A NEXT STEP
Part of Canada's Radioactive Waste Review

Integrated Strategy on Radioactive Waste

What We Heard Report (5)

Technical Workshops
Held between September 21st, 2021 & October 6th, 2021

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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 (radwasteplanning.ca), as part of the government's radioactive waste management policy review.

The NWMO was asked to lead this work because it has close to 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 Integrated Strategy for Radioactive Waste (ISRW) is distinct from the work that the NWMO is leading on the deep geological repository for used nuclear fuel, which will continue as planned.

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, and hosting roundtable discussions and technical workshops. This report summarizes what we heard from our virtual technical workshops which took place in September and October 2021.

The intent of the ISRW is to identify next steps to address gaps in Canada's current radioactive waste management strategy, for low- and intermediate-level radioactive waste, and to look further into the future. We stipulated at the start of each session that our focus is on engagement, information sharing and gathering, not consultation.

Through these technical workshops, we engaged with interested Canadians and Indigenous peoples, both technical experts and laypersons. Prior to the workshops, registrants were encouraged to read the full technical options report or the technical options report – layperson summary. We then invited participants to discuss the report and its assessment of technical options for the storage of Canada's low- and intermediate-level waste. Multiple individual sessions for low- and intermediate-level waste were held at both the expert and layperson level, offering several opportunities for attendees to participate, give feedback and ask questions.

Refer to **Appendix A – Technical Workshop Sessions** for the dates and audiences for the technical workshops, and to **Appendix B – Promotion of Technical Workshops** for more details on how the technical workshop activities were promoted to invite layperson and expert participation.

This What We Heard Report presents the feedback that was collected over the course of six technical workshops. This report includes a summary of the key themes, as well as individual sections for specific discussion points that surfaced from the individual low- and intermediate-level waste sessions. It is not a reflection of each of the individual comments that were made.

During the sessions, participants were asked to comment on the report, and asked if the order of recommended options is prioritized in the way they felt it should. Participants were encouraged to focus on the technical options in isolation of other factors that will come into the final strategy recommendations. Overall, we heard there was general support for the order of the options. Participants also suggested that further assessment may be required in future phases of analysis.

The ranked order of technical options presented to participants of the technical workshops for consideration was as follows:

Ranked Order – Low Level Waste

1. Engineered Containment Mound
2. Concrete Vault (tied for 2nd place)
3. Shallow Rock Cavern (tied for 2nd place)
4. Deep Geological Repository
5. Rolling Stewardship (not a disposal option)

Ranked Order – Intermediate-Level Waste

1. Deep Geological Repository
2. Deep Borehole (an option limited by the packaged size of the waste)

It should be noted that the recommended technical options and their ranked order, as presented in the technical options report or the technical options report – layperson summary, do not represent the final ISRW recommendations

Input from our engagement efforts will be considered in the drafting of the overall recommendations for the ISRW. This strategy will be based on public input, Indigenous Knowledge, international scientific consensus, and best practices from around the world.

Draft recommendations will be published later this year and will also be informed by the Government of Canada's revised radioactive waste management policy.

A consistent methodology was used to structure each of the Technical Workshops. Refer to **Appendix C – Methodology** for information on how we conducted the sessions. The general format was as follows:

- Separate workshops were held to address low- and intermediate-level waste.
- Separate workshops were offered to technical experts and laypersons, participants self-selected which option they preferred.
- Participants received a presentation on the topic by a NWMO representative.
- Participants had an opportunity to ask questions of clarification from the NWMO representative.
- Participants were guided through a series of questions by an independent bilingual facilitator to obtain their views on the topic of 'Does the order of recommendations for the storage of low- or intermediate-level waste stand?'
- The NWMO representative provided additional information on other engagement opportunities for the Integrated Strategy for Radioactive Waste and ended the session with thanks.

ISRW guiding principles were shared with participants as part of the presentation. Refer to **Appendix D – ISRW Guiding Principles** for the full text of the ISRW Guiding Principles.

What We Heard – Summary

This What We Heard section summarizes the discussions that emerged from all six workshops that were conducted in late September through October 2021.

The objective of the workshops was to determine the order of rankings of the technical options for disposal of low- and intermediate-level waste. The ranked order presented did not take into consideration that a combination of approaches may be used. Some participants questioned why In-situ decommissioning was not included as one of the possible options; under current regulatory context In-situ can only be considered for legacy situations and was therefore not suitable for the waste being addressed as part of these technical workshops.

Through the discussions, we found that a shortcoming of the report was that the ranked order is not definitive.

Through our engagement with laypeople and technical experts, we captured feedback on the ranked potential disposal options for low-level waste and for intermediate-level waste for which there are no current long-term management plans.

Materials related to the development of the Integrated Strategy for Radioactive Waste, and the various engagement activities, can be found on the RadWastePlanning website, including all materials used for these Technical Workshops.

The development of the strategy is grounded in a range of guiding principles and objectives as we explore key questions and issues discussed at our events. This Report details what we heard from participants who attended the Technical Workshops.

At A Glance – Key Themes from Technical Workshops

The key themes that emerged from the Technical Workshops are listed below and reflect what we heard from participants as they provided feedback, asked questions, conveyed concerns, and expressed how they felt on the long-term radioactive waste strategy.

Key Finding 1 – Safety is Paramount

Safety continues to be an important theme. Participants raised concerns about location, storage, containment, and transportation of the waste as key factors in the final decision.

We heard from participants, that in the future when any waste disposal project is undertaken, the design would need to be suitable for the location, waste volumes and waste characteristics, and meet regulatory requirements.

Key Finding 2 – Communication & Transparency

We heard that there seemed to be an abundance of technical discussions about waste, but not enough about the social or political aspects.

Some participants noted that the public is not typically engaged until a solution is presented in their community. They expressed a desire to be engaged early in the development of any plans.

Key Finding 3 – Education & Engagement

Some participants expressed that they did not have enough information to make adequate judgement as part of the discussion. This highlighted the need for further public education so that Canadians and Indigenous peoples understand the unique challenges posed by radioactive waste. Participants conveyed that they want to contribute to the strategy but need more information. Some felt that it was difficult to consider the technical options without also looking at cost, environmental and safety factors including waste descriptions and makeup, and the application of the waste hierarchy (what happens before storage including other uses).

Participants expressed that there was a lack of knowledge about nuclear waste and questioned whether NWMO will be taking stock of community understanding of the problems we are attempting to address because there is a lot of misinformation.

Key Finding 4 – Sustainability & the Environment

We heard a broad and repeated consensus from participants that waste minimization should be further pursued. We heard several questions about assumptions around the packaging of radioactive waste. Packaging considerations were seen to be a potential impediment to future waste disposal.

Some participants shared their lived experience and expressed concern about potential spills which should be considered in finalizing recommendations.

We heard from participants about the potential environmental impact of a deep geological repository, including habitat displacement during construction. Questions included whether there would be programs to support the wildlife in any potential siting location.

We also heard that our report was missing information about the potential impact of climate change.

Key Finding 5 – Transportation

We heard some concern about transportation costs and risk if there was only one or a few centralized storage facilities. Participants expressed that these considerations should be factored into the final recommendations.

Key Finding 6– Rolling Stewardship & Waste Disposal

We heard different views on Rolling Stewardship and waste disposal.

The majority of participants expressed support for disposal, rather than leaving the waste for future generations. We heard that the uncertainty associated with future climate impacts makes rolling stewardship a less acceptable solution. However, a considerable number of participants included a caveat which stressed the need for perpetual monitoring, for as long as the waste is hazardous. These participants noted the importance of having assurance that someone was overseeing the waste and keeping waste owners accountable.

We heard from most participants that intermediate-level waste should be disposed of in a deep geological repository.

Key Finding 7 – Co-location and Centralization

Participants indicated that the best option is deep-disposal of intermediate-level waste. Some of the participants expressed support for the longer-lived intermediate-level waste to be emplaced with the high-level waste.

The majority of participants believed that there were cost advantages to co-location including re-packaging, surveillance, and monitoring. Some participants identified potential concerns related to the characteristics of the waste, such as heat and gas generation that could impact the feasibility of co-locating intermediate- and high-level waste.

Some participants discussed co-locating low- and intermediate-level waste. However, most participants felt that when it comes to low-level waste, any disposal facility should be built separately from that for intermediate-level waste.

Conclusion

Focusing solely on the technical options for the long-term management of low- and intermediate-level waste, participants agreed with the order of recommended options as follows:

Ranked Order – Low Level Waste

1. Engineered Containment Mound
2. Concrete Vault (tied for 2nd place)
3. Shallow Rock Cavern (tied for 2nd place)
4. Deep Geological Repository
5. Rolling Stewardship (not a disposal option)

Ranked Order – Intermediate-Level Waste

1. Deep Geological Repository
2. Deep Borehole (an option limited by the packaged size of the waste)

Participants identified the importance of other decision factors such as safety, environment, transportation, and cost.

It was our intention to collect and present these views in a manner that reflects the voices of the people we engaged with and integrate this invaluable feedback as we proceed with recommending the next steps towards managing low- and intermediate-level waste in Canada for which there are currently no long-term plans.

This is an ongoing conversation, and inclusion is an essential aspect of our project as this will be a decision affecting future generations of Canadians and Indigenous peoples.

The NWMO's recommendations will also be informed by the revised policy on radioactive waste, which was published for public comment in February 2022.

Technical Workshops – What We Heard

The technical workshops were structured in a way to ensure participants were able to take part in open discussions, guided by an independent bilingual facilitator. The objective was to obtain feedback from participants on the ranked order of long-term management options described in the technical options report or the technical options report – layperson summary (Hereafter referred to as the technical options report). During each workshop, participants were given multiple opportunities to discuss the technical options, ask questions, and provide feedback. What we heard from participants was captured in the individual summaries for low- and intermediate-level waste below.

The facilitated discussion was structured in the same way for the low-level waste technical workshops, and for the intermediate-level waste technical workshops, for both laypeople and technical experts. The points of discussion were as follows:

1. With which aspects of the report do you agree?
2. With which aspects of the report do you disagree?
    a. Are there technical options that have been eliminated that should be brought back, and why?
3. What is missing from the report?
4. Based on the discussion, does the Order of Recommendations still stand?

The facilitator ensured that these points of discussion were addressed in each workshop for the assumptions defined in the technical options report, for the recommended options, and for any other aspects that participants wanted to address.

Assumptions – Technical Options Report

The technical options report included the following assumptions for low- and intermediate-level waste:

- All liquid waste were assumed to be solidified.
- Unless quantified by the waste owner, additional decontamination and volume reduction practices were not assumed in this study.
- Projected operational waste was assumed to be packaged in the same physical configuration as existing waste of the same source.
- All long-term management options can accept nuclear waste with non-nuclear hazardous properties.
- Waste owner inventory volumes have been rounded, given the level of uncertainty present at this time.

Low-Level Waste

The following ranked order of technical options for the low-level waste, arising from the analysis in the technical options report, was accepted by participants. We reiterated that these recommendations are only part of the considerations that will go into the final ISRW recommendations.

We heard agreement with the recommendations overall, after discussion and addressing questions about the technical options, upstream waste minimization, packaging, and the characterization of the waste.

Ranked Order – Low-level Waste Disposal Options

1. Engineered Containment Mound
2. Concrete Vault (tied for 2nd place)
3. Shallow Rock Cavern (tied for 2nd place)
4. Deep Geological Repository
5. Rolling Stewardship (not a disposal option)

Technical Workshop Discussion - Low-level Waste

It was noted that Rolling Stewardship was included in the technical options for low-level waste, but that this was not a disposal option. Some participants felt that the different types of low-level waste could be addressed by Rolling Stewardship but acknowledged that this would come with a significant cost. Some participants questioned whether rolling stewardship should still be considered, given uncertainty about the future.

We heard a range of questions from participants who wanted to know if there has been any consideration of low-level waste in the context of other waste. For example, what are the considerations for the management of low-level waste, if there is already a deep geological repository for high-level waste and intermediate-level waste. Participants were also curious about engineered containment mound initiatives, and what different types existed.

Some participants questioned the assumption that all the low-level waste is solid, and whether it is a realistic reflection given the actual make-up of the waste.

We also heard that the technical options report would benefit from additional information on disused sealed sources. There were also questions about the possibility of separating longer and shorter-lived low-level wastes from each other and addressing their disposal differently.

We also heard from participants who felt we need to dedicate more efforts to reduce the volume of low-level waste. Some participants noted that there is currently waste that is packaged where much of the material is not radioactive.

We heard concerns about the need to repackage the waste, and the consequent impact on overall volume. Participants had questions about how waste is packaged, and what types of containers are used.

We heard that determining a disposal strategy could enable waste owners to adopt ‘final’ packaging, suitable for the waste disposal method. This could minimize the handling of the waste.

Some participants sought clarification on the difference between Engineered Containment Mound (ECM) and Concrete Vault, as technical options low-level waste disposal. Others sought clarification on whether shallow rock caverns are excavated or natural. Some participants questioned whether existing mines could be used as shallow rock caverns.

We heard from some participants who supported exporting waste to other countries, for example where there are commercial arrangements for fuel waste to be sent back to origin or to repatriate industrial or medical sources that are sold from Canada.

We heard that some participants needed further clarification on the definition of low-level waste and the groupings that were used in the study. Some participants wanted to know more about the source the data in the technical report for information on waste storage locations, volumes, and percentages.
Some participants sought additional information about safety, for example, the safety case and whether there could be explosions, as well as the possibility of waste monitoring and reporting over a long period of time. Some wanted additional information on environmental risk and public health.

Some participants discussed co-locating low- and intermediate-level waste. Participants felt that when it comes to low-level waste, any disposal facility should be built separately from that for intermediate-level waste.

Intermediate-Level Waste

The following ranked order of technical options for the intermediate-level waste, arising from the analysis in the technical options report, was accepted by participants. We reiterated that these recommendations are only part of the considerations that will go into the final ISRW recommendations.

We heard agreement with the recommendations overall, after discussion and addressing questions about the technical options, upstream waste reduction, the characterization of the waste, and the cost implications.

Ranked Order – Intermediate-level Waste Disposal Options

1. Deep Geological Repository
2. Deep Borehole (an option limited by the packaged size of the waste)

Technical Workshop Discussion - Intermediate-level Waste

Some participants questioned whether the range of options presented was comprehensive. For example, questions were asked about why vitrification of intermediate-level-waste was not presented as one of the options available. We also heard from a small number of participants who were disappointed by the limited disposal options presented, and the “obvious” recommendations, in particular the deep geological repository.

Some participants identified concern with statements in the technical options report that identified certain technical options as "not suitable for the allocated waste group" because these statements were deemed to be too broad and did not allow for the performance based regulatory approach, which is based on demonstrating safety rather than prescribing allowable options. We heard a suggestion that these recommendations for technical options should not use words like 'unacceptable' or ‘not suitable’ and provide a means for other options to be used on a case-by-case basis to describe 'preferred' and 'not preferred' options rather than dismiss any approach outright. We heard from some participants that the ISRW should have sufficiently broad options, that met safety requirements, suitable to accommodate multiple waste types. In the case of in-situ disposal, we heard that the report should elaborate on the reasons for its exclusion from the options. In particular, some participants expressed that it should explicitly state that this option was excluded because

the totality of the ISRW inventory does not qualify for the application of this option in the Canadian context.

We heard that most participants agreed that a deep geological repository would be the most technically appropriate solution for intermediate-level waste; but there was also an acknowledgement there are multiple disposal options that might be applicable to the different varieties of waste and that perhaps a combination of options might be appropriate. Some participants thought both options – deep borehole and deep geological repository – were strong options.

Some participants questioned the anticipated environmental impact of a deep geological repository, including habitat displacement during construction and whether will be programs to support the wildlife in which ever area is chosen.

There were questions about deep boreholes, for example some participants wanted to know if a deep borehole would be deeper than a deep geological repository. Some participants had questions about packaging requirements for deep borehole disposal.

There were other questions about deep boreholes, including whether these would be located near or away from a deep geological repository for intermediate-level waste, and the impact on disposal costs and transportation. We also heard participants wanting to learn more about whether there was an advantage to processing low- or intermediate-level waste in small diameter cannisters. Some participants expressed interest in the potential costs of various options, and there was a perception that boreholes may be less expensive in the long term.

As part of the discussion on the suitability of the assumptions in the technical options report, some participants wanted to know if waste currently stored in drums was liquid or solid.

Although Rolling Stewardship is a storage rather than a disposal option, and the technical options report deemed it “not suitable for the allocated waste group” for intermediate-level waste, some participants favoured this option. We also heard some participants express that we should not think of disposal as being a ‘permanent’ solution because intermediate-level waste remains hazardous for a long time. We heard participants express the importance of being able to have ongoing monitoring of the waste, which rolling stewardship would enable. Other participants were less confident that rolling stewardship would be the right decision, or even a feasible option.

Some participants expressed that even if intermediate-level waste was disposed of in a deep geological repository, the repository should remain open and accessible to enable constant monitoring and intervention if warranted for safety and environmental reasons. Because of the very long nature of the hazard from intermediate level waste, some participants believed that rolling stewardship for 7000 generations, from generation to generation.

We also heard that the technical options report was missing a discussion on the consideration of the impact of climate and uncertainty which could make rolling stewardship very difficult or non-sustainable over the long term.

Some participants questioned the assumptions in the report about potential waste arising from the implementation in the future of small modular reactors. They wanted to know why there were no volumes assigned to these wastes. Participants also wanted to know whether the potential for fusion reactors to produce significant volumes of waste was considered and if this waste and its characteristics would be included as part of our projections.

Throughout the sessions participants discussed the number of facilities that should be constructed. Participants felt that a deep geological repository is very expensive to site and build, and unlikely be a financially viable option for multiple facilities in every province with radioactive waste. They also felt that boreholes would likely be less costly, and more could be built. Currently, the dimensions of the waste that could be accepted by a deep borehole are a constraint. Countries looking at deep boreholes typically don't have nuclear power programs; their waste is mainly medical waste or industrial sources. Most participants agreed that it could make sense for the ISRW to allow for a combination of types of facilities, for example, multiple deep boreholes and one deep geological repository for whatever doesn't fit.

Appendix A – Technical Workshop Sessions

All technical workshop sessions took place in 2021. The dates of the technical workshop sessions, and participant focus are below. All sessions were offered in English with simultaneous French translation.

Links to the presentations used during the technical workshop sessions can be found below:

Technical Workshop – LLW
Technical Workshop – ILW

Technical Workshop Sessions:

Sector	Session	Language	Date
Laypeople	Intermediate Level Waste	Bilingual	21 Sep 21
Experts	Low Level Waste	Bilingual	27 Sep 21
Experts	Intermediate Level Waste	Bilingual	28 Sep 21
Experts	Intermediate Level Waste	Bilingual	4 Oct 21
Laypeople	Low Level Waste	Bilingual	5 Oct 21
Experts	Low Level Waste	Bilingual	6 Oct 21

Appendix B – Promotion of Technical Workshops

Methodology, Parameters and Results

The Technical Workshops were designed to provide a safe shared space for multiple voices to be heard and to connect participants in new and meaningful ways. The events were free of charge and open to all interested Canadians and Indigenous peoples. Some Technical Workshops were tailored to laypeople and others were tailored to technical experts.

As it was important to encourage wide participation, the NWMO used various outreach and promotional tools, including social media (owned) and emails to the ISRW distribution list, to reach to relevant audiences to raise awareness of the Technical Workshops and stimulate registration.

Emails and Owned Social Media

The NWMO sent tailored email invitations to the ISRW distribution list to encourage registration for both technical workshops on low-level waste and intermediate-level waste. The NWMO also shared social media posts across their owned channels. NWMO posted three owned social media posts in both English and French on Facebook and Twitter, promoting the Technical Workshops, inviting interested Canadians and Indigenous peoples to register and participate.

Appendix C – Methodology

The objective of the Integrated Strategy for Radioactive Waste's (ISRW) technical workshop sessions is to invite and facilitate broad dialogue in support of the development of a strategy for managing Canada's radioactive waste, in particular low- and intermediate-level waste. We approached this goal by listening to the perspectives of expert and layperson attendees.

The development of the strategy is grounded in a range of guiding principles and objectives as we explored key questions and issues discussed at our events. A consistent methodology was used during each layperson and expert technical workshop.

Technical workshops were open to the public but required pre-registration to participate. The NWMO invited all those who had expressed interest in participating in the engagement activities related to the ISRW, and a broad multi-sectoral list of individuals with whom the NWMO had been communicating over the course of the engagement. We invited Canadians and Indigenous people to provide input to the approaches that we should consider for the long-term management of low- and intermediate-level radioactive waste.

In advance of the meeting, participants received links to the a technical options report commissioned by the NWMO or the technical options report – layperson summary to make the subject accessible to experts and non-experts alike. Participants were encouraged to read the Report prior to the technical workshop, but the material presented within the technical workshop was designed to allow participation, even where participants did not complete the pre-reading. We also described the principles that had been developed for the ISRW (see Appendix D – ISRW Guiding Principles)

We conducted these workshops over a three-week period, giving technical experts and laypersons multiple opportunities to provide feedback and attend sessions to discuss the long-term management of low- and intermediate-level waste.

Each session was facilitated by an independent facilitator who guided the presentation and workshops and throughout the process emphasized the non-attribution of comments, so participants were free to provide their opinion in a safe space. The bilingual technical workshop presentation was made available for participants with simultaneous interpretation. Throughout the process, participants could ask questions via video, or they could post their question in the chat room.

Each technical workshop session began with a land acknowledgement, recognizing and expressing gratitude for the land we are on. This was followed by an introduction and an overview of logistics for the event. Before addressing the topics for discussion, the technical workshop started with an opening context-setting presentation from Karine Glenn, Strategic Project Director for the NWMO, which covered the following:

1. Information on the ISRW project such as:
    a. Gaps in existing plans (e.g., low- and intermediate-level radioactive waste)
    b. Timeline of the project including key milestones and deliverables (from Fall 2020 to Winter 2021/2022)
    c. The strategy's guiding principles, including: 1) safety as an overarching principle, 2) security must be ensured, 3) environment is protected, 4) informed by the best available knowledge, 5) meets or exceeds regulatory requirements, 6) be transparent and inform and engage the public, 7) respect Indigenous rights and treaties, 8) make use of existing projects, and 9) fiscally responsible.

Following the NWMO presentation on the ISRW, there was a question-and-answer opportunity. This was followed by a presentation summarizing information on either low- or intermediate-level waste, depending on the focus of the workshop, such as the types and volumes of waste for which there are no current plans for disposal. Participants had the opportunity to ask questions of the NWMO following this part of the presentation.

Following another question-and-answer period, the NWMO presented a summary of the content of the technical assessment, addressing the content of the technical options report, for either low- or intermediate-level waste, depending on the focus of the workshop. This covered the following:

1. Assumptions
2. Information about development of the ranking of the technical options such as:
    a. Methodology used to determine ranking of options
    b. Information on waste grouping and the suitability of technical options for various waste groupings
    c. Proposed ranking of the suitability of the technical options
3. Context for the objective of the discussion in the technical workshop, which was to obtain the feedback of participants on the order of the technical option recommendations

The presentation was followed by another opportunity for participants to ask questions. Following the presentation, attendees participated in the discussion-based portion of the workshop. Joining the attendees was an independent facilitator, and NWMO ISRW project team members who were taking non-attributable notes for this What We Heard Report. NWMO representatives were on hand to answer questions from participants during the discussion.

The points of discussion were as follows:

1. With which aspects of the report do you agree?
2. With which aspects of the report do you disagree?
    a. Are there technical options that have been eliminated that should be brought back, and why?
3. What is missing from the report?
4. Based on the discussion, does the Order of Recommendations still stand?

Following the discussions, participants were provided with ways to further be involved in the strategy development process, such as, registering for updates through the project's radwasteplanning.ca website, partaking in the project's online survey, visiting the learn more page on the project's website, and were provided additional resources, such as an email address, to continue the engagement, ask questions and share comments.

The session ended with thanks to those participating and to those supporting the session, such as translators, notetakers and production team. The NWMO representative offered to remain on the virtual platform until all participants signed off, should participants have any final questions or feedback. The NWMO representative and production team remained on the virtual platform until all participants signed off.

Appendix D – ISRW Guiding Principles

The NWMO developed a set of principles that are comprised of what the organization had heard previously from Canadians and Indigenous peoples. These initial principles were included in public opinion research and refined by participants at the Canadian Radioactive Waste Summit — the first of the engagement events for the development of an Integrated Strategy for Radioactive Waste (ISRW), held from 30 March to 1 April 2021. The principles that emerged from the Summit were used as the basis for discussion in subsequent ISRW engagement sessions.

The guiding principles are:

- **Safety as an overarching principle**
- **Informed by the best available knowledge**
- **Respect Indigenous rights and treaties**
- **Be transparent and inform and engage the public**
- **Meet or exceed regulatory requirements**
- **Fiscally responsible**
- **Make use of existing projects**
- **Security must be ensured**
- **Environment is protected**

The full text of the guiding principles is as follows:

- **The strategy must have safety as the overarching principle** guiding its development and implementation. Safety, **including the protection of human health**, must not be compromised by other considerations.
- The strategy must **ensure the security of facilities, materials, infrastructure, and information**.
- The strategy must **ensure that the environment is protected**, including the protection of the air, water, soil, wildlife, and habitat.
- The strategy must be developed and implemented to **meet or exceed regulatory requirements** for the protection of health, safety and the security of people and the environment.
- The strategy must be **informed by the best available knowledge**. **This includes Indigenous Traditional Knowledge**, science, social science, local knowledge, and international best practices. Ensuring that Traditional Knowledge and ways of life are interwoven throughout is important for a strong strategy. This includes knowledge about the land and environment. It also includes values and principles about developing and maintaining effective and meaningful relationships.
- The strategy must **respect Indigenous rights and Treaties** and consider that there may be unresolved claims between Indigenous peoples and the Crown.
- The strategy must be **developed in a transparent manner that informs and engages the public, including youth and Indigenous peoples.** It is important to proactively provide easily understandable information to those most likely to be affected by implementation of the strategy. Questions and concerns must be heard, acknowledged, and addressed. Information used to develop the strategy will be readily available to the public**.**
- The strategy must be **developed and implemented in a fiscally responsible way** to ensure that the cost of the project does not become a burden to current electricity ratepayers, taxpayers, or future generations.

Glossary of Terms (Nuclear Waste Management)

Bulk Material: Material that is granular in nature, such as soil, demolished concrete, or construction/demolition waste.

Concrete Vault: Concrete vaults are a type of engineered near surface disposal facility widely used around the world for the disposal of low-level radioactive waste (LLW). Concrete vaults look like large concrete boxes and a repository would be made up of a series of these. Each one would have its own drainage system and an 'earthen cover system' engineered from multiple layers of soil and with grass or other plants growing on top. This disposal method can be used in a wide variety of soil conditions. It is also modular in its design, which means that additional vaults can be added to increase its capacity as needed.

Deep Borehole: Deep borehole disposal is an emerging technology for waste that requires isolation for more than a few hundred years. It may be suitable for the disposal of small volumes of intermediate-level waste (ILW). The series of narrow boreholes are created to a depth of about 500 to 1000 metres into which waste packages would be lowered, creating a stack deep underground.

Deep Geological Repository (DGR): A deep geological repository typically consists of a network of underground tunnels and placement rooms for radioactive waste constructed several hundred meters below the surface. Repositories are designed to use a system of multiple barriers: engineered barriers such as waste containers and natural barriers like the rock itself work together to contain the waste and isolate it from people and the environment.

Disposal: The placement of radioactive waste without the intention of retrieval.

Engineered Containment Mound (ECM): Engineered containment mounds are a type of engineered near surface disposal facility that sees waste packages placed on a waterproof base and then covered over with thick layers of natural materials such as clay and soil. Layers of synthetic materials such as high-density polyethylene are also incorporated to prevent release of radiation to the environment. These facilities usually have wastewater collection and treatment systems as well. ECM is suitable for low-level waste which will not reduce in volume or compact over time.

High-Level Waste (HLW): High-level radioactive waste is primarily used nuclear fuel and/or is waste that generates significant heat via radioactive decay. HLW is associated with penetrating radiation, thus shielding is required. HLW also contains significant quantities of long-lived radionuclides necessitating long-term isolation. Placement in deep, stable geological formations at depths of several hundred metres or more below the surface is recommended for the long-term management of HLW.

Intermediate-Level Waste (ILW): Intermediate-level radioactive waste is generated primarily from power plants, prototype and research reactors, test facilities, and radioisotope manufacturers and users. ILW generally contains long-lived radionuclides in concentrations that require isolation and containment for periods greater than several hundred years. ILW needs no provision, or only limited provision, for heat dissipation during its storage and disposal. Due to its long-lived radionuclides, ILW generally requires a higher level of containment and isolation than can be provided in near surface repositories. Waste in this class may require disposal at greater intermediate depths of the order of tens of metres to a few hundred metres or more.

Long-Term Management: The long-term management of radioactive nuclear waste by means of storage or disposal.

Low-Level Waste (LLW): Low-level radioactive waste 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.

Radionuclide: A material with an unstable atomic nucleus that spontaneously decays or disintegrates, producing radiation. Nuclei are distinguished by their mass and atomic number.

Rolling Stewardship: Rolling stewardship is an approach to managing radioactive materials for which there is no disposal solution in the near term. Under rolling stewardship, the radioactive waste is stored on the surface where human controls can safely contain, isolate, monitor, and secure it for many generations indefinitely i.e., roll the radioactive waste forward from generation to generation (a succession of stewards). This concept assumes that technology will eventually resolve the problem for the long-term management of the waste, potentially by destroying or neutralizing it.

Shallow Rock Cavern: The shallow rock cavern is an engineered near surface disposal method sometimes used for the disposal of low-level waste, or low- and intermediate-level waste (LLW or L&ILW). A series of rock caverns are excavated at a nominal depth of 50 to 100 meters below the surface in low permeability rock. They are accessed from the surface by a small system of ramps and tunnels

Small Modular Reactors (SMR): SMRs are advanced reactors that produce electricity of up to 300 MW(e) per module, which is less than current power generation reactors.

Waste: In the context of the What We Heard report, waste is assumed to be a radioactive waste unless specified otherwise (e.g., non-nuclear waste).

Waste Owner: The radioactive waste owner is the organization currently responsible for the radioactive waste.

For more information contact:

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