Transportation themes 2014 to 2019:

What we heard about transportation planning

DECEMBER 2019

nwmo
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

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BACKGROUND

The safe and secure transportation of used nuclear fuel is an important component of Adaptive Phased Management (APM), Canada's plan for the long-term management of used nuclear fuel. The ability to transport used fuel to the repository site safely and in a socially acceptable manner is a key factor that will need to be addressed in the selection of a preferred repository site, along with safety of the repository site and the ability to implement the project in partnership with those in the area.

Although the transportation of used nuclear fuel to a repository site is not expected to begin before 2040, it is an area of interest for communities, interested individuals and groups. The communities involved in the site selection process are keen to explore the safety and security of transportation as an integral part of exploring the APM Project. Over the course of these conversations, communities express a strong sense of responsibility to all Canadians and future generations to ask and have answered the key questions important to advancing the project. Furthermore, as communities, interested individuals and groups explore the basis for confidence in safety of the transportation of used nuclear fuel, the Nuclear Waste Management Organization (NWMO) is learning about the questions that need to be addressed, and the values, objectives and processes needed to guide transportation planning.

Since 2014, the NWMO has published each year a rolling summary of the ongoing conversations about this important topic. This 2019 report is intended to summarize what we have heard and help fuel further discussion.

SUMMARY OF FINDINGS TO DATE

To date, the NWMO has engaged thousands of Canadians, to hear their comments, questions, and concerns, and to provide information on transportation topics. This is done as part of ongoing learning and engagement on the project and the advancement of the site selection process. Key activities include presentations, briefings, open houses, interjurisdictional working group meetings, technical tours at the NWMO's Oakville facility, dry storage tours, and a presence and/or presentations at key Métis, First Nation and municipal conferences. Supplemental to these conversations, in late 2016, the NWMO published a transportation discussion document to contribute to the ongoing dialogue on transportation. This document was designed to explore areas of interest being raised by communities on five important questions.

As a complement to ongoing engagement, public attitude research and First Nation and Métis dialogue sessions were conducted to further understand principles, values and objectives to ground future transportation planning.

Across all these conversations, common interests, questions and concerns are emerging. People are telling us that:

- Safety of people, including workers, people transporting the used fuel and people along the route, needs to be a primary consideration.
- We need to have strong security plans and procedures in place to make sure shipments are not threatened by terrorism or theft.
- Emergency response plans need to be developed and in place in case of emergencies along transportation routes. First responders and other emergency response personnel need to be equipped and supported.
- We should use the best science available when making decisions about transportation planning