

Implementing Adaptive Phased Management 2023-27

March 2023



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nwmo

NUCLEAR WASTE
MANAGEMENT
ORGANIZATION

SOCIÉTÉ DE GESTION
DES DÉCHETS
NUCLÉAIRES

Land acknowledgment

The Nuclear Waste Management Organization (NWMO) acknowledges that we have worked in many different Indigenous territories since the inception of the organization. We are grateful to the Indigenous and municipal communities that have worked with us over the past 20 years.

We further acknowledge that today we are working in northwestern Ontario in the traditional territory of Wabigoon Lake Ojibway Nation with the community of Wabigoon Lake Ojibway Nation and the Township of Ignace.

In southern Ontario, we are working in the traditional territory of Saugeen Ojibway Nation (SON) with the two SON communities – Chippewas of Nawash Unceded First Nation and Chippewas of Saugeen First Nation – and the Municipality of South Bruce.

We further acknowledge that in both the northwest and the south, we have the privilege of working with other First Nations and organizations, with Métis communities and the Métis Nation of Ontario, and many municipal communities that have all expressed an interest in learning about our work.

As part of our commitment to Reconciliation, we recognize both the historic and current injustices far too many Indigenous communities endure. We pledge to do our part to encourage well-being in communities with which we work.

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Welcome

Welcome to *Implementing Adaptive Phased Management 2023-27*.

This is the five-year strategic plan for the NWMO as we implement Canada's plan for the safe, long-term management of used nuclear fuel.

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 and responsive, and that 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> |

Commitment to transparency

At the NWMO, commitment to transparency is part of our culture. It is entrenched in everything we do.

This annual implementation plan is one way we demonstrate that commitment. This plan is a living document that evolves and grows over time. Each year, we update our plan to reflect progress in our work, input from communities and the public, advances in science and technology, insight from Indigenous Knowledge, evolving societal values and changes in public policy.

We are resilient and focused. We anticipate the ups and downs that accompany advancing Canada's plan for the safe, long-term management of used nuclear fuel, while protecting people and the environment. Canada's plan is designed to be adaptive. In 2022, we adapted.

Once again this year, we took cues from our employees and the communities we work with. Our collaborative work took place virtually and in person. We conducted a range of activities online, from environmental workshops and transportation engagement sessions in potential siting areas, to knowledge-exchange meetings with international counterparts. The lessons we learned will help guide our implementation plan should we face similar challenges in the future.

Our face-to-face time engagement with the communities with which we work continued to be affected in 2022 by provincial lockdowns associated with the COVID-19 pandemic. We have always anticipated the need to adapt over the course of the process, while keeping an eye on the long view. In reviewing progress against last year's version of this annual implementation plan, it became clear we needed to adjust the timing for selecting a preferred site for the deep geological repository. As we announced in August 2022, we now expect to identify a preferred site by fall 2024. This adjustment in timing is not expected to impact the long-term timelines for construction or the start of operations in the early 2040s.

Efforts in the potential siting area communities continue, ensuring Canada's plan respects the unique character of the future repository site. As we have always maintained, the project will only proceed in an area with informed and willing hosts, where the municipality, First Nation and Métis communities, and others in the area are working together to implement it.

In 2022, in collaboration with the potential siting area communities, we released the findings from a series of [community studies](#). These findings cover a wide range of topics, including employment and workforce growth, opportunities for businesses, infrastructure improvements and construction of a Centre of Expertise that will attract world-class academics from around the globe.

We also published the *Confidence in Safety* reports for each potential site, reflecting years of research and fieldwork. These reports summarize why we are confident that a deep geological repository can be safely constructed and operated at either siting area.

The NWMO successfully completed a *full-scale demonstration* of the engineered barriers that will safely contain and isolate Canada's used nuclear fuel in the repository. We also released our *revised transportation planning framework and Preliminary transportation plan* that are designed to advance conversations and provide more details on how we plan to safely transport used nuclear fuel.

The momentum at the NWMO is palpable and will undoubtedly continue into the next phase of implementing Canada's plan.

Your feedback is essential to the implementation of Canada's plan. Every year, we ask Canadians and Indigenous peoples for their input on our implementation plan to inform and guide our work. We invite you to share your thoughts until June 9, 2023.

Other ways to provide feedback (you may indicate that you wish for your response to remain anonymous):

- Email us at learnmore@nwmo.ca
- Send us a letter (with your name and mailing address) to:
Lisa Frizzell
Vice-President of Communications, NWMO
RE: Implementation Plan 2023-27
22 St. Clair Avenue East, Fourth Floor
Toronto, ON M4T 2S3
Canada

Take the
implementation
plan survey



Introduction to the NWMO

Canada has been using nuclear energy as a reliable, low-carbon power source for our homes and businesses for nearly 60 years. Now, as worldwide energy demand grows and the need to address climate change intensifies, nuclear power has become an increasingly important part of the conversation. The Nuclear Waste Management Organization (NWMO) plays a vital role by closing the fuel cycle.

We are entrusted with implementing Canada's plan for the safe, long-term management of used nuclear fuel inside a deep geological repository, in a manner that protects people and the environment for generations to come.

In 2002, the Government of Canada mandated the establishment of the NWMO through the *Nuclear Fuel Waste Act*. Following the "polluter pays" principle, we are an independent, non-profit organization that is funded by the waste owners in Canada: Ontario Power Generation, New Brunswick Power, Hydro-Québec and Atomic Energy of Canada Limited.

Currently, Canada's used nuclear fuel is stored at licensed, above-ground facilities. While this approach is safe, it is temporary and widely recognized as inappropriate over the long term. Canadians and Indigenous peoples have clearly told us they recognize the importance of taking action on a long-term approach today and not leaving used nuclear fuel as a burden for future generations to manage.

Canada's plan for used nuclear fuel, which follows an approach known as Adaptive Phased Management (APM), emerged through a three-year dialogue with Canadians and Indigenous peoples, including specialists and the public. It is based on the values and objectives they identified as important. In 2007, the Government of Canada selected APM as the country's plan for the safe, long-term management of Canada's used nuclear fuel.

A significant milestone is now on the horizon as we expect to select the site for the repository in 2024. Getting to site selection will require building on all the work we have done for the past 20 years. With a project of such complexity and generational scope, we must always stay focused on reaching our upcoming milestones, while also keeping an eye on the long view.

Canada's plan: Adaptive Phased Management (APM)

Technical method

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

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

Management approach

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

APM is both a technical method (what we plan to build) and management approach (how we will work with people to get it done). The technical method involves building a deep geological repository in a suitable rock formation to safely contain and isolate used nuclear fuel. The management approach 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 to the repository site from the facilities where it is currently stored on an interim basis.

The project also includes plans for a Centre of Expertise, which will be established at or near the site. Initially, it will support multi-year testing and assessment of the site, with a focus on safety and community well-being. Eventually, it will become a hub for knowledge sharing across Canada and internationally.

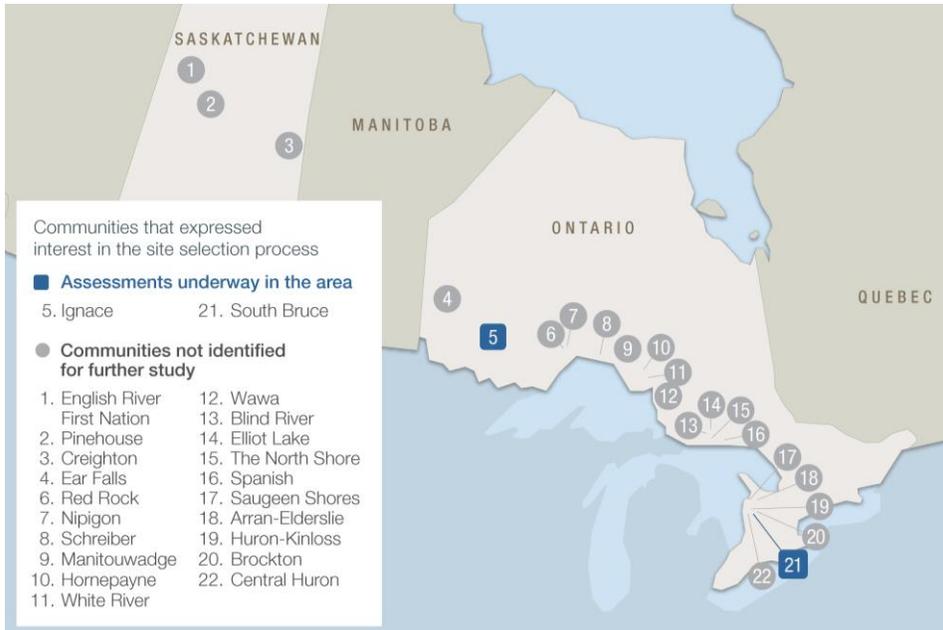
Planning timelines

Great strides were taken in 2022, despite continued unknowns created by the pandemic. The NWMO's work moved forward and adapted. Like all organizations and businesses, several provincial lockdowns associated with the pandemic impacted our work. The lockdowns led to a significant loss of time for the face-to-face interactions that are critical to the engagement process, especially in the communities exploring their potential to host the project. In reviewing our rolling five-year implementation plan and considering the impacts of the pandemic, we made the decision to shift the timing for site selection. Although we decided to adjust the timing for site selection by one year, we remain on track to meet our construction and operations timelines.

