, respecting Indigenous peoples' spiritual connection with and responsibility to protect the natural environment. This includes air, land, fire, water, plants, medicines, animals, and humans.

Over the next five years, we will continue to interweave Indigenous Knowledge, and reflect on what we learn from ceremony and traditional teachings. For example, water is a subject of vital importance to people. Several communities in our site selection process, particularly Indigenous communities, asked us to provide more information about how our project will protect water. In response, we have initiated a series of presentations to do just that. The water presentations have evolved into water's relationship with the deep underground, clay and copper, which are vital components of the multiple-barrier system. The water presentations incorporate Indigenous teachings about water, clay, and copper, and use oral tradition as part of how the presentations are delivered. Over the next five years, we will continue to work with Indigenous communities and knowledge keepers to ensure Canada's plan respects and protects water and the environment.

We will continue to reach out to Indigenous peoples to gather their views and questions on water, rock, clay, and other subjects. This ongoing feedback is crucial as Indigenous and other communities consider the project in the context of their long-term interests and well-being.

We will also continue to work with our research partners to incorporate Indigenous perspectives into all our work. Over the next five years, that will include continuing to offer cultural awareness training or access to knowledge keepers to both internal and external specialists.



The NWMO's Jessica Perritt, Section Manager for Indigenous Knowledge and Reconciliation, and Bob Watts, Vice-President of Indigenous Relations, gather the sacred bundle at the ceremony formalizing the NWMO's Reconciliation Policy.

Cost and funding

Canadians expect that the money necessary to pay for the long-term care of used nuclear fuel will be available when needed. This expectation is being met.

The NWMO is responsible for determining the cost of the project and designing a system that collects the funds needed. Both Canada's plan and the NWMO are funded by the waste owners. Federal law requires waste owners to pay into trust funds each year.

These funds cover the future cost of constructing and maintaining a deep geological repository for used nuclear fuel well into the future. The federal *NFWA* requires Ontario Power Generation, New Brunswick Power, Hydro-Québec, and Atomic Energy of Canada Limited to establish independently managed trust funds and make annual deposits to ensure the money to fund this project will be available when needed. Each company pays into its trust fund based on the amount of used nuclear fuel it has and/or continues to create. This process is designed to ensure Canada's plan is funded over the long term.

These four companies are also responsible for funding the day-to-day operations of the NWMO. The NWMO is responsible for determining what costs can reasonably be expected to arise over the life of the project, along with a contingency for unexpected events, and for designing a system that collects the funds needed. We also monitor these funds to ensure that the entire cost can be covered under a variety of social and economic circumstances and within the required time frame.

Many factors will affect that long-term cost, including the volume of used nuclear fuel to be managed, location of the deep geological repository, surrounding infrastructure, rock type and characteristics, design of the repository, and length of time allocated to monitoring the site following fuel placement. The existing inventory of used nuclear fuel in Canada is approximately 2.9 million bundles, and more bundles are produced each year as nuclear reactors generate electricity.

Based on the expected volume of 5.2 million fuel bundles, the total lifecycle cost of Canada's plan – from the beginning of site selection in 2010 to the completion of the project decades from now – is approximately \$23 billion (in 2015 dollars) over the course of the about 150-year timeline of the project. This figure covers many decades of lifecycle activity – stretching well into the next century. That does not mean, however, that we need \$23 billion today. Instead, we must calculate how much money needs to be in trust today so that it can continue to generate enough income over time to cover the costs of Canada's plan. We know these funds will grow over time as waste owners pay into trusts and investment income provides returns. So how much do we need in trust today to cover the project's costs tomorrow and decades from now? Based on best estimates in 2020 present value, the funding required to manage 5.2 million bundles from 2020 onwards is \$9.6 billion – a sum that will grow and compound as the project advances so it is always available to cover the costs of Canada's plan.

Included in the \$9.6 billion funding requirement is \$2.8 billion for work to select a site for the repository, complete a detailed design, develop the Centre of Expertise, acquire the site, evaluate environmental impacts, and obtain a site preparation and construction licence under the *Nuclear Safety and Control Act (NSCA)*. This planning period will see increased spending as our activities become more intensive. These pre-construction costs are paid for by the waste owners based on the annual budget as approved by the Board of Directors.

Keeping abreast of the external landscape and adapting to change

The NWMO is committed to staying abreast of local, national and international developments that may either change the landscape in which we operate or impact our project directly. We continue to monitor advances in the energy sector, innovations in nuclear waste management, changes in energy and environmental policy, potential developments involving new nuclear reactor units, changes in society's expectations, values, and insights, as well as developments with other Canadian nuclear waste initiatives.

We regularly report on new developments. We maintain a watching brief on used nuclear fuel reprocessing and alternative used nuclear fuel management technologies, and update it annually (www.nwmo.ca/adaption). We also monitor and report on potential inventories of used nuclear fuel quantities and types for implications to repository design (www.nwmo.ca/howmuchfuel).

In Canada, there is an active research sector exploring new technologies such as small modular reactors (SMRs), fuel reprocessing and other types of advanced reactors. The NWMO understands that we will also be responsible for the long-term management of nuclear fuel waste from advanced reactors and SMRs. We encourage organizations developing new concepts to work with us to identify the types of fuel waste that may result. Once we have sufficient information about new types of fuel to be managed, we will determine potential impacts to repository designs and how our funding formulas can be adapted to include new entrants.

A core principle of APM is the commitment to adapt plans in response to input obtained through engagement activities. By way of example, we are continuing to respond to interest from stakeholders on the subjects of how water behaves in the underground environment, and how our plans can be adapted to include fuel waste that may be generated in the future as new technologies emerge.

