A NEXT STEP

Part of Canada's Radioactive Waste Review

Draft Integrated Strategy for Radioactive Waste (ISRW)

-DRAFT FOR PUBLIC COMMENT-

DATE:

August 25, 2022 (REV 1)

Comments and Ideas Submission Process

Interested individuals and groups are invited to submit their comments and ideas about the recommendations captured in this document: Draft Integrated Strategy for Radioactive Waste (ISRW).

The process of submission is open to all Canadians and Indigenous peoples, and can be made as an individual or on behalf of an organization.

Submissions are accepted through the ISRW website (https://radwasteplanning.ca) as well as by email (info@radwasteplanning.ca) between August 25, 2022 and ~~October~~ November 24, 2022 (~~60~~ 90 day period).

Please note that information provided by external sources will be published in accordance with our Community guidelines and privacy policy.

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Executive Summary

In the fall of 2020, the Minister of Natural Resources Canada tasked the Nuclear Waste Management Organization (NWMO) with leading an engagement process with Canadians and Indigenous peoples to inform the development of an integrated long-term management strategy for all of Canada's radioactive waste, in particular low- and intermediate-level waste, as part of the government's radioactive waste management policy review. The NWMO was asked to lead this work because it has 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 intent of the Integrated Strategy for Radioactive Waste (ISRW) was to identify next steps to address gaps in Canada's current radioactive waste management strategy and to look further into the future (radwasteplanning.ca). The Integrated Strategy should build on the plan developed by NWMO for the long-term management of Canada's nuclear fuel waste. It should include:

- Taking stock and describing the current waste management situation in Canada in terms of current and future volumes, characteristics, locations, and ownership of the waste;
- Updating on current plans and progress in advancing long-term management and disposal solutions for Canada's wastes as well as identifying the gaps that must be addressed;
- Providing conceptual approaches for dealing with those wastes for which no long-term plan exists, including technical options for long-term management or disposal, and options for the number of long-term waste management facilities in Canada; and
- Making recommendations about the staging, integration, establishment, and operation of long-term waste management facilities.

This report presents this draft Strategy and solicits feedback on the recommendations that it contains. The comment period for this report will conclude on October 24, 2022, 60 days from the date of publication. Comments received will then be reviewed and considered to inform the final ISRW recommendations. The final report will only be submitted to the Minister of Natural Resources Canada following the publication of the revised *Policy for Radioactive Waste Management and Decommissioning*, which at the time of writing is expected in the last quarter of 2022, to ensure the final recommendations align with and support the policy.

Technical options and inventories

In 2020, the NWMO began its work by undertaking an international benchmarking study of the best practices used for radioactive waste management of low and intermediate-level radioactive waste. Based on this work, six (6) potential options for the long-term management of Canada's low- and intermediate-level waste were identified by the NWMO:

- Engineered Containment Mound
- Concrete Vault
- Shallow Rock Cavern
- Deep Geological Repository
- Deep Borehole
- Rolling Stewardship

Following the benchmarking study, the NWMO commissioned a preliminary technical assessment of the six potential options. A summary level of detail was gathered about the current and projected future inventories from the current Canadian waste owners to identify existing and future Canadian low- and intermediate-level waste that have no current long-term management plans totalling approximately 294,000 m^3 of low-level waste (LLW), 51,000 m^3 of intermediate-level waste (ILW) and less than 10 m^3 of high-level waste (HLW). The options were assessed from a technical perspective against the characteristics of the current and projected inventories of low- and intermediate-level waste.

Volume of radioactive waste with no long-term management plan

LLW: 294,000 m^3

ILW: 51,000 m^3

HLW: less than 10 m^3

The Engineered Containment Mound was determined to be the most suitable option for bulk low-level waste such as soils and demolished concrete, given the low concentrations of radionuclides and the large volume of waste. It could also potentially accommodate other low-level waste with further assessment. The Concrete Vault and Shallow Rock Cavern were considered the most suitable options for non-bulk low-level waste, given the increased containment and structural integrity offered (concrete barrier or rock mass) compared to the Engineered Containment Mound. These long-term management options may also be suitable for bulk low-level waste.