| | | |
|---|-----------------|---|
| Developing Canada's plan | 2002 | The NWMO is created. |
| | 2005 | As required by the <i>Nuclear Fuel Waste Act</i> , the NWMO completes <i>Choosing a way forward</i> , a three-year study of the alternatives for the safe, long-term management of Canada's used nuclear fuel. The study involved interested individuals, leading scientists and other experts, Indigenous peoples and the Canadian public. |
| | 2007 | Government of Canada selects Adaptive Phased Management (APM) and mandates the NWMO to begin implementation. |
| Developing the siting process | 2008-09 | 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. |
| | 2010-15 | Twenty-two communities initially express interest. In collaboration with interested communities, the NWMO conducts initial screenings, followed by preliminary assessment desktop studies and community engagement. Areas with less potential to meet project requirements are eliminated from further consideration. |
| | 2015-24 | The NWMO expands assessment to include field investigations. Areas with less potential are eliminated from further consideration as the narrowing down process continues. |
| | 2022 | The Government of Canada reaffirms that a deep geological repository is the best solution for Canada's used nuclear fuel. |
| | 2024 | A single, preferred site is identified. |
| Towards construction | 2025 | Additional site characterization activities are initiated at selected site. The NWMO begins the federal impact assessment process and the Canadian Nuclear Safety Commission's (CNSC) regulatory decision-making process. An updated transportation planning framework is issued (updated every three years). |
| | 2028 | Impact assessment studies are submitted as part of the regulatory decision-making process. |
| | 2030 | The grand opening of the Centre of Expertise is held. The impact assessment is approved (estimate). The Licence to Prepare Site is granted (estimate). The Licence to Construct application is submitted to the CNSC. |
| | 2032 | The Licence to Construct is granted (estimate). |
| | 2033 | Construction begins. |
| Beginning operations | 2040-45 | Operations of the deep geological repository begin. Transportation of used nuclear fuel to the repository begins. |
| Extended monitoring | Post-operations | Decades of monitoring are initiated. |

Selecting a site

The NWMO has been engaged in a multi-year, community-driven process to identify a site that will safely contain and isolate Canada's used nuclear fuel in a deep geological repository.



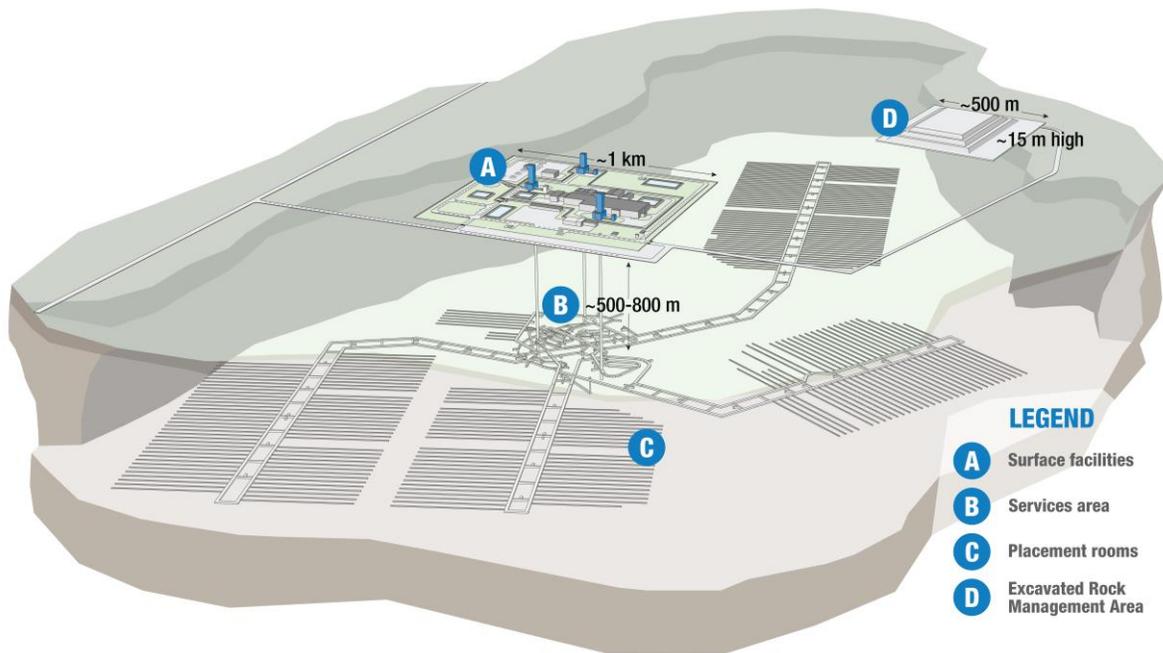
We initiated the site selection process in 2010. Over the following two years, 22 municipalities and Indigenous communities voluntarily expressed interest in learning more and exploring their potential to host the project. We gradually narrowed our focus to two potential sites through extensive social engagement and technical site evaluations to assess the safety of those sites and transportation of used nuclear fuel to them, and the potential to build supportive and resilient partnerships. Both potential sites are in Ontario – one in the Wabigoon Lake Ojibway Nation (WLON)-Ignace area in northwestern Ontario and one in the Saugeen Ojibway Nation (SON)-South Bruce area in southern Ontario.

Throughout 2022, we implemented more detailed technical evaluations at both potential sites and engaged in meaningful discussions with communities around partnerships and community well-being investments.

As we advance the siting process, we maintain the fundamental principle that the project will only proceed in an area with informed and willing hosts, where the municipality, First Nation and Métis communities, and others in the area are working together to implement it.

[Learn more about the site selection process.](#)

Key components of the repository



This diagram shows a conceptual layout for the surface facilities, as well as an approximate area of 1,500 acres (600 hectares) for the underground services area and placement rooms in the deep geological repository, at the proposed site with crystalline rock.

This design will continue to evolve as the project progresses and will adapt to changes in technology and future decisions about nuclear power generation that may change the volume or type of fuel to be managed.

For example, 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. New nuclear technologies may result in different types of used fuel. However, there is international consensus that deep geological repositories represent the best practice for the long-term management of used nuclear fuel resulting from SMRs as well, including any high-level waste from reprocessing.

The repository design is currently sized to account for the existing inventory of used fuel, as well as projected inventories from planned reactor life extensions and refurbishments of operating reactors. Both potential sites have the capability for expansion of the underground to accommodate additional inventory. For more information about how the NWMO will account for the potential for used fuel created by SMRs, please see the section [Keeping abreast of the external landscape and adapting to change](#).

The deep geological repository uses a multiple-barrier system designed to safely contain and isolate used nuclear fuel over the very long term. Constructed more than 500 metres below ground, the repository will consist of a network of placement rooms that will store the used nuclear fuel. This approach aligns with international best practices.

At the surface, there will be facilities where the used fuel is received, inspected and repackaged into purpose-built containers encased in a buffer box of bentonite clay before being transferred to the main shaft for underground placement. Work is underway on the design of the repository surface facilities, including the Used Fuel Packaging Plant.

The repository underground will be accessed through three shafts, which will be located within a single centralized and secure services area. This services area will also include an underground demonstration facility for initial testing of the future engineered barrier emplacement equipment. The layout also includes multiple access tunnels that enable the placement rooms to be situated in areas with the most suitable host rock. The buffer boxes, with the used fuel containers inside, will be arranged in the horizontal placement rooms, and any spaces left over will be backfilled with granular bentonite pellets or chips.

In 2022, we successfully completed a full-scale demonstration of the engineered barriers that will safely contain and isolate Canada's used nuclear fuel in a deep geological repository. This important safety and technical achievement was the culmination of more than eight years of preparation, including the design and fabrication of specialized prototype equipment and components by the NWMO's team of leading technical specialists and engineering partners.

Work has started on site-specific conceptual designs of the repository layout based on information from geoscience assessments and borehole drilling in the potential siting areas. The NWMO will be completing assessments of site-specific transportation systems and developing the preliminary design of the Used Fuel Transportation System. We will continue to evolve the design of the repository using the site-specific information we obtain from additional site characterization after site selection, with an objective to develop the updated repository design for the construction licence around 2030. The proposed site in the WLON-Ignace area would be located in crystalline rock, while the proposed site in the SON-South Bruce area would be in sedimentary rock.