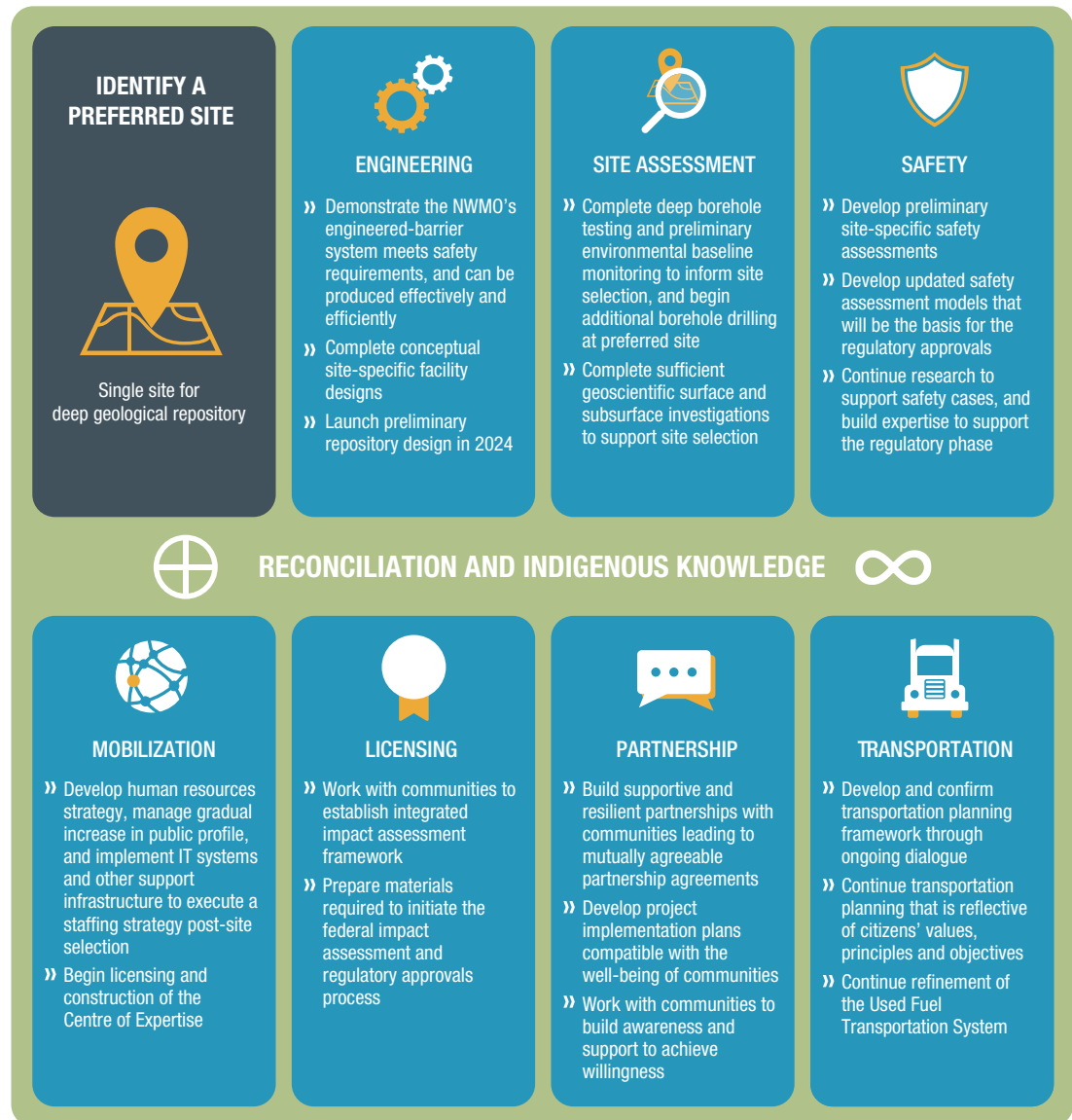
New federal legislation passed in 2019 has also required us to adapt our plans. The *Impact Assessment Act* has altered the licensing and regulatory landscape for Canada's plan. The NWMO has responded by adjusting our timelines for submitting reports and licensing applications as we continue to monitor the implementation of the bill. The NWMO has begun to use this new framework as the basis of our work in the regulatory approval phase. By 2024, we expect to begin submitting applications and studies as required.

Planning priorities

At the NWMO, we structure our work plans around seven priorities – engineering, site assessment, safety, mobilization, licensing, partnership, and transportation. Our commitment to incorporate Indigenous Knowledge and Reconciliation will guide our efforts related to all priority areas.

These planning priorities reflect the many activities required during this transitional period, both to achieve site selection and prepare for the work that follows.

In this section, we will outline our plans within these seven work streams.





PRIORITY: ENGINEERING

The NWMO will:

- » Demonstrate the NWMO's engineered-barrier system meets safety requirements, and can be produced effectively and efficiently;
- » Complete conceptual site-specific facility designs; and
- » Launch preliminary repository design in 2024.

The deep geological repository is an effective way to safely contain and isolate used nuclear fuel because of the engineered barriers placed around it and the natural barrier provided by the rock formation in which the repository will be located.

Over the next five years, our technical program will further develop engineering designs and demonstrate their effectiveness. We will also continue to prepare site-specific preliminary designs as we progress towards a single preferred location. Physical prototypes of the long-lived repository containers will be manufactured and tested. This work will incorporate robust design practices and proven manufacturing technologies, and demonstrate the NWMO's ability to meet the rigorous requirements of the repository environment. Specialists will continue to investigate manufacturing and prototype testing technologies.