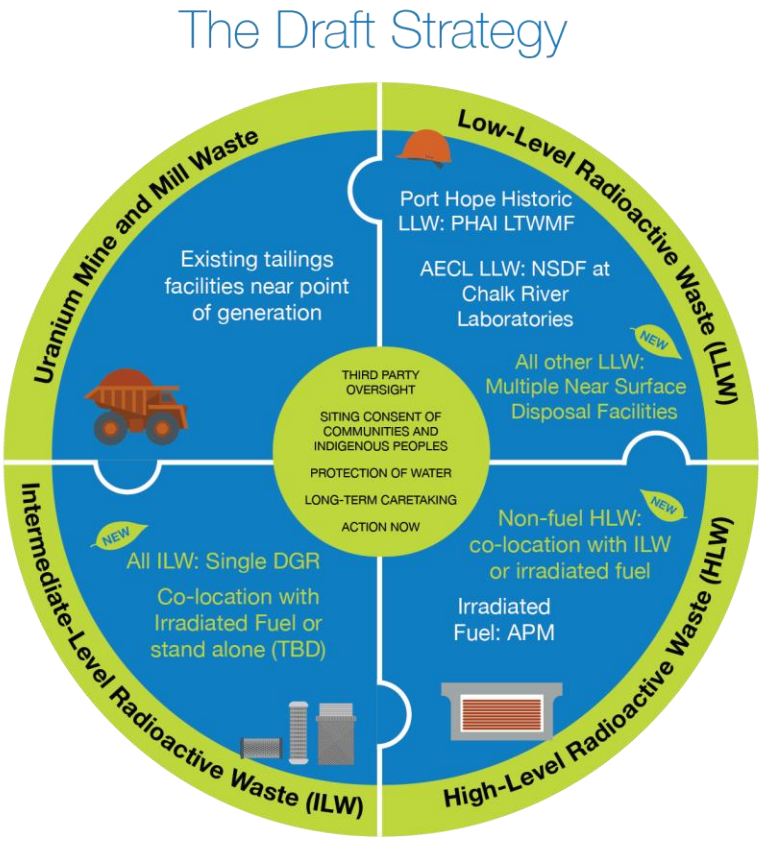
The Deep Geological Repository emerged as the most suitable option for all intermediate-level waste. Additionally, the co-disposal of non-bulk low-level waste was considered as an alternative. Deep Boreholes are considered an alternative long-term management option for small dimensional intermediate-level waste such as disused sealed sources and spent ion exchange resins.

The Draft Integrated Strategy

With extensive input from waste producers and owners, government, Indigenous peoples, and interested Canadians, the NWMO focused on identifying gaps in current plans for the long-term management for radioactive waste and providing technical options to address these gaps. The resulting recommendations consider options for the number of long-term waste management facilities in Canada, as well as for the staging, integration, siting, establishment and operation of these facilities for all of the radioactive waste in Canada, regardless of how it was generated. This draft strategy represents a next step and is a result of what we have heard from Canadians and Indigenous people. It is not intended to replace other projects currently in progress but rather includes these plans.

Table 1: Draft Integrated Strategy for Radioactive Waste

Waste Type		Long-Term Plan	Responsibility for Implementation	Status
Uranium Mine and Mill Waste		Tailings Facilities near point of generation	Uranium Mining Companies	Existing Facilities
Low Level Waste (LLW)	Port Hope Historic low-level radioactive waste	Port Hope Area Initiative Long-Term Waste Management Facility (PHAI LTWMF)	Canadian Nuclear Laboratories (CNL)	Existing Facilities
	Low-level waste owned by Atomic Energy of Canada Limited (AECL)	Near Surface Disposal Facility (NSDF) at Chalk River Laboratories	Atomic Energy of Canada Limited	Ongoing project (under regulatory review)
	All other low-level waste –	Multiple near surface disposal facilities	Waste owners	New project recommended as part of ISRW
Intermediate Level Waste (ILW)		Single Deep Geological Repository (DGR) – colocation with irradiated fuel or stand alone to be determined	Nuclear Waste Management Organization (NWMO)	New project recommended as part of ISRW
High-Level Waste (HLW)	Irradiated Fuel	Adaptive Phased Management (APM) Deep Geological Repository (DGR)	Nuclear Waste Management Organization	Ongoing project (in site selection)



The process that was followed, the work that was completed and the input received in developing this draft are outlined in this report.