[Learn more about the project.](#)

Centre of Expertise

A Centre of Expertise will be established at or near the repository location, after the site is selected. The specific location will be determined in collaboration with the host communities.

The centre will become a hub for knowledge sharing across Canada and internationally and a focal point for those living in the area to learn about the project through public viewing galleries and interactive displays. The centre may also serve as a hub for sharing Indigenous Knowledge, culture, history and traditions.

The design and use of the centre will be developed collaboratively with those living in the area, including First Nation and Métis communities. In 2022, the NWMO began working with local communities to develop a vision for the centre in a manner that aligns with their requirements and aspirations. This visioning process and continued dialogue around community interests for the facility will continue in both siting regions in the coming years, supporting ongoing dialogue and the unique opportunities the centre could provide.

For the NWMO's needs, the centre will initially be used to support the continued site characterization work related to technical safety, ongoing education and dialogue, and community well-being. It will be home to active technical and social research, as well as technological demonstration programs, with contributions from scientists and other experts in a wide variety of disciplines from both the NWMO and around the world. An engineering test facility will be located within the Centre of Expertise to continue the development of materials and equipment to be used in the repository, and to support the construction and operation of the facility in the future.

Once both community and the NWMO's requirements are finalized, the project will begin.



This artist rendering shows one possible design for a Centre of Expertise in the Wabigoon Lake Ojibway Nation-Ignace area.



This artist rendering shows one possible design for a Centre of Expertise in the Saugeen Ojibway Nation-South Bruce area.

Reconciliation and Indigenous Knowledge

The NWMO is committed to understanding, honouring and aligning with Indigenous Knowledge in our work. This commitment is reflected in many ways – through oversight by our Indigenous Relations team, advice from the NWMO’s Council of Knowledge Holders, Indigenous representation in our organization (including in our executive team and Board of Directors), meaningful policies to guide our work and regular engagement with First Nation and Métis communities. In all areas that we operate, this commitment is an essential part of doing good work and maintaining positive relations.

Over the next five years and into the future, the NWMO will continue to implement our *Reconciliation Policy* (2019), measure progress and align Indigenous Knowledge with our work. Measured annually and reported publicly, this work affirms our commitment to acting on the Truth and Reconciliation Commission’s call to action #92, which calls upon the corporate sector to build respectful relationships with Indigenous peoples and provide valuable learning opportunities for staff on the history of Indigenous peoples.

In 2022, the NWMO published our first *Reconciliation Report* (2021), which provides an evaluation of the NWMO’s *Reconciliation Policy*’s impacts since its formalization in 2019. Activities tracked have included mandatory staff Reconciliation training or continuous learning opportunities, informal training opportunities, staff support systems and community-driven work plans.

Reconciliation

Reconciliation matters. For Canadians, it ensures that we learn from and address historic and ongoing wrongs, and that we work together to co-create a better future. The NWMO is committed to our Reconciliation journey. As we move forward, we ensure Reconciliation is considered in all our work.

Our *Reconciliation Policy* was released in 2019 as part of establishing a solid foundation for working with Indigenous peoples. In step with our policy, the NWMO continues to engage meaningfully with First Nation, Métis and municipal communities and organizations as we work together to implement Canada’s plan.

The NWMO recognizes the truth of the historic wrongs and the challenges we have today and seeks opportunities to co-create a better future. Our policy requires that the NWMO build relationships with First Nation and Métis communities on a foundation of respect for languages and customs, culture and institutions.

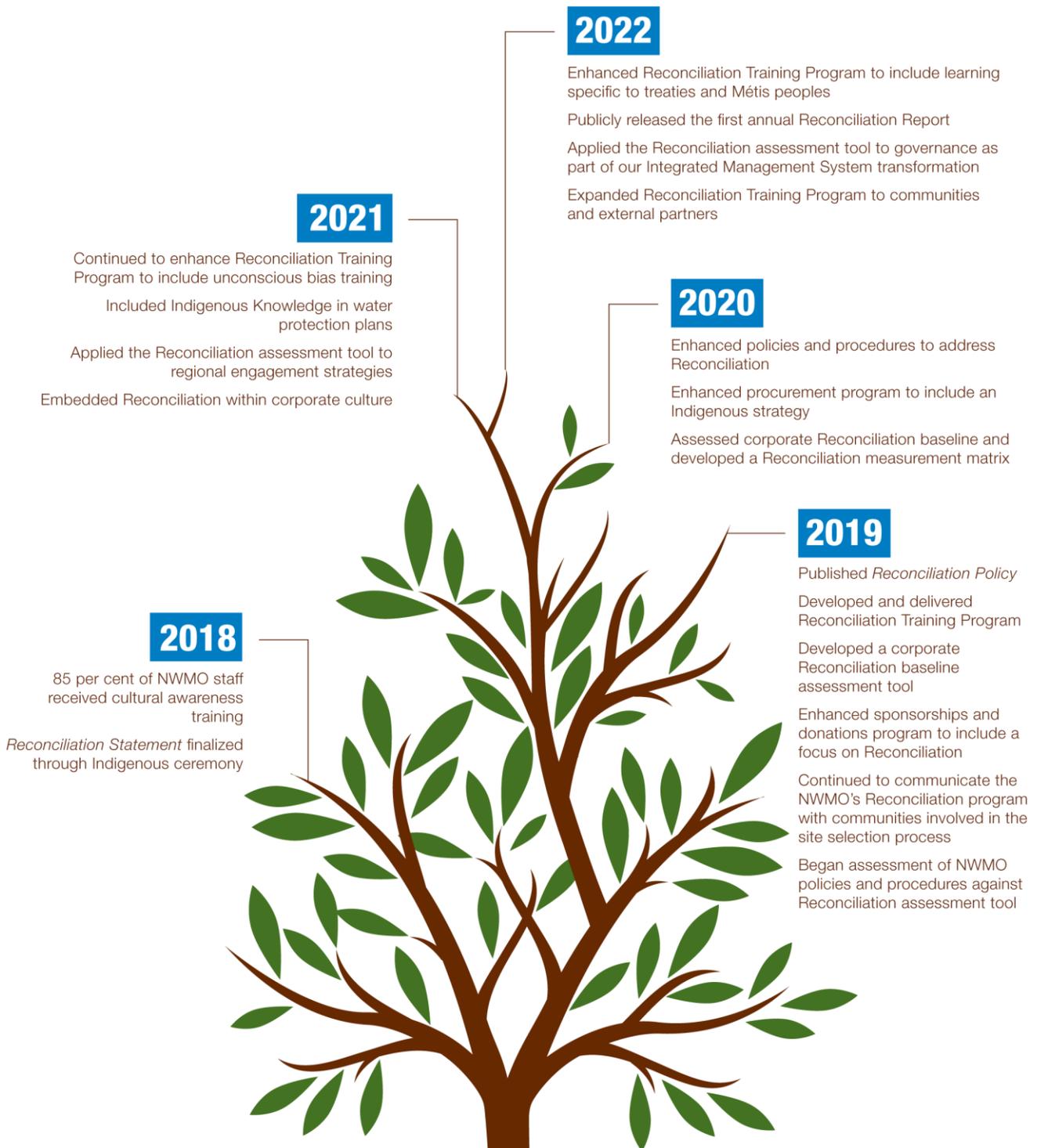
The NWMO's Indigenous Relations team works with Reciprocal Consulting – an Indigenous-owned firm specializing in Indigenous evaluation and monitoring – to publish our annual Reconciliation report. It evaluates the NWMO against the Reconciliation baseline to ensure we are meeting the commitments outlined in the *Reconciliation Policy* (2019). The Reconciliation baseline is used to evaluate our contributions to Reconciliation, identify gaps and determine how we should move forward as an organization. Measuring our progress helps instill Reconciliation as a core value, which is reflected in how we act as an organization.

We continue to apply our Reconciliation assessment tool to key documents. We have completed 18 Reconciliation assessments of the NWMO's policies, as well as applied the tool to both regional engagement strategies and the draft Integrated Strategy for Radioactive Waste. We have also taken the assessment tool outside the organization, using it with some of our partner universities to apply this lens as they expand research programs related to our work.

Cultural awareness training is one way the NWMO supports our learning. To date, more than 80 per cent of the NWMO's staff have completed the first two Reconciliation training modules, which include space for learning circles and Indigenous-led dialogue. Part three of our Reconciliation training program was rolled out in fall 2021, with a focus on historic and contemporary understandings of treaties, as our Reconciliation continuous learning stream continues to evolve. In 2022, we introduced a new Métis awareness training module.

As the NWMO implements the *Reconciliation Policy* (2019), we demonstrate our contribution to this important movement towards change.

NWMO RECONCILIATION STRATEGY



Indigenous Knowledge

The NWMO's commitment to aligning with Indigenous Knowledge and the important teachings from Indigenous Knowledge Holders guide our work. These teachings include the role and significance of spirit and ceremony, understanding natural laws, respecting Mother Earth and creating space for Indigenous voices.