We are actively encouraging organizations developing new reactor concepts such as SMRs to work with us to identify the types of fuel waste that may result. The planning to accommodate this material will take time, and starting early will ensure we are prepared to manage all Canada's used nuclear fuel when the repository begins operating.

Following site selection, the NWMO will launch the preliminary design for a deep geological repository.

In the period 2020 to 2024, the NWMO will also:

- » Support site selection with conceptual site-specific repository designs that incorporate data collected through borehole drilling and preliminary environmental baseline investigations;
- » Complete the design, fabrication, and testing of prototype repository containers, buffer, and emplacement systems;
- » Maintain a prototype test and demonstration facility for engineered-barrier evaluations;
- » Update the conceptual designs and cost estimate for APM as required, and initiate design and development of used fuel handling systems; and
- » Arrange independent peer reviews of specific aspects and features of the engineered-barrier design, and seek reviews of the engineered-barrier system testing program.

Engineers from the NWMO tour the Posiva project in Finland. Posiva is the Finnish counterpart to the NWMO, and both organizations learn from each other. The Posiva project is in the construction phase of its repository for used nuclear fuel at its ONKALO site.





PRIORITY: SITE ASSESSMENT

The NWMO will:

- » Complete initial borehole testing and preliminary environmental baseline monitoring to inform site selection, and begin additional borehole drilling and detailed site characterization at preferred site; and
- » Complete sufficient geoscientific surface and subsurface investigations to support site selection.

The period 2020 to 2024 will see the NWMO complete the process of identifying a single preferred site and move into the licensing and regulatory process.

In the technical realm, work will focus on assessing the suitability of potential sites through geoscientific and environmental evaluation studies. The NWMO has worked collaboratively with municipal and Indigenous communities in identifying potential repository sites where additional studies such as borehole drilling and environmental baseline studies could begin. The results from these studies will allow us to progress to more detailed site characterization work.

To ensure we appropriately incorporate Indigenous Knowledge, we seek guidance from local knowledge holders in planning and executing our studies. Activities have included cultural verification studies of potentially affected areas, the use of ceremony before work is carried out, Indigenous guides and monitors employed on-site to observe our work, and cultural awareness training for contractors performing work at potential sites.

Between 2020 and 2023, as site investigations continue, we will continue to work with interested municipalities, First Nation and Métis communities, and others in the area as they reflect on the potential environmental, social, cultural, and economic effects of hosting Canada's plan. Involving people in the broader area helps ensure that a wide range of potential effects, some that are positive and some that may be areas of concern, are recognized and considered as we move through site selection.

In the period 2020 to 2024, the NWMO will also:

- » Continue engagement with communities in the siting process, exploring the potential for a sustainable partnership and how the project could support community well-being;
- » Complete borehole drilling and field studies to inform the assessment of geoscientific, engineering, environmental, and safety factors, as well as factors identified by Indigenous Knowledge holders and communities in areas with strong potential to meet the requirements of the project;
- » Support the process to select a site suitable for locating the deep geological repository in a safe location through geoscientific studies in the vicinity of interested communities; and
- » To support regulatory approvals, confirm through detailed site characterization studies that the selected site is technically suitable for hosting the deep geological repository.

Ignace is one area where we are continuing investigation work to collect geoscientific data, information and knowledge as we advance Canada's plan for the safe, long-term management of used nuclear fuel.





PRIORITY: SAFETY

The NWMO will:

- » Develop preliminary site-specific safety assessments;
- » Develop updated safety assessment models that will be the basis for the regulatory approvals;
- » Continue research to support safety cases, and build expertise to support the regulatory phase;
- » Maintain active technical research programs through partnerships with industry, academia and international organizations; and
- » Maintain collaboration agreements, and participate in joint international efforts as appropriate.

The NWMO is committed to keeping people and the environment safe. We place all aspects of public and employee safety – including environmental, conventional, nuclear, and radiological safety – first and foremost in everything we do.

The preferred site for the deep geological repository will be in a rock formation with characteristics (geological, hydrogeological, chemical, and mechanical) that support the safe, long-term containment of used nuclear fuel. Repository performance must meet or exceed the regulatory expectations of the Canadian Nuclear Safety Commission (CNSC).

The NWMO has prepared generic safety case studies for crystalline and sedimentary settings by applying our preclosure and postclosure safety assessment methodology. These assessments examine features of the repository system, test key safety parameters, and confirm that people and the environment will be safe in the long term under various scenarios.

In the period 2020 to 2024, the NWMO will develop preliminary site-specific safety assessments for the remaining sites. These assessments will help inform our site selection process. Following site selection, we will also develop updated safety assessment models that will be the basis for regulatory approvals. The NWMO will also continuously improve technical knowledge in collaboration with international partners. We will continue to participate in the Nuclear Energy Agency (NEA) of the Organisation for Economic Co-operation and Development to exchange information in such areas as safety case development.

We are continuing to conduct joint research projects with international organizations and counterparts in other countries, including Sweden, Switzerland, Finland, France, Korea, Japan, and the United Kingdom. Partnering with other radioactive waste management organizations allows the NWMO to foster international co-operation on technology research and development, learn from other countries' experience, and keep abreast of developments in geoscience and safety cases for various host rock formations.

Research partnerships with universities also play an important role in ensuring the NWMO's technical work is scientifically rigorous.

The NWMO's Dr. Erik Kremer discusses findings from a case study that assesses the long-term safety of a deep geological repository in sedimentary rock formations, similar to those found in southern Bruce County.