Proposed Recommendations for the Implementation of the Strategy

The following recommendations consider the inputs obtained from international benchmarking, stock taking, technical and cost estimate assessments, and public and Indigenous engagement. These recommendations address the existing gaps in Canada's long-term management of radioactive waste. These recommendations when taken along with the existing ce projects in operation or undergoing regulatory assessments at the time of writing form a complete strategy to address all existing and future waste in Canada.

Recommendation 1: Low-level waste should be disposed of in multiple near-surface facilities with implementation resting with the waste owners

Disposal of low-level waste aligns with international best practices and was preferred by the majority of participants.

From a technical, financial and societal perspective, near-surface disposal is the best option to contain the waste until it no longer poses a hazard.

The Concrete Vault options is the recommended technical approaches to address all the low-level waste. The Engineered Containment Mound was the option most often preferred from a societal and financial perspective, but it is only suitable for 6% of the inventory based on preliminary technical assessments.

From a societal point of view, multiple facilities located in willing host communities were preferred given the large volumes of waste and transportation considerations. Centralization does garner significant support as well and, financially, economies of scale may favour centralization. Further detailed analysis, including the cost of transportation, is needed. The concept of regional facilities should be further explored.

DID YOU KNOW:

Low level radioactive waste (LLW) comes from operating reactors and from medical, academic, industrial, and other commercial uses of radioactive materials.

LLW contains material with radionuclide content above established clearance levels and exemption quantities (set out in the Nuclear Substances and Radiation Devices Regulations), but generally has limited amounts of long-lived activity.

LLW requires isolation and containment for periods of up to a few hundred years. An engineered near surface disposal facility is typically appropriate for LLW.

Recommendation 2: Intermediate-level waste should be disposed of in a single deep geological repository with implementation by a single organization, the NWMO

Disposal of intermediate-level waste aligns with international best practices and was preferred by the majority of participants.

From a technical and societal point of view, disposal in a deep geological repository is the best option to isolate the waste from the environment. This approach would also be able to accommodate non-fuel high-level waste.

We heard from participants that having one central place in the country for intermediate level waste would be preferable to several regional facilities. From a societal perspective, co-location with irradiated fuel has the same level of support as a separate deep geological repository for intermediate-level waste. From a financial perspective, co-location is the most economical option.

We heard from participants support for the NWMO to be the organization to implement the solution for intermediate-level waste.

Recommendation 3: A third-party, independent of the implementing organizations, should oversee the implementation of the strategy

In the development of the ISRW, there was also considerable support expressed for independent oversight of the implementation of the strategy for radioactive waste, as well as for the greater ongoing involvement of interested parties throughout the lifecycle of the facilities. Waste owners would retain responsibility for funding, planning, development and operation of their radioactive waste disposal sites.

Natural Resources Canada should consider an appropriate oversight model that is independent of the implementing organizations. This oversight should consider how to incorporate the input or involvement of interested parties such as Indigenous peoples and civil society.

Recommendation 4: Consent of the local communities and Indigenous peoples in whose territory future facilities will be planned must be obtained in siting

This consideration was prioritized by the majority of contributors. It is also aligned with the objectives of Canada's draft Radioactive Waste Policy, in relation to the implementation of United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).

Recommendation 5: Design of facilities should prioritize the protection of water

While safety can be demonstrated from a technical standpoint regardless of location, it may be difficult to obtain societal support for facilities located in close proximity to major sources of drinking water. This was a priority for most participants who felt strongly that waste disposal sites should not be built near sources of drinking water as they felt these could contaminate it and affect their way of life.