Internal workshop discussions explore the sacred relationship and stewardship role Indigenous Knowledge Holders have with water and the commonalities that exist within western science perspectives. Participants at these workshops include Indigenous Knowledge Holders, Elders, scientists, industry professionals and NWMO employees. Together, we explore how water is a life force that sustains us, flows between and within us, and shapes the land.

“Water is a unifying and transformational being that brings us all together. It is also a great teacher, with a voice and a story to tell.”

– Elder Diane Longboat

It is our duty and responsibility to listen to and learn from water so that we always respect, protect and nurture it. That is why protecting water, people and the environment is so important to us. It is at the core of what we do and a commonality we share with Canadians and Indigenous peoples because we all have a personal relationship with water.

Understanding the water, its quality, its memory and where it is flowing is essential for us to be able to make good decisions as we assess the geology and other environmental features in our potential siting communities, conducting environmental and geological studies.

Through collaboration with Indigenous Knowledge Holders, Elders, scientists, industry professionals, conservation authorities, youth and others, we continue to learn about water and can share our knowledge with one another and others around the world.

Several communities in our site selection process asked us to provide more information about how our work will protect water. Since 2017, we have engaged with communities through our “Journey of water” presentation series. We align with Indigenous Knowledge in these presentations about water, a subject of vital importance to all people. Developed collaboratively with the Council of Knowledge Holders, Wabigoon Lake Ojibway Nation Women's Circle and Indigenous community groups, this series helps tell the story of water and how it interacts with materials proposed to be used in the multiple-barrier system. The NWMO continues to seek opportunities to present these vital teachings in the future.

In the next five years, our commitment will endure, as we seek to align with Indigenous Knowledge in everything we do, creating space to learn from ceremony and applying pertinent learnings to how decisions are made at the NWMO.

Cost and funding

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

Consistent with the “polluter pays” principle, Canada’s plan for used nuclear fuel is funded by the waste owners in Canada: Ontario Power Generation (OPG), New Brunswick Power (NBP), Hydro-Québec (HQ) and Atomic Energy of Canada Limited (AECL). The *Nuclear Fuel Waste Act* requires each of these four companies to establish independently managed trust funds and make annual deposits to ensure the money to fund this project will be available when needed.

Each company pays into the trust fund based on the number of fuel bundles it has and continues to create. The amounts cover estimated fixed costs for the NWMO to construct, operate, monitor and decommission a deep geological repository, as well as variable costs associated with managing each fuel bundle. This process is designed to ensure Canada’s plan is funded over the long term.

For more information on trust fund deposits, please refer to the [NWMO Triennial Report 2020-22](#). In addition to these trust fund contributions, waste owners are also responsible for funding the NWMO’s annual operating budget.

| Total trust fund deposits: Year 2023 | | |
|---|--|--|
| Owner | Trust fund balance (\$ million) | Deposit to trust funds (committed and future bundles) (\$ million)* |
| | December 2022 | 2023 |
| OPG | 4,404 | 93 |
| NBP | 187 | 6 |
| HQ | 174 | 0 |
| AECL | 72 | 0.4 |
| Total | 4,837 | 99 |

** Annual trust fund deposits are required to be made within 30 days of the submission of the annual report. A deposit date of April 27 is assumed for illustrative purposes.*

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. We maintain a system to estimate funding requirements and communicate with waste owners to ensure they provide the required deposits to the trust funds.

Many factors will affect the long-term cost of Canada's plan: the volume of used nuclear fuel to be managed, the location of the facility, the surrounding infrastructure, rock type and characteristics, the design of the repository, and the length of time allocated to monitoring the site following fuel placement. The existing inventory of used nuclear fuel in Canada is approximately 3.2 million bundles, and more bundles are produced each year as nuclear reactors continue to generate electricity. Future decisions about nuclear generation in Canada may change the volume and type of fuel to be managed.

The NWMO regularly updates the lifecycle cost estimate and completed a full update of the cost estimate for the project in 2021. These estimates provide the basis for financial planning and trust fund deposits for future years. For planning purposes, our 2021 cost estimate is based on an expected volume of about 5.5 million fuel bundles, which is the anticipated volume at the end of the planned operation of Canada's existing nuclear reactors. With this expected volume, the total lifecycle cost of the project – from the launch of the site selection process in 2010 to the completion of the project about 175 years later – is approximately \$26 billion (in 2020 dollars). This figure covers many decades of lifecycle activity, stretching well into the next century.

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 change the landscape in which we operate or impact the project directly. We continue to monitor advances in the energy sector, innovations in nuclear waste management, changes in energy and environmental policies, potential developments involving new nuclear reactor units, changes in society's expectations, values and insights, and developments with other Canadian nuclear waste initiatives.

A core principle of Adaptive Phased Management is a commitment to adapt plans in response to input obtained through engagement activities. For example, our transportation planning framework and *Preliminary transportation plan* are both based on what we heard from communities and people interested in Canada's plan. Both transportation planning documents were designed to advance conversations and provide more information on how we plan to safely transport used nuclear fuel.

Beginning in 2020, we shared the draft of the framework publicly for broader engagement, and in 2022, we published both documents. We have committed to updating these documents every three years, based on feedback from Canadians and Indigenous peoples, as well as new developments in best practice, technologies, ongoing adaptation and continuous improvement.

We have also adapted our plans for the regulatory decision-making process in response to changes in the *Impact Assessment Act* passed in 2019. More information about the regulatory decision-making plan can be found in the section [Regulatory decision-making process](#).

As advancements in small modular reactor (SMR) technology continue to progress in Canada, we have been working with SMR developers to identify the types of used nuclear fuel that may result, as the NWMO will be responsible for managing it. This information will help us optimize how to handle the used nuclear fuel for long-term management, how to handle the potential impacts to the repository design and how our funding formulas can be adapted to include new entrants. It will also help us better inform the potential host communities about the total scope of the project.

The NWMO is currently aware of two SMR projects in the licensing process – Ontario Power Generation is working together with GE-Hitachi Nuclear Energy to deploy an SMR at the Darlington new nuclear site, and Global First Power is working to construct an SMR at Chalk River Laboratories in Ontario. While we are aware of other SMR proposals and as these advance, we will make appropriate changes to our plans. As more SMR projects advance towards licensing, the NWMO will be prepared to adapt and identify any potential efficiencies in managing the used fuel they produce.

There is international consensus that deep geological repositories represent the best practice for the long-term management of used nuclear fuel resulting from SMRs, including any high-level waste from reprocessing. Canada's plan is designed to adapt to changes in technology, and we can build flexibility into repository designs so we can be ready for future decisions.

We further regularly update a [watching brief on advanced fuel cycles and alternative waste management technology](#). We also monitor and report on [potential inventories of used nuclear fuel quantities](#) for implications to the repository design.

Planning priorities

At the NWMO, we structure our work plans around seven priorities: engineering, site assessment, safety, mobilization, regulatory decision-making process, partnership and transportation. In this section, we outline our plans within these seven work streams.

Our commitment to Reconciliation and aligning with Indigenous Knowledge guides our efforts in all priority areas.

Over the next five years, we will transition from the site selection process to the regulatory decision-making process. These planning priorities reflect the many activities required during this transitional period.



ENGINEERING

The NWMO will:

- Complete conceptual site-specific facility designs to support regulatory decision-making;
- Initiate preliminary repository design work to complete a future construction licence application; and
- Continue optimization of engineered-barrier system for construction and operations.

The deep geological repository is an internationally recognized approach, based on scientific consensus, for the safe, long-term management of used nuclear fuel. Multiple engineered barriers will be emplaced in a stable rock formation to contain and isolate the used nuclear fuel deep underground.

As we move through the siting process and into the regulatory decision-making process, we will develop site-specific repository designs using data collected through borehole drilling and preliminary environmental baseline investigations. This work will support the site selection decision. Once a site has been selected, we will begin preliminary engineering at the selected site to support the preparation of regulatory submissions and assessments and achieve a future construction licence application.

We will continue to optimize our processes and techniques to enhance confidence in the strength of the engineered-barrier system design. We will also integrate the latest information from our ongoing research and development activities into our designs through interdisciplinary reviews, as part of our Technical Research Review Committee.

In the period from 2023 to 2027, the NWMO will also:

- Maintain a prototype test and demonstration facility for engineered-barrier evaluations;
- Continue to update cost estimate information for the project as required;
- Support the preparation of the initial project description and assessments needed for the regulatory process;
- Begin preliminary engineering for the selected site to support the future construction licence application; and
- Arrange independent peer reviews of specific aspects and features of the repository and engineered-barrier design.

SITE ASSESSMENT

The NWMO will:

- Continue geoscientific investigations and environmental baseline monitoring at both sites; and
- Begin additional geoscientific investigations and baseline data collection at the selected site.