Safety continues to be an important subject of discussion for communities, and they continue to drive the focus and shape of that discussion. They have identified questions they want to see addressed and safety-related topics they want to learn more about, such as safety assessments, the engineered-barrier system, and water management during construction and repository operations. They have also identified the NWMO specialists and independent experts they want to engage in discussion, and the independent conferences they will attend, to advance their understanding of these topics.

In response, the NWMO has organized presentations, such as *The Journey of Water*, which take a more community and culturally responsive approach to conveying information, telling a story, and using relevant and meaningful references to communities. These types of presentations aim to bring together technical knowledge and understanding with traditional knowledge, local knowledge and the lived experience of communities to explore important safety topics in new ways. The forum for these presentations, set by communities, continue to evolve to include learning and sharing gatherings and learning symposia hosted by communities.

Increasingly, the NWMO is incorporating Indigenous Knowledge in scientific workshops and seminars we host. For example, scientists are exploring how guidance received through ceremony can be combined with digital data collection and laboratory analysis to understand the land from multiple dimensions.

Within the organization, the NWMO is continuing to build a strong safety culture among our employees as we prepare for the licensing phase. We are focused on continuously improving and introducing new safety measures. We are working to create and sustain an environment where employees proactively take responsibility for their safety and that of their fellow employees in all occupational activities.

In the period 2020 to 2024, the NWMO will also:

- » Conduct preliminary site-based safety assessments;
- » Conduct research to enhance our understanding of key processes relevant to repository safety, and expertise to support the regulatory phase;
- » Continue to participate in national and international projects, including underground experiments, with other waste management organizations and international agencies such as the NEA and International Atomic Energy Agency;
- » Continue to host an annual Geoscience Seminar to bring together researchers from academia and industry; and
- » Support and build discussion to increase the understanding of safety among community members.



PRIORITY: MOBILIZATION

The NWMO will:

- » Develop a human resources strategy to prepare for the next phases of work following site selection;
- » Increase awareness of the project among key stakeholder groups;
- » Implement information technology systems and other support infrastructure; and
- » Advance the licensing and construction process for the Centre of Expertise.

As the completion of the site selection process nears, the NWMO is beginning to look towards how we implement Canada's plan following site selection. This planning period is the first to go beyond our 2023 milestone of selecting and announcing the final site for our project.

Once a preferred site is selected for Canada's plan, there will be an escalation of activity on many fronts in the local and regional area. As a large national infrastructure project, it will result in significant economic benefits to the area. This includes jobs for the initiating community and region, as well as First Nation and Métis communities in the area and beyond. It will also mark the beginning of a multi-phase organizational transformation for the NWMO. Focusing our efforts in one area will require everything from adding more resources to the region, to ensuring we have the technology in place to support Canada's plan, through to sourcing land for NWMO facilities and the Centre of Expertise.

To prepare for this increased activity, internally, we will ensure we have the human, organizational and information capital in place to proceed in conducting detailed site characterization, making regulatory submissions, and constructing and operating the deep geological repository. We will also be prepared to manage the opportunities and challenges that arise from an increase in public scrutiny.

The number of jobs sourced from the siting area will depend in part on the location of the repository, and the capacity of communities in the immediate vicinity and economic region. The NWMO will seek to maximize job opportunities in the local area and to build capacity in communities to secure jobs on the project.

In the period 2020 to 2024, the NWMO will also:

- » Develop work plans and assess resource requirements to advance detailed site characterization, environmental assessments, engineering designs, and safety case development for the selected siting area in support of the licensing application;
- » Deepen our safety culture and build a learning organization, encouraging and supporting continuous employee learning;
- » Continue to leverage the technology provided by our Enterprise Resource Planning System to improve workflow processes, and integrate electronic systems and effectively manage employee information;
- » Continue to strengthen our corporate culture through appropriate management behaviours, standards and corporate tools, including appropriate technology platforms. This includes our safety culture, excellence in project management and commitment to interweaving Indigenous practices;
- » Continue to build a stronger local staffing presence in potential siting areas and provide local contracting opportunities for the project; and
- » Invest in building skills and capacity of youth and community members in the municipalities, and First Nation and Métis communities engaged in the site selection process to position them to secure jobs related to Canada's plan.



PRIORITY: LICENSING

The NWMO will:

- » Work with communities to establish an integrated impact assessment framework;
- » Prepare materials required to initiate the federal impact assessment and regulatory approvals process; and
- » Begin the impact assessment process and the drafting of necessary reports for licensing.

The NWMO's overriding objective in implementing Canada's plan is protecting people and the environment for generations to come. We will have to demonstrate that the project meets or exceeds strict regulatory requirements to protect the health, safety, and security of people and the environment, while also respecting Canada's international commitments.

As a result, our site investigations and associated technical studies will adhere to relevant municipal, provincial and federal requirements for the project. We keep abreast of all regulatory changes that are pertinent to the project. For example, the NWMO has already begun, and will continue over the next five years, to conduct our studies consistent with the *Impact Assessment Act* passed in 2019. We have adapted our plans to this change in legislation and expect to formally begin the regulatory processes in 2024.

We will continue to interact with the CNSC, consistent with the terms of a special project arrangement, prior to submission of a licence application. These activities include providing briefings to the CNSC on the progress of Canada's plan. (The CNSC explains its role in the *Nuclear regulatory oversight* box that follows.)