While participants indicated that facilities should be located away from any major water sources, the reality of the Canadian landscape is that this would not be feasible. Protection of water is paramount, and therefore any disposal facilities must meet the highest standards of environmental and water protection

Recommendation 6: Long-term caretaking should be established for disposal facilities

There should be oversight of the waste and of the facilities for as long as future generations deem it to be necessary to ensure that the environment remains protected. This concept also includes the transfer of knowledge of the waste and where it is located with future generations and periodic review of the monitoring plans, to determine whether they continue to be adequate or necessary.

Recommendation 7: We need to take action now and not defer to future generations

There is a need for an integrated strategy, and the approach to the long-term management of low-level and intermediate-level waste should be determined with a sense of urgency rather than leaving this to future generations. This will require on-going commitment and support from government, with a structure that will be empowered to deliver on the implementation of the strategy regardless of changes in power.

Additional Recommendations Outside of the Scope of the ISRW

The ISRW did not consider options for additional waste processing, including volume reduction, beyond those planned and quantified by the waste owner. Subject to future study, the Integrated Strategy for Radioactive Waste may benefit from a holistic approach to waste processing upstream from disposal. Furthermore, an integrated approach may open avenues of waste processing resulting from economies of scale for waste processing options that have not yet been accessible for smaller waste owners.

Engagement

In 2021, the NWMO began engaging with Canadians and Indigenous peoples, conducting public opinion research, hosting a Summit to hear from diverse voices, listening to citizens in a series of engagement sessions in communities where waste is stored today, hosting Roundtable discussions, and Technical Workshops. In total, the NWMO engaged in over 70 activities offered in a variety of formats over a period of 18 months from January 2021 to June 2022, with a total of nearly 4000 participants. The following summarizes the key themes that emerged during this engagement.

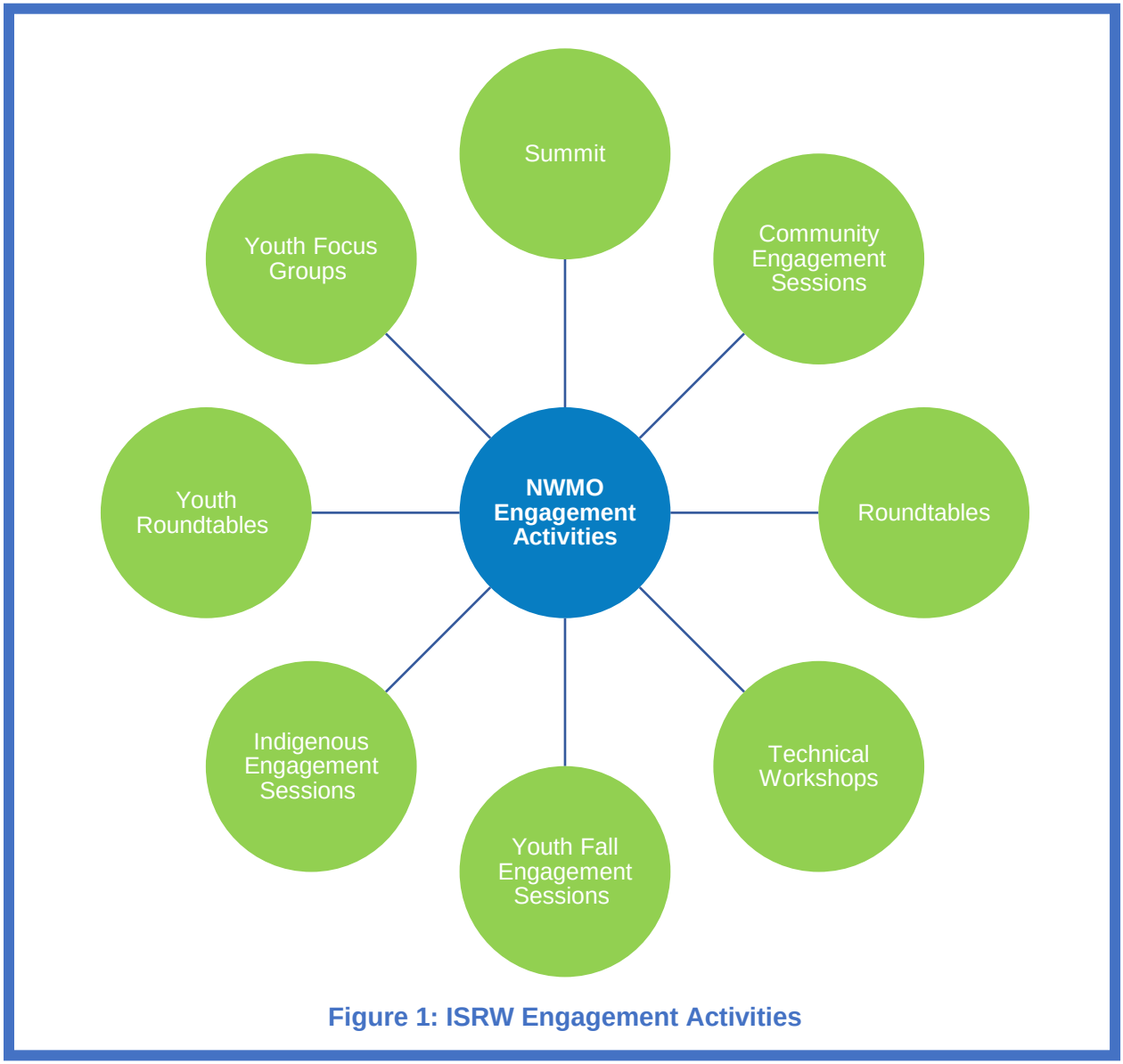


Figure 1: ISRW Engagement Activities

Key Theme 1 – Safety is Paramount

The most prominent theme that emerged throughout the engagement was the importance of safety in every aspect of the development and implementation of the Integrated Strategy for Radioactive Waste. Participants prioritized safety over cost efficiency. As a key priority, safety should be considered through a long-term lens so that the strategy is able to respond to future risks and ensure safety in unpredictable and potentially unstable future conditions in the environment, government, and technology.

Key Theme 2 – The Time to Act is Now

There is a need for an integrated strategy, and the approach to the long-term management of low-level and intermediate-level waste should be determined. There was general agreement that it was the right thing to do to have and to implement a plan for all of Canada's radioactive waste, and to do so with a sense of urgency rather than leaving this to future generations.

Key Theme 3 – Communication and Transparency

Participants were adamant that clear, fact-based, inclusive communication that provides context in a relevant, accessible and an unbiased way is essential. Transparency, including clear, open and ongoing communication about decisions and processes, is very important. Transparency about the waste and any potential risks associated with it is also needed, as is effective communication providing context when necessary. Some participants expressed the importance of having more visibility of waste inventories, as they exist today, and what could be expected in the future.

Key Theme 4 – Trust and Relationships with Indigenous Communities

Meaningful engagement and ongoing relationship building with Indigenous communities must be central to developing and implementing the plan. Listening to Indigenous peoples is important to restore trust, bridge relationships and affirm the importance of reconciliation. Ensuring that Indigenous Knowledge was incorporated along with western science was also identified as important to a strategy that would address the far future, as well as more immediate considerations. Participants wanted the strategy to reflect Indigenous communities' right to Free Prior and Informed Consent and to avoid exploitative practices with respect to Indigenous involvement.

Key Theme 5 – Education and Engagement

Full engagement is required to achieve real buy-in for a strategy that will work for people in Canada and the importance of youth engagement was emphasized. Education is vital to enable potentially impacted people and communities to be appropriately informed and needs to be further integrated into discussions to help Canadians and Indigenous peoples understand the unique challenges posed by radioactive waste, and how safety is assured. Learning from science-based best practices internationally was also identified as an important pathway to ensuring both public safety and cost effectiveness, which are both important, now and in the long-term. Youth saw a need for an intergenerational education strategy to cultivate a sense of responsibility for the long-term strategy implementation among young people.

Key Theme 6 – Sustainability and the Environment

In addition to the safety of the community and its residents, minimizing the carbon footprint and protecting the environment, in particular water, over the long-term were important. Participants shared that we needed to be mindful of the climate emergency to ensure that every aspect of this strategy is sustainable, considers the risks posed by climate change, respects the environment, and protects water sources for all future generations. The goal of minimizing environmental impacts should be viewed through a lifecycle approach and include the construction of facilities and transportation of radioactive waste. Youth participants were acutely aware of the history of environmental racism especially towards Indigenous communities. They saw environmental justice as a key consideration when discussing how many facilities to build and where.

Key Theme 7 – Transportation

Transportation is a particularly important aspect of the long-term plan. People had many questions about the risks associated with transportation, and the consequences of transportation accidents on the safety of the radioactive waste being transported and generally preferred to minimize the transportation of radioactive waste, to reduce any associated risks. Other concerns around transportation included cost, potential increase of greenhouse gas emissions and potential environmental impacts from building new access roads. Participant views on the relative risks of transportation influenced their views on having one central repository for low-level waste and for intermediate-level waste or having multiple disposal facilities closer to where the waste is produced.

Key Theme 8 – Shared Responsibility Framework / Independence of Accountable Entity

There were varying perspectives regarding who should be responsible for the oversight of the strategy. There were differences of opinion about the role of industry, but there was general agreement that there should be a single entity with appropriate expertise that is independent from the implementers, subject to regulated safety and environmental oversight. The governance of such an entity was subject to different ideas, with some suggesting that the oversight governance should be comprised of industry, civil society organizations, and Indigenous peoples, and others focusing on ensuring the oversight remained independent and included the right expertise. There was broad support for the waste owners to pay for financing the strategy.

Key Theme 9 – Rolling Stewardship and Waste Disposal

A majority supported the idea of finding solutions to permanently dispose of the waste now, and not leaving the decision for future generations. Uncertainty about climate change, and whether changes to government or society in the long term could leave waste vulnerable under indefinite storage arrangements were some of the concerns that were cited. Participants wanted to see intermediate-level waste treated the same as high-level waste and disposed of in a deep geological repository. However, there were others that saw rolling stewardship as the preferred strategy, in particular for low-level waste, because of considerations such as potential future technology innovations, ensuring that the waste was not forgotten, and the ability to constantly monitor the waste to ensure that any environmental impacts could be identified and remediated before causing significant harm, especially to the water table.

Key Theme 10 – Co-location and Centralization

There was a range of responses from participants who felt minimizing the number of facilities could have advantages. Participants acknowledged the difficulty in finding willing and informed host communities, and obtaining the free, prior, and informed consent of Indigenous peoples made multiple sites more challenging. However, there were concerns about the impact of a single location on the transportation of waste. Some participants cautioned about the importance of ensuring appropriate technical arrangements for different waste types located in the same facility, while others noted the cost advantages of consolidating expertise and facilities in a single location.

The majority preferred using a centralized facility for intermediate level waste to enable greater control and oversight over the long lifespan of this waste, with potential cost and time savings. Centralizing intermediate-level waste was seen as preferable to limit potential risk exposure to one location instead of potentially endangering multiple ecological zones. The idea of co-location and centralization was more broadly supported for intermediate-level and high-level waste, than it was for low-level waste and intermediate-level waste. The volumes of low-level waste are greater, and participants generally felt that leaving it nearer to the sites where it was generated or stored, rather than transporting it vast distances, was preferable. Regardless of the option preferred, community willingness was identified as a pillar for any disposal facility.

Key Theme 11 – A Strategy by and for Canadians and Indigenous peoples

Overall, across sessions, it was clear participants want this to be a strategy created by and for Canadians and Indigenous peoples and that this is key to have buy-in. An inclusive strategy is a reflective strategy. In addition, the ISRW should consider the unique conditions and environment of Canada including the size of the country, the diversity of Canadians and the changing climate.