The NWMO anticipates identifying a single, preferred site by fall 2024 and then moving into the regulatory decision-making process in 2025. At this point, initial site assessment activities have been completed with suitable information to inform site selection. After site selection, site characterization will continue at the selected site to support the regulatory decision-making process and inform geoscientific, engineering, environmental and safety assessments work that will be needed to apply for a construction licence.

To ensure we appropriately include Indigenous Knowledge, we seek guidance from local Knowledge Holders to incorporate applicable learnings into our planning and the execution of our studies. Local Indigenous experts ensure Indigenous protocols guide our field activities. To date, these activities have included cultural verification studies of potentially affected areas, including ceremony, and cultural awareness training for staff and contractors working in the field.

Our work with people in interested municipalities, First Nation and Métis communities, and others in the area continues. We encourage consideration of the potential environmental, social, cultural and economic effects of hosting the deep geological repository. Involving people in the broader siting areas ensures a wide range of potential benefits and impacts are considered as we move beyond site selection.

Canada's plan is constantly being adapted to reflect the priorities of siting communities. While our timeline for identifying a site has shifted, the geoscience fieldwork activities have continued in both siting areas.

In the period from 2023 to 2027, the NWMO will also:

- Continue field studies, including additional borehole drilling at the selected site, and consideration of factors identified by Indigenous Knowledge Holders to inform geoscientific, engineering, environmental and safety assessments;
- Continue geoscientific studies to support the process to select a suitable site for hosting the deep geological repository in a safe location;
- Engage communities on specific topics such as safety of people and the environment, project benefits and stewardship of the land; and
- Provide support for regulatory decision-making and initiate additional site characterization studies to confirm the site is technically suitable for hosting the deep geological repository.

SAFETY

The NWMO will:

- Continue development of preliminary site-specific safety assessments;
- Maintain our commitment to considering safety from a social perspective;
- Develop updated safety assessment models for the selected site that will be the basis for the regulatory decision-making process; and
- Continue research to support the safety case and build expertise to support the regulatory decision-making process.

The NWMO is committed to keeping people and the environment safe for generations to come. The safety of the public and our employees comes first in everything we do, including environmental, conventional, nuclear and radiological safety.

As we continue to improve our knowledge of the two potential sites, we share our understanding of safety with communities through presentations, on our digital platforms and by making the NWMO's specialists available.

The deep geological repository will be placed in a rock formation that supports the safe, long-term containment and isolation of used nuclear fuel. Repository performance in this site must be shown to meet or exceed the regulatory expectations of the Canadian Nuclear Safety Commission as part of the future licensing process.

As we look to identify a preferred site by fall 2024, the [Confidence in Safety](#) reports released in 2022 provide a summary of evidence that a deep geological repository can be constructed at either potential site. After a site with willing and informed hosts is selected, further technical studies will be undertaken at the selected site. These will provide even greater clarity for the repository design and formal safety case that will be submitted to regulators.

The safety of a proposed site will be confirmed through a rigorous regulatory review of the repository design and safety case.

In the period from 2023 to 2027, the NWMO will also:

- Continue to conduct joint research projects with international organizations and counterparts in other countries – including Sweden, Switzerland, Finland, France, Korea, Japan and the United Kingdom – to learn from and contribute to the experience of other countries, while keeping abreast of the state-of-science in geoscience and safety cases for various host rock formations;
- Engage universities in research partnerships that ensure our technical work is scientifically rigorous and develop young engineers and scientists knowledgeable in waste management. This will include continuing to host an annual Geoscience Seminar and an Engineered-Barrier Science Workshop to bring together researchers from academia and industry;
- Increase awareness of the important role of Indigenous Knowledge in our work, in part by offering training and sponsoring workshops on Indigenous Knowledge and western science for our research partners; and
- Continue building a strong safety culture among employees as we prepare for the regulatory decision-making process, by creating and sustaining an environment where employees take proactive responsibility for their safety and that of their colleagues and the public in all activities.

Focus on safety from a social perspective

While the deep geological repository represents an important environmental infrastructure project for Canada, just as core to our work is protecting people. Key to that commitment is our focus on implementing the project in a way that makes people feel safe. The NWMO considers safety as seen from a social perspective at three levels – societal, community and personal.

The NWMO considers safety from a social perspective at the societal level by ensuring we seek broad acceptance for the project. When the NWMO was founded in 2002, we began a three-year study designed to assess possible approaches and alternatives for the safe, long-term management of Canada's used nuclear fuel, so that the public could understand the options and make considered choices.

Face-to-face conversations were held with thousands of individuals and representatives of organizations at local, provincial, national and international levels. These included representatives of Indigenous organizations, nuclear power plant workers, youth, residents of nuclear power plant communities, environmental groups, industry experts, faith communities, government agencies and parliamentarians. Canada's plan emerged from this dialogue and was based on the values and priorities that Canadians and Indigenous peoples identified.

We also engaged the public in order to develop and design our site selection process. Voluntary participation, shared decision-making, openness and fairness formed the basis of that process, which we detailed in our [2010 site selection process](#) and continue to follow today.

Our site selection process has been voluntary from the outset, with 22 communities initially expressing interest in learning more and exploring their potential to host the project. As we have continued to move forward in our site selection process, narrowing down to the two remaining siting areas, safety from a social perspective has been built into the foundation of our engagement efforts and the site selection process.

We have maintained our commitment that Canada's plan will only proceed in an area with informed and willing hosts, where the municipality, First Nation and Métis communities, and others in the area are working together to implement it.

We have also demonstrated our commitment to safety from a social perspective at the community level by aligning with Indigenous Knowledge and working towards Reconciliation (for more information, please see the section [Reconciliation and Indigenous Knowledge](#)).

To ensure we address safety from a social perspective at the personal level, the NWMO regularly solicits individual feedback on our work through our on-the-ground engagement efforts, social media and public surveys. We listen to communities, residents, community leadership and those expressing a diversity of views about our work. Through this process, we seek to understand and address the concerns people raise.

Since transparency is a core value of our organization, we also publish annually the results of these engagement efforts through a series of “What we heard” reports that summarize the questions and themes we are hearing.

Our ongoing efforts to ensure that the project considers safety from a social perspective include:

- Using the feedback we receive to understand the issues of importance to Canadians and Indigenous peoples, adjusting our work to address those concerns if needed, and highlighting those concerns in our public reporting;
- Actively and willingly participating in public panels featuring different perspectives on the project;
- Using common themes from the feedback we receive to guide the design of the repository and respond to that feedback in our reporting, as we have done on topics such as the importance of protecting water;
- Providing capacity to communities engaged in the site selection process so they can develop their own processes for determining if they are willing to host the project;
- Affirming our commitment to Indigenous communities that a site will not be selected without their consent;
- Following a collaborative approach to developing partnership and hosting agreements;
- Extending our engagement to regional and neighbouring communities, beyond the potential host communities;
- Involving communities in the development of community studies and the discussion of results considering a range of socio-economic factors, to explore the potential for partnership and ensure the project can be implemented in a way that fosters well-being in the area;
- Including communities in participatory environmental monitoring programs;
- Considering realistic lifestyles in our safety assessments – how and where people in the area live;
- Making safety assessment experts available to the public on a drop-in basis in the siting areas; and
- Creating opportunities for our staff to directly engage community members in the siting areas to discuss the safety of the program and learn about concerns they may have.

MOBILIZATION

The NWMO will:

- Implement a human resources strategy, and ensure the information technology security and platforms required for the organization and regulatory decision-making process are available; and
- Begin planning, design and tendering for construction of the Centre of Expertise.

With a project of such complexity and generational scope, we have always anticipated the need to adapt over the course of the process, while also keeping an eye on the long view.

Site selection is a critical milestone, marking the beginning of a new series of activities. After the site is selected, there will be increased activity in the local and regional area. It will also mark the beginning of a multi-phase organizational transformation for the NWMO.

As we look to expand our team, the NWMO will seek to build an equitable, diverse and inclusive workforce, maximize job opportunities in the siting area – the municipality and surrounding region, including First Nation and Métis communities – and develop capacity in communities through investments in training and education.

With site selection drawing closer, we are preparing to move our operations to be based in the location selected for the repository. We are also making plans to increase resources within the region, ensure we have the technology in place to support Canada's plan, and secure land for our facilities, including the Centre of Expertise.

Internally, we are preparing for this increased activity by putting in place the resources needed to undertake continued site characterization, engineering designs, regulatory submissions, and construction and operation of the deep geological repository.

In the period from 2023 to 2027, the NWMO will also:

- Assess resource requirements to advance and support continued site characterization, environmental assessments, engineering designs and safety case development for the selected siting area in support of the licensing application;
- Continue to build a strong local presence in potential siting areas and provide local contracting opportunities for the project;
- Work with communities to understand the housing and infrastructure needs that will be required to support the transition of the NWMO workforce to the selected site;
- Invest in building up the skills and capacity of youth and community members in the municipalities and First Nation and Métis communities engaged in the site selection process, to help them secure jobs related to the plan; and
- Continue to strengthen our corporate culture through appropriate organizational behaviours, standards and tools, including the use of technology platforms. This includes striving for excellence in project management, achieving meaningful partnerships, embracing diversity and inclusion, committing to Reconciliation, and aligning with Indigenous Knowledge and practices in all our work.

The operational readiness plan

To ensure we are ready to move into the next phase of the project, the NWMO is developing an operational readiness plan that will include:

- Developing and implementing the systems, processes and tools required for the next phase of the project, including care and control of the project site in the selected community; and
- Ensuring the NWMO has the project, contract management, and commercial processes and tools to execute large, complex projects and multi-year contracts.

To align with the planning priorities, the NWMO is developing organizational capabilities and competencies for the regulatory decision-making process and preparing for construction. This includes further developing the processes, systems and tools that will be required to implement Canada's plan on time and on budget, including our management system, commercial strategy, business and information technology infrastructure, and information management systems.

The NWMO will also be delivering more complex aspects of the project in the next phase of work, with increased risk for impacts to the cost and schedule. Our ability to manage and report on these projects and contracts will require the right resources to be in place by the time we select a site, so that we can transition effectively into the next phase of work.

In the period from 2023 to 2027, the NWMO will also:

- Continue the transformation of our management system to be consistent with the requirements of CSA N286-12, *Management System Requirements for Nuclear Facilities*, as it applies to our activities;
- Continue to use information technology tools and technology to automate processes, support strategic initiatives, and digitize information, content and records;
- Use artificial intelligence, business intelligence and data analytics to drive operational efficiencies and aid in critical decision-making;
- Develop a commercial strategy for the labour, goods and services necessary for the next phase of work;
- Implement the Project Management Information System to support the execution and monitoring of the NWMO's projects; and
- Apply the project management and commercial strategy governance to our work.

REGULATORY DECISION-MAKING PROCESS

The NWMO will:

- Prepare with community input the submissions to start the regulatory decision-making process; and
- Start the regulatory decision-making process with partner communities.

Protecting people and the environment for generations to come remains at the heart of all our work. As we head towards site selection and beyond, it will become even more important to demonstrate that Canada's plan meets strict regulatory requirements to protect the health, safety and security of people and the environment, while also respecting Canada's international commitments.

We expect to formally notify the regulators that we will be starting the regulatory decision-making process shortly after site selection and target our initial submissions for 2025.

Our site investigations and associated technical studies, in advance of this process and once it is underway, must follow all relevant municipal, provincial and federal requirements. To ensure we achieve this, the NWMO monitors and adapts our activities to all regulatory changes that affect the project. For example, we adapted our plans to conduct studies that are consistent with the *Impact Assessment Act* that came into force in 2019.

We also continue to engage with the Canadian Nuclear Safety Commission (CNSC) in preparation for the eventual submission of a licence application, consistent with the terms of a special project arrangement already in place.

In the period from 2023 to 2027, the NWMO will also:

- Develop impact assessment methodologies in collaboration with municipal and Indigenous siting area communities in preparation for formally launching the regulatory decision-making process;
- Work with communities and others to identify opportunities to enhance our understanding of the current local and regional conditions, including collaboration with Indigenous communities to align Indigenous Knowledge with this understanding as a foundation for the environmental, social, health and economic assessments;
- Building on the work completed on safety from a social perspective up to site selection, continue to work with community members to understand their issues and concerns, and address them in our designs and studies;
- Establish environmental monitoring programs in potential siting areas in close collaboration with community members and Indigenous Knowledge Holders;
- Work with potential host communities to define their role in the regulatory decision-making process and then facilitate their participation;
- Obtain from the Impact Assessment Agency of Canada (IAAC), the CNSC and other regulatory authorities clarity regarding the requirements of the *Impact Assessment Act* and implementation under the act;
- Prepare and submit materials required to initiate the federal impact assessment and CNSC licensing; and
- Begin the integrated impact assessment and licensing process, and prepare the necessary reports after we have received the Site-Specific Impact Assessment Guidelines and Permitting Plan from the IAAC.

The regulatory decision-making plan

Once a site has been selected in 2024, the NWMO will shift our focus to the regulatory decision-making process that will allow construction of the deep geological repository to move forward if approvals are granted.

All regulatory decisions will involve independent review by federal and provincial regulators and an appointed review panel. The process will be open and transparent and involve members of the public who choose to participate.

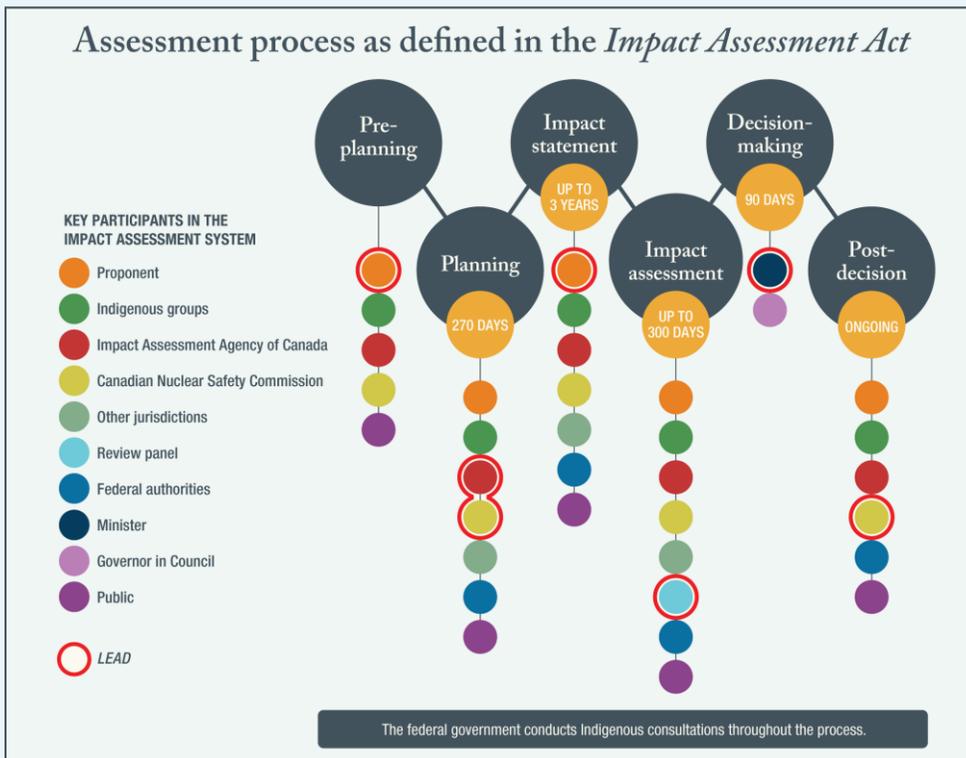
There are two integrated regulatory decision-making processes:

- An impact assessment under the *Impact Assessment Act*, and
- Licensing under the *Nuclear Safety and Control Act*.

Together, these processes will help the federal government assess various aspects of the project, including safety, sustainability, adverse effects, national security and whether it is in the public interest.

The NWMO and host communities for the project will undertake a substantial work program, studying the potential impacts of the project, including cumulative effects, and identifying any necessary mitigations. Overall, our target is to have received the necessary regulatory approvals to transition to site preparation by 2030.

[Learn more about the regulatory decision-making process.](#)



PARTNERSHIP

The NWMO will:

- Build supportive and resilient partnerships with communities leading to mutually agreeable partnership agreements; and
- Select the preferred site for the deep geological repository in an area with informed and willing hosts.

The NWMO is committed to supporting community well-being by allocating funding to each potential host community to advance community-led projects. These funds are intended to support the community's continuing efforts to build community sustainability and well-being, to support capacity-building to participate in discussions to explore partnership with the NWMO, and to host the project in the future through the development of transferable skills. Municipalities in the siting process continue to express interest in enhancing relationships with their Indigenous neighbours, which we are working to facilitate through our engagement efforts.

In 2023 and 2024, we will continue to work with municipal and Indigenous communities in each siting area to explore the potential for partnership. We follow a partnership road map outlining a sequence of partnership-building topics to examine alongside the communities.



In Ignace, the conversation around a values and principles exercise continues with the newly elected municipal government, with the potential for additional work to be initiated based on those discussions. In South Bruce, the municipality established 36 guiding principles that reflect the community's priorities and expectations. Each topic in our partnership road map builds on the values and principles the communities identify to guide our discussions, ensuring the project is implemented in a manner that enhances community well-being.

After a site is identified in 2024, our work will shift from building awareness, understanding the potential to support well-being and gaining confidence in the safety of the project, including safety from a social perspective, to implementation and governance of the partnership agreements. Youth engagement will remain a priority, given the intergenerational nature of the project and the need for intergenerational transfer of knowledge to support implementation of the project.

In the period from 2023 to 2027, the NWMO will also:

- Continue engaging municipalities, First Nation and Métis communities in the siting areas, and surrounding communities to build awareness of the project and develop and sustain relationships, taking into account traditional laws, practices and use of land;
- Work with the siting communities to continue to build awareness of the project in the region;
- Engage communities within the siting areas to understand how safety from a social perspective can be supported, including aspects such as community cohesion and well-being;
- Identify other potential partners and build supportive and resilient relationships;
- Ensure communities engaged in the siting process have the resources and information they need to fully participate in siting activities and make an informed decision;
- Develop mutually agreeable hosting agreements in each siting area, and after a site is selected, begin implementing the agreements in the siting area that is continuing into the regulatory decision-making process; and
- Ensure through partnership that communities have sufficient resources to actively participate in the regulatory decision-making process.

TRANSPORTATION

The NWMO will:

- Demonstrate the potential for a socially acceptable transportation plan through dialogue on the transportation planning framework;
- Continue to work with Indigenous peoples to understand how the NWMO can align our transportation planning with Indigenous Knowledge;
- Continue refinement of the Used Fuel Transportation System; and
- Begin implementing the transportation planning framework, which will be updated every three years.

Transportation of used nuclear fuel occurs on a daily basis worldwide. In almost 60 years, there has never been an accident resulting in human or environmental harm as a result of radioactive release.

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. However, we recognize the need to explain this good safety track record and answer peoples' questions about how the NWMO will uphold this standard.

In 2021, we released a [Preliminary transportation plan](#) that describes, conceptually, how the NWMO plans to safely transport used nuclear fuel to the deep geological repository, as well as the [transportation planning framework](#), which describes peoples' values, objectives and priorities associated with the safe transportation of used nuclear fuel.

Transportation planning and evaluations will fully address regulatory requirements for safely transporting used nuclear fuel through different provinces. Site-specific technical and social engagement planning activities will continue after site selection in 2024. We plan to start transporting used fuel to the deep geological repository site in the 2040s, once the repository is operational.

In addition to the technical requirements, social considerations are important to our planning process. We understand that the transportation of used nuclear fuel is an important topic to Canadians and Indigenous peoples, and we are taking a collaborative approach that includes shared decision-making. More specifically, we have designed an iterative approach to transportation planning that will incorporate future generations' inputs into the planning process, acknowledging the importance of seven generations in Indigenous worldview.

The framework will be updated and reissued every three years. As identified earlier, it is our responsibility to ensure that people with a broad range of interests are included in our planning discussions and that we address their questions and concerns.

As part of the site selection process, an acceptable transportation route must have the potential to be developed. The NWMO continues to conduct technical assessments to help define potential routes.

We have heard many questions about safety over the past year and have begun several work programs to address concerns people have expressed:

- **Safety risk assessment** looks at national and provincial accident data. The objective is to understand the causes, patterns and trends associated with conventional, dangerous goods and used fuel accident data so that we can identify ways to prevent and mitigate accidents in our current and future planning. This program will also consider safety from a social perspective;
- **Transportation package performance review** provides insight into key aspects of the regulations governing transport of radioactive materials and how those aspects are designed to prevent radiological consequences of transport accidents; and
- **Emergency Response Framework** outlines emergency response requirements and best practices for transportation of used nuclear fuel.

In the period from 2023 to 2027, the NWMO will also:

- Continue transportation planning that is reflective of citizens' values, principles and objectives, including an emphasis on safety from a social perspective;
- Undertake transportation logistics studies and risk assessments;
- Seek from the Canadian Nuclear Safety Commission design approval certificates for road and rail transport packages as appropriate;
- Research and establish key requirements for emergency management and transportation security for future planning purposes;
- Continue to expand engagement to include municipalities and Indigenous communities along potential transportation routes, as well as interested individuals and groups; and
- 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.

Developing a Canadian Integrated Strategy for Radioactive Waste

In 2020, the NWMO was asked by the Minister of Natural Resources to lead the development of an [Integrated Strategy for Radioactive Waste](#) (ISRW) to ensure that all Canada's radioactive waste has long-term management approaches.

A team from the NWMO led the strategy development, in part to leverage our 20 years of recognized expertise in the engagement of Canadians and Indigenous peoples on plans for the safe, long-term management of used nuclear fuel. The focus of this work is on low- and intermediate-level waste for which there are no long-term plans in place.

All Canada's radioactive waste is safely managed today in interim storage. An integrated strategy will ensure these materials continue to be managed in accordance with international best practices over the long term. Building on previous work, this strategy represents a next step to identify and address any gaps in radioactive waste management planning, while looking further into the future.

Through the engagement process, we heard from communities across Canada, Indigenous peoples, youth, academics, civil society organizations and technical experts to help inform practical recommendations to the Government of Canada on a more comprehensive radioactive waste management strategy.

Following the engagement process reflecting on the values and interests of the public, a draft strategy was released in summer 2022 for public comment. This strategy has been informed by what we heard from Canadians and Indigenous peoples who participated in surveys or in one of more than 70 engagement sessions since March 2021. Canadians and Indigenous peoples were able to share their perspectives on the draft strategy via the [website](#) and email.

These perspectives are currently being reviewed to further inform the final ISRW recommendations. The strategy and recommendations will only be issued after an updated policy release by Natural Resources Canada (NRCan), which is expected in the first quarter of 2023, to ensure we are consistent with the updated policy.

If the ISRW recommendations are accepted by NRCan, the NWMO would be responsible for the planning and management of intermediate-level waste. We would then develop a detailed plan on how best to integrate this work into our existing program for the safe, long-term management of intermediate-level waste. We are anticipating that NRCan will make this decision in 2023.

Sound governance and accountability

The NWMO maintains an accountable governance structure intended to provide 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 *Nuclear Fuel Waste Act (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 member organizations 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 appoint 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, law, sustainable development, Indigenous relations, Indigenous Knowledge and community-based research. Members of the council are knowledgeable in a range of topics, including nuclear waste management issues, and experienced in working with citizens and communities on a range of public policy issues.

Council of Knowledge Holders (formerly the Council of Elders and Youth)

The [Council of Knowledge Holders](#) 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 align with Indigenous Knowledge in implementing the Adaptive Phased Management project. Additionally, 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 uses an integrated management system for activities supporting the safe, long-term management of used nuclear fuel. The NWMO maintains our management system to be compliant with Canadian and international standards for quality, environment, and health and safety.

The NWMO management system also satisfies the CSA N286-12, *Management System Requirements for Nuclear Facilities*, which includes nuclear waste facilities and builds on international standards.

The NWMO's integrated management system ensures the organization has a strong foundation for implementing our mission and values. The focus on protecting people and the environment for generations to come fully aligns with the CSA N286-12 management principle that safety is the paramount consideration guiding our decisions and actions.

Independent reviews

Consistent with recommendations from 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 reviews are increasingly focused on specific design aspects and features. These reviews ensure the science is sound, contribute to the design and overall program quality, and help enhance public confidence in the NWMO's implementation plan and decision-making. A number of external committees have been established to review the NWMO's work:

- Municipal Forum;
- Geoscience Review Group;
- Environmental Review Group; and
- Site Selection Review Group.

In addition to these formal peer-review groups, the NWMO has also created advisory groups and community forums on an as-needed basis to receive external input, guidance and expertise for the project. Peer review is also often incorporated directly in third-party technical work scopes and managed as part of the contracted work. Independent review is further achieved by regularly publishing technical research and results in scientific journals and at conferences.

Reporting

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

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

Transparency

The NWMO is committed to being open and transparent in our processes, communications and decision-making, so that the approach we are implementing is clear to Canadians and Indigenous peoples. To demonstrate this commitment, we maintain a [Transparency Policy](#) (2020). Sharing information and encouraging an exchange of perspectives are fundamental to our mandate, and we strive to ensure our practices are aligned with the spirit of the NWMO [Reconciliation Policy](#) (2019), as well as all relevant freedom of information, access to information and privacy legislation.

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 people and the environment for generations to come. 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 (a corrosion-resistant 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 not included in the implementation plan as used fuel will remain at interim storage facilities until the repository is operational.

Retrievability is the ability to remove the used nuclear fuel from where it has been placed. Retrievability is an important component of Adaptive Phased Management and was included on the direction of Canadians and Indigenous peoples. 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 the project, 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 people and the environment from the harmful or dangerous effects of used nuclear fuel, now and in the future.

Small modular reactors (SMRs) provide an alternative to large-scale nuclear reactors. SMRs can be purchased and constructed in a modular way. The NWMO would be responsible for the long-term management of used nuclear fuel created through new or emerging technology such as SMRs, if it is implemented in Canada.

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

Willingness is fundamental to the siting process. From the very beginning, the NWMO outlined a number of principles regarding willingness. These include a commitment to only site the project in an area with informed and willing hosts, time and resources for communities to learn about the project before making a decision, and a compelling demonstration of community willingness.

Beyond the demonstration from the communities, the NWMO also needs to ensure the other requirements and commitments outlined in the siting process can be met in order to implement the project in an area.

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

What we heard

In March 2022, the NWMO published *Implementing Adaptive Phased Management 2022 to 2026*, updating the previous five-year version of this annually updated plan. By also publishing our survey about the implementation plan digitally, we have made it easier for the public to review and comment on Canada's plan, supporting our commitment to transparency. We heard from hundreds of individuals from the two remaining siting areas, as well as Canadians and Indigenous peoples living outside those areas.

However, this document and the survey about it is only one way that we gather input that informs our work. The NWMO also solicits feedback through activities such as on-the-ground and digital engagement efforts, community liaison committees, educational events, advisory groups, publishing in peer-reviewed journals, attending conferences and meeting with all levels of government representatives.

The survey offers a snapshot of respondents' thinking and provides insight into confidence in our ability to implement Canada's plan, as well as identifying areas of opportunity for the NWMO. The survey was designed to solicit broad feedback from interested individuals, and it was disseminated through social media and other digital channels. As the survey was open to all interested parties, the results should not be viewed as statistically reliable. Instead, these results should be interpreted as qualitative and indicative of broader trends.

Overall participation numbers in 2022 were slightly greater than in 2021. We received 757 partial and completed surveys in 2022, versus 729 partial and completed surveys in 2021. However, we noted an imbalance in responses across regions, with more than twice as many responses coming from southern Ontario than northwestern Ontario (191 and 86 respectively). In response to this imbalance, we will step up efforts to promote the survey for the 2023-27 implementation plan in northwestern Ontario, by increasing public engagement on its promotion and using targeted digital communications.

This type of public input informs and guides our work, and comments received have helped us update this plan year after year. This is a summary of what we heard.

Confidence in the NWMO

Overall, more than half of respondents said they were “confident” or “very confident” in the NWMO after reading the plan. A strong majority said they found the NWMO plan understandable, clear and transparent. On the other hand, less than a third of respondents found the plan unclear, too technical or not understandable.

Overall, perceptions of the NWMO were more positive in southern Ontario than in northwestern Ontario. On the question of whether they had confidence in Canada’s plan, more than three-quarters of respondents in southern Ontario said they were confident, compared to just over half in northwestern Ontario.

This regional difference prompted the NWMO to consider how we are communicating with people living in each area. In 2022, the NWMO continued ongoing communications efforts, as we sought to diversify and extend our outreach to Canadians and Indigenous peoples across the country, and also targeted outreach within the two remaining potential siting regions. The NWMO launched campaigns to share fact-based information regarding the technical aspects of Canada’s plan, our commitment to water stewardship, as well as the tangible benefits associated with hosting the repository.

As part of our ongoing communications efforts, we will continue to diversify and extend our outreach through the revamped NWMO office in the Wabigoon Lake Ojibway Nation-Ignace area and more visits from our Mobile Learn More Centre, our rolling exhibit designed to travel across the country to share Canada’s plan. In 2022, we increased both the length of time our Mobile Learn More Centre was on the road visiting communities and the number of stops we made, with a total of 61 events compared to 48 in 2021. We also opened new offices in Dryden and Teeswater and renovated our existing Teeswater office to support engagement efforts in the siting areas.

Reconciliation

As in years past, the majority of respondents told us they share Reconciliation as a priority, and they want us to communicate more about the steps in our Reconciliation journey.

Our commitment has always been to publicly report our progress on Reconciliation. In 2022, we reached an important milestone in our ongoing Reconciliation journey. Our first [Reconciliation Report \(2021\)](#) was published, providing an evaluation of the NWMO's [Reconciliation Policy](#)'s impacts since its formalization in 2019. Activities tracked have included mandatory staff Reconciliation training and continuous learning opportunities, informal training opportunities, staff support systems and community-driven work plans.

We are committed to an ongoing Reconciliation journey. The NWMO was one of the first North American organizations with a formal Reconciliation policy, aligning with other corporations that are dedicated to taking concrete action in terms of meeting the Truth and Reconciliation Commission's calls to action (released in 2015). We are committed to contribute to Reconciliation in all our work by co-creating a shared future built on rights, equity and well-being.

Again this year, we heard Indigenous peoples must be engaged in the work we are doing to implement Canada's plan. We know, however, engagement is not enough. Working with Indigenous peoples, learning from Indigenous Knowledge and applying learnings to our work are critical to successfully implementing the safe, long-term management of used nuclear fuel. These are serious commitments and important values in our organization.

Transportation

Several comments expressed concern about the safety of transporting used nuclear fuel or the outright belief that transportation is dangerous. Some respondents, particularly those in northwestern Ontario, said they were worried about the possibility of traffic collisions and inadequate transportation infrastructure in the community selected.

Used nuclear fuel will need to be moved from interim storage facilities near reactor sites across Canada to the deep geological repository site. The transportation approach of Canada's plan will be subject to ongoing review and public reporting, with the transportation program expected to begin in the 2040s, once the repository is operational.

The NWMO released two planning documents in the last year addressing the wide range of priorities, questions and concerns heard to date from Canadians and Indigenous peoples about the transportation of used nuclear fuel. The [transportation planning framework](#) and the [Preliminary transportation plan](#) were designed to give clarity and advance conversations about how we plan to safely transport used nuclear fuel.

The NWMO's transportation approach will continue to undergo review and public reporting. Every three years, the transportation planning framework will be reviewed and revised as necessary. This will take into consideration factors such as evolving best practice, new technologies, ongoing adaptation and continuous improvement.

Safety

When asked “what priorities are most important to you?”, safety remained in the top spot. It was identified by 42 per cent of survey respondents as their most important priority, with a further 32 per cent ranking it as their second highest. Protecting people and the environment for generations to come underscores everything we do and every decision we make as we work to implement Canada’s plan.

We are constantly testing and evaluating our design and assumptions. In June 2022, we published the [Confidence in Safety](#) reports for each potential site. These reports reflect years of research and fieldwork. They provide detailed results that show why we are confident that both siting areas, where communities are considering hosting the project, are suitable for the safe, long-term management of used nuclear fuel.

The lifting of pandemic restrictions this year allowed the NWMO to get specialists back into communities. When it was safe to do so, we were able to engage directly with residents, giving them an opportunity to address questions and concerns. Through our campaigns and our people, we also increased our communications around safety-related topics.

We are also committed to ensuring the project is safe from a social and cultural perspective. We support this commitment by listening to the feedback we receive at the societal, community and personal levels and adjusting our work accordingly. That is also why all our work is supported by the wisdom of our Council of Knowledge Holders. This independent advisory body is comprised of Indigenous Elders and youth that help shape the NWMO’s work by guiding us on how to respectfully align with Indigenous Knowledge, inspiring new outlooks and perspectives, and helping our organization walk a path towards Reconciliation.

Trust in engineering

This year's survey showed most respondents understand and feel positive about the NWMO's engineering, ranking it as the highest understood priority. Specifically, 86 per cent of respondents said they understand this priority, and 75 per cent expressed a positive or neutral sentiment about it. The NWMO's geotechnical expertise and robust engineering approach and Canada's engineering leadership were cited in respondents' comments as some of the reasons for their confidence and positive sentiments.

As of 2022, the NWMO has successfully completed the full-scale demonstration of the engineered barriers that will safely contain and isolate Canada's used nuclear fuel in a deep geological repository. This important safety and technical achievement was the culmination of more than eight years of preparation, including the design and fabrication of specialized prototype equipment and components by the NWMO's team of leading technical specialists and engineering partners.

Canada's use of a deep geological repository is consistent with international best practice. This approach is the culmination of more than 30 years of research, development and demonstration of technologies and techniques. There is also consensus among major nuclear regulatory and monitoring organizations that deep geological repositories are the responsible way forward.

Share your thoughts

Your feedback is essential to the implementation of Canada's plan for the safe, long-term management of used nuclear fuel.

Take the
implementation
plan survey



Every year, we ask Canadians and Indigenous peoples for their input on our implementation plan to inform and guide our work. We then take that feedback into account in our planning activities, and in each year's implementation plan, we report on what we heard from the public about the previous year's plan. We invite you to share your thoughts until June 9, 2023.

Other ways to provide feedback (you may indicate that you wish for your response to remain anonymous):

- Email us at learnmore@nwmo.ca
- Send us a letter (with your name and mailing address) to:

Lisa Frizzell
Vice-President of Communications, NWMO
RE: Implementation Plan 2023-27
22 St. Clair Avenue East, Fourth Floor
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