In the period 2020 to 2024, the NWMO will also:

- » Develop impact assessment methodologies in collaboration with siting communities, both Indigenous and non-Indigenous, in preparation to formally launch the regulatory approvals process;
- » Establish environmental monitoring programs in potential siting areas in close collaboration with community members, as well as Indigenous Knowledge keepers;
- » Work with the CNSC and other regulatory authorities to obtain certainty regarding the requirements and implementation of the new *Impact Assessment Act* so that we can account for them in our plans;
- » Work with potential host communities to define their role in the regulatory process and then facilitate their participation; and
- » Working with communities and others, identify opportunities to enhance understanding of the current local and regional conditions, including collaboration with Indigenous communities to interweave local traditional knowledge into this understanding, as a foundation for the environment, social, health, and economic assessments.

NUCLEAR REGULATORY OVERSIGHT

Implementation of a deep geological repository falls within federal jurisdiction and will be regulated under the *NSCA* and its associated regulations. The CNSC, as Canada's independent regulatory authority, regulates the use of nuclear energy and materials to protect the health, safety, and security of Canadians and the environment; and to implement Canada's international commitments on the peaceful use of nuclear energy. The CNSC's mandate also includes the dissemination of objective scientific, technical and regulatory information to the public.

Under section 26 of the *NSCA*, activities associated with a nuclear facility can occur only in accordance with a licence issued by the CNSC. The repository for Canada's used nuclear fuel will be subject to the CNSC's comprehensive licensing system, which covers the entire life cycle of the repository, from site preparation to construction, operation, decommissioning (closure and postclosure), and abandonment (release from CNSC licensing).

This stepwise approach will require a licence for each phase of the repository life cycle. The process for obtaining a "site preparation" licence will be initiated by the NWMO. The NWMO would submit an application for a Licence to Prepare Site to the CNSC. A licensing decision under the *NSCA* on a repository can be taken only after the successful completion of an impact assessment, following the process established under the *Impact Assessment Act*. More information about the CNSC's licensing process is available at www.nuclearsafety.gc.ca.

The transportation of used nuclear fuel is jointly regulated by the CNSC and Transport Canada.

Although the CNSC is the main licensing authority, it administers its licensing system in co-operation with other federal and provincial government departments and agencies in areas such as health, environment, transport, and labour.



PRIORITY: PARTNERSHIP

The NWMO will:

- » Build supportive and resilient partnerships with communities leading to mutually agreeable partnership agreements, and begin implementing those agreements;
- » Develop project implementation plans compatible with the well-being of communities, including a vision for a Centre of Expertise at or near the repository location; and
- » Work with communities to build awareness and support to achieve willingness.

The NWMO will, over the next five years, work with siting communities to build the supportive and resilient partnerships required to implement the project. During the period 2020 to 2023, the NWMO will continue to work with municipal and Indigenous communities in each siting area to explore the potential for partnership.

Following a partnership road map that outlines a sequence of topics and milestones to explore the potential for partnership, communities will build on the values and principles they identified to guide discussions. Work will include developing area-specific visions for the project and engagement of communities in concrete discussions to explore how the project can be implemented in a manner that is consistent with community well-being objectives and aspirations.

As exploration of partnership deepens, municipalities in the siting process are increasingly expressing interest in enhancing relationships with their Indigenous neighbours. The NWMO supports learning through cultural awareness training and provides support where appropriate in establishing formal lines of communication.

Following site selection in 2023, we will shift focus from building partnerships to implementing partnership agreements.

Funding and resources will be provided to support communities as they build their capacity and understanding of the project, engage in discussions with community members and neighbours, reflect on their interest in the project, and participate in discussions with the NWMO to reach mutually agreeable partnership agreements.

Ultimately, only one site can be selected as the location where Canada's plan will be implemented, and as communities exit the siting process, the NWMO remains committed to ensuring they are better off for having participated. We take great pride in feedback to date from local leaders who maintain their communities benefited from their involvement in the process, even though they were screened out as potential siting areas.

We will continue to work with the Council of Elders and Youth and the Municipal Forum. We will also work with and learn from Indigenous Knowledge holders, and provide opportunities for them to share their knowledge with us. Youth engagement will remain a priority after a site is selected, given the long-term nature of the project and need for intergenerational transfer of knowledge to support project implementation.

The NWMO has a number of policies and plans in place that guide our work, including an Ethical and Social Framework. Importantly, a Reconciliation Policy was developed and released in 2019. Across the NWMO, we recognize that there are Indigenous peoples in all areas of Canada where our work will take place. We acknowledge, respect and honour that Aboriginal peoples – Indian, Métis and Inuit peoples of Canada – have unique status and rights as recognized and affirmed in section 35 of the *Constitution Act* (1982). Through the Reconciliation Policy, we commit to contribute to Reconciliation through the implementation of our work.

In the period 2020 to 2024, the NWMO will also:

- » Ensure communities have the resources they need to fully participate in siting activities, reflect on their interests, and incrementally improve their well-being while exploring the project;
- » Complete social impact and baseline studies as a component of the impact assessment;
- » Brief Canada's nuclear host communities about our progress, including planning for eventual transportation of used nuclear fuel from their communities to the deep geological repository;
- » Continue to develop and sustain relationships with:
 - Interested communities that chose to engage in the site selection process, First Nation and Métis communities in the area, and surrounding communities;
 - National, provincial and regional Indigenous organizations to keep them apprised of progress in implementing APM and the site selection process;
 - A range of municipal associations across provinces, in order to better understand local governments' points of view, and work with them to implement APM;
 - Federal, provincial and local governments; and
 - Non-governmental organizations and civil society at large.
- » Continue to work with potentially affected Indigenous peoples, including Indigenous Knowledge holders, in recognizing the diversity of cultures and languages, practices, and approaches within Indigenous communities; in identifying sacred areas; in understanding traditional laws, practices, and use of land; and in protecting the environment to sustain community life;
- » Implement the NWMO's Reconciliation Policy released in 2019. It commits to a strategy to annually measure the organization's progress in contributing to Reconciliation;
- » Develop a willingness assessment plan and employ it to inform the final site selection decision;
- » More specifically define the terms "social acceptance" and "willing host," and work in collaboration with municipalities, communities, and Indigenous peoples involved in the site selection process to understand how they can be demonstrated;
- » Continue work to increase awareness among – and consider comments from – Canadians and Indigenous peoples of Canada about Canada's plan, including young people; and
- » Continue to develop plain-language exhibits, communication products and multimedia to share the details of Canada's plan, and expand online engagement through our website and social media platforms.



PRIORITY: TRANSPORTATION

The NWMO will:

- » Develop and confirm transportation planning framework through ongoing dialogue;
- » Continue transportation planning that is reflective of citizens' values, principles and objectives; and
- » Continue refinement of the Used Fuel Transportation System materials, including transportation of nuclear waste in Canada and internationally, to identify lessons that apply to APM.

The NWMO is developing safe, secure and socially acceptable plans for transporting used nuclear fuel from the current interim storage sites to the deep geological repository.

As part of the process of selecting a site, an acceptable transportation route must be identified or have the potential to be developed. Transportation planning and evaluations must fully address regulatory requirements for safely transporting used nuclear fuel through different provinces. From a technical perspective, used nuclear fuel can be transported safely and securely with radiological safety assured through the use of robust transportation packages. As such, the timeline for transportation planning is longer than the site selection timeline to allow time for on-site and detailed technical perspectives to help define routes. The NWMO does not plan to transport used fuel to the deep geological repository site before 2040.

In addition to technical requirements, social considerations and community concerns are important considerations in identifying transportation routes. The NWMO has progressively broadened and deepened our engagement with communities and interested individuals and groups to enhance our understanding of social priorities and concerns that need to be addressed. We have also conducted public attitude research with a cross-section of people in Ontario, Quebec and New Brunswick. These activities have supported the development of a draft transportation planning framework, which will be the focus of further discussion in 2020, and once confirmed, will help guide APM transportation planning.

The NWMO will need to demonstrate the safety and security of any transportation system to regulatory authorities and citizens, including Indigenous communities, before transportation to the repository can begin.

Transportation is an important focus of public engagement, leading to a better understanding of social considerations.

In the period 2020 to 2024, the NWMO will also:

- » Undertake transportation logistics studies and risk assessments;
- » Conduct public attitude research and continue dialogue to explore public perception, questions and concerns about the transportation of used nuclear fuel;
- » Continue ongoing dialogue about planning for the safe and secure transportation of used nuclear fuel with municipalities, and First Nation and Métis communities, and with municipal associations and Indigenous organizations;
- » Seek CNSC design approval certificates for road and rail transport packages as appropriate;
- » Establish key requirements for emergency management and transportation security for planning purposes;
- » Continue review of experience and best practices with transportation of hazardous materials, including transportation of nuclear waste in Canada and internationally, to identify lessons that apply to APM; and
- » Share the draft transportation planning framework with communities for further discussion, and to refine and confirm.

Ensuring strong governance and accountability

The NWMO will maintain an accountable governance structure that provides confidence to the Canadian public in the conduct of our work.

Our governance structure comprises the member organizations, Board of Directors and Advisory Council. The NWMO is subject to the requirements of the *NFWA* and oversight by the Minister of Natural Resources.

MEMBERS

Ontario Power Generation, New Brunswick Power Corporation and Hydro-Québec are the founding members of the NWMO. The Membership Agreement and bylaws set out member roles and responsibilities in supporting the objectives of the *NFWA* and the NWMO's implementation mandate. The NWMO regularly briefs our member organizations.

BOARD OF DIRECTORS

The Board of Directors is responsible for oversight and taking a leadership role in developing the corporation's strategic direction. The members elect the Board of Directors. There are currently nine directors on the Board, representing a range of perspectives from both within and outside the nuclear industry, including capabilities in Indigenous culture and financial management.

ADVISORY COUNCIL

The *NFWA* requires that the Board of Directors appoints an Advisory Council to review and comment on the NWMO's work. The Council meets regularly with the NWMO's senior management, closely following the organization's plans and activities, and providing ongoing counsel and advice.

Advisory Council members represent a broad range of expertise, including engineering, community engagement, public affairs, environment, sustainable development, law, Indigenous relations, Indigenous Knowledge, and community-based research. This group of individuals is knowledgeable in nuclear waste management issues and experienced in working with citizens and communities on a range of public policy issues.

COUNCIL OF ELDERS AND YOUTH

The Council of Elders and Youth is an independent advisory body made up of First Nation and Métis Elders and youth. It meets regularly throughout the year and provides counsel to the NWMO on how to apply Indigenous Knowledge in implementing APM. In addition, the Council provides advice on issues that could enhance the development and maintenance of good relations with First Nation and Métis communities and organizations.

INTEGRATED MANAGEMENT SYSTEM

The NWMO continues to operate our integrated management system for activities supporting the long-term management of nuclear waste. To sustain governance excellence, accountability and safety, the organization maintains certifications to Canadian and international standards, including:

- ISO 9001:2015 for quality;
- ISO 14001:2015 for environment; and
- CSA Z1000:2014 for health and safety management.

In addition to complying with these standards, the NWMO has augmented our management system to satisfy the CSA N286-12 Management System Requirements for Nuclear Facilities, which includes nuclear waste facilities. The NWMO's integrated management system ensures the organization has a strong foundation on which to implement our mission and values. The focus on protecting people and the environment fully aligns with the CSA N286-12 management principle that safety is the paramount consideration guiding decisions and actions.

INDEPENDENT REVIEWS

As recommended by our Advisory Council, the NWMO will continue to seek external expert review of and comment on our technical program. As the program continues to move from research into design, fabrication, and demonstration, the nature of the reviews is increasingly focused on specific design aspects and features. These reviews benefit program design and delivery, contribute to overall program quality, and help to enhance public confidence in the NWMO's implementation plans and decision-making.

REPORTING

The NWMO maintains high standards of reporting to demonstrate safety, integrity, excellence, collaboration, accountability, and transparency in the implementation of APM. We report regularly on our progress, and especially in response to the advice of Canadians and the changing external environment.

The *NFWA* requires the NWMO to issue annual and triennial reports. In each case, reports are to be submitted to the Minister of Natural Resources and to the public at the same time. The minister must table the reports in Parliament and issue a statement on each report.

Glossary

Deep geological repository is a facility for the placement of used nuclear fuel deep underground where both natural and engineered barriers contain and isolate it from humans and the environment. There is the potential for retrieving the used nuclear fuel.

Fuel bundle for CANDU nuclear reactors is manufactured by sintering uranium oxide powder into pellets. The pellets are loaded into Zircaloy (an alloy of the metal zirconium) tubes, which are then welded into a bundle of tubes – a fuel bundle. Each bundle contains about 1,000 uranium oxide pellets.

Long-term management of used nuclear fuel involves containment and isolation of the radioactive material. The radioactivity decreases substantially with time, due primarily to the decay of short-lived radionuclides. The radioactivity of used nuclear fuel decreases to about one per cent of its initial value after one year, decreases to about 0.1 per cent after 10 years, and decreases to about 0.01 per cent after 100 years. After approximately one million years, the radioactivity in used nuclear fuel approaches that of natural uranium.

Optional shallow underground storage facility would involve building a shallow rock cavern storage facility at the chosen site for the deep geological repository. This is included in APM as an option. This option is not expected to be needed and is not included in the current implementation plan.

Retrievability is the ability to remove the used nuclear fuel from where it has been placed. Retrievability is an important component of APM and was included on the direction of Canadians. It is part of a risk management approach to allow corrective action to be taken if the repository does not perform as expected or if new technologies emerge in the future that could significantly improve the safety of used nuclear fuel long-term management. While used nuclear fuel will be retrievable as part of APM, the process will become progressively more demanding as the used nuclear fuel containers are sealed in the placement rooms, and then years later when access tunnels and shafts are eventually backfilled and sealed.

Safety in this report refers to the protection of individuals, society and the environment from the harmful or dangerous effects of used nuclear fuel, now and in the future.

Used nuclear fuel means the irradiated fuel removed from a commercial or research nuclear fission reactor. Used nuclear fuel is classified as a high-level radioactive waste.

Note about terminology: In this document, we use the terms Aboriginal, Indigenous, First Nation, and Métis. Our intention in the writing is to honour and respect people, nations and communities, as well as historical and contemporary understanding.

What we heard

In March 2019, the NWMO published *Implementing Adaptive Phased Management 2019 to 2023* – the previous version of this five-year strategic plan. The document outlined Canada’s approach for the safe, long-term management of the country’s used nuclear fuel, and how the NWMO intends to proceed over that time period.

To encourage public review and comment, the plan was distributed by mail and email to more than 3,800 people and organizations that had expressed interest in the APM Project. It was also used by our staff and contractors as a discussion point in communities, at events, and with people involved in the siting process. To increase reach, we also posted it on our website (www.nwmo.ca) and on our social media platforms, with an invitation to comment by making a submission, sending a letter or email, or filling out the comment form.

We received responses from a range of people – some representing government agencies or businesses, and others as individuals. This input helps inform our plans and work activity. We have used the comments we received to help inform the updated plan.

Several themes emerged from the suggestions and comments received – below is a summary of what we heard.

Continuing local engagement and communicating clearly

A number of respondents commented on the strength of the NWMO’s ongoing engagement program and plans going forward. It was acknowledged that a project of this size and with such long time frames will have a significant impact wherever it is implemented, and therefore, both local involvement and clear, honest communication about the project and its potential effects are particularly important.

Canada’s plan is a major infrastructure project that will last generations, and the NWMO recognizes that social factors must be considered alongside the economic factors. We are working with communities to develop partnership frameworks that consider how the project will fit into each area’s vision for itself. In the *Partnership* section of this plan, it is also noted that a willingness assessment plan will be developed and used to inform the final site selection.

To better understand how potential siting communities would like to receive information at this point in the site selection process, in 2019, the NWMO conducted surveys among local residents. The results of the survey, which was conducted by an independent Canadian research firm on behalf of the NWMO, will be shared with communities and published online in 2020. We will use the findings to continue to improve the way we communicate and engage with the public.

Some commenters shared specific suggestions for improving communications materials. For example, in 2019, the NWMO released updated conceptual designs for the deep geological repository for both sedimentary and crystalline rock formations. This new working concept was included in the 2019-23 implementation plan. Commenters advised us to indicate potential dimensions of the above and below ground facilities and the excavated rock pile. In response, we have added labels to diagrams included in this year’s plan, as well as other NWMO publications. To further help people visualize what a repository and associated facilities might look like, we introduced a three-dimensional conceptual model as part of a travelling exhibit launched in 2019.

We were also asked why the NWMO often notes in our communications materials the optional step of temporary shallow underground storage of used nuclear fuel, even though it is not expected to be required. Shallow storage is not currently being considered for implementation, as the used fuel is safely stored on an interim basis at facilities that are expected to operate until the deep geological repository is available for long-term management. In the interest of transparency, we continue to note it as an option should future needs change.

Increasing public awareness about the project and transportation planning

Commenters encouraged us to expand communications and engagement about the overall project and transportation planning specifically in areas beyond potential siting communities. This includes the broader regions in which these communities are located, along potential transportation routes and in current nuclear host communities where interim storage facilities are located.

In the *Partnership* section of this plan, we note our commitment to engaging with nuclear host communities, including planning for eventual transportation of used nuclear fuel from their communities to the deep geological repository site. We also note our commitment to continue to increase awareness about Canada's plan. We continue to expand our outreach beyond siting areas through regional engagement, as well as media and social media campaigns.

We also are continuing to extend our engagement efforts to include communities and groups that may be affected by or have expressed an interest in transportation. The *Transportation* section of the plan notes that we have progressively broadened and deepened our engagement with communities, and conducted public attitude research to help inform a transportation planning framework.

The framework will outline transportation planning objectives, issues to be addressed, factors to be considered in making decisions, and how we will ensure transportation planning includes best practice and aligns with the values and priorities of citizens. We will use the framework as part of ongoing dialogue with the public to help guide the plans that are ultimately developed.

We have included information in the *Transportation* section of this plan about the planning and engagement process for developing a draft transportation planning framework that will be the focus of further discussion in 2020.

Adapting to technical developments

Several commenters noted that the NWMO needs to be prepared to adapt to new developments. It was noted that last year's plan acknowledged Canada's active research sector exploring new technologies such as SMRs, fuel reprocessing and other types of advanced reactors. As noted in the section *Keeping abreast of the external landscape and adapting to change*, we continue to encourage organizations developing new concepts to work with us so we can determine potential impacts to repository designs. We also actively monitor and report on new technical developments and maintain a watching brief on alternative technologies, updating it annually (www.nwmo.ca/adaption).

Several commenters asked why Canada's plan is to contain and isolate used nuclear fuel in a deep geological repository, rather than recycling it. If Canada chooses to reprocess nuclear fuel in the future, it would be a joint decision by nuclear energy producers, the associated provincial governments and the federal government. If such a decision was taken, the NWMO would work with utilities and government to safely manage the high-level fuel waste resulting from this process. This approach is aligned with international best practice – countries that reprocess used nuclear fuel and others that are examining advanced fuel cycles all have plans to implement deep geological repositories.

Accessing land

After we published the 2019-23 implementation plan, we heard interest in learning more about how we would access land in Huron-Kinloss and South Bruce, where constructing a repository on Crown land is not an option as it is in northern Ontario communities. Since then, we launched a process inviting local landowners to consider signing option or purchase agreements with the NWMO that will allow us to conduct site investigations, and potentially, if the site is later selected, to purchase the land in question.

Once land access is secured, we expect to proceed with borehole drilling and other environmental baseline studies at the identified site as described in the *Site Assessment* section of this plan.

Managing risks related to site selection

We received a number of comments about risks associated with selecting a site and implementing Canada's plan, including concerns that we may not be successful in finding a site, delays could occur, or institutional arrangements for regulation and ownership of generation and storage facilities could change.

While we remain adaptable, we are ultimately planning for success – in each potential siting area, geoscientific and environmental evaluation studies to date have given us confidence that we can build and operate a deep geological repository for used nuclear fuel. The next part of the project is about working towards partnership with communities, and our plans for achieving that goal are described in the *Partnership* section of this plan. We are fortunate to be working with communities that are actively engaged in helping to shape these plans.

We also have an active process in place for managing risks. This process involves identifying events that may affect the NWMO or our work, assessing their likelihood, implementing mitigation strategies, and managing resulting risks to ensure we can achieve our mandate.

With respect to changes in regulations and ownership of used nuclear fuel, these are among the factors we monitor on an ongoing basis to ensure we are able to adapt if needed. For example, as described in the section *Keeping abreast of the external landscape and adapting to change*, this year's plan demonstrates how we have adapted to the *Impact Assessment Act*, which was passed in 2019.

Share your thoughts on
Implementing Adaptive Phased Management 2020 to 2024

1. Are the priorities that we have identified appropriate? Have we missed key areas?

2. The plan identifies activities we propose to undertake to accomplish these priorities. Have we set out appropriate activities?

3. The plan is intended to anticipate the challenges ahead and plan for them. Over the next five years, what are the key challenges that will need to be addressed?

4. What will the NWMO need to put in place to respond to these challenges?

5. Other comments, questions or suggestions?

Name (optional): _____

Organization (if appropriate): _____ Date: _____

Address: _____

Email: _____ Tel.: _____

Would you like your comments posted on the NWMO website? Yes No

Please reply by
June 10, 2020, to:
Lisa Frizzell
Vice-President,
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Implementing Adaptive Phased
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The logo for Nuclear Waste Management Organization (NWMO) is displayed in white lowercase letters on a blue background. The letters 'n', 'w', and 'm' are bold and lowercase, while the 'o' is a simple lowercase circle.

NUCLEAR WASTE
MANAGEMENT
ORGANIZATION

SOCIÉTÉ DE GESTION
DES DÉCHETS
NUCLÉAIRES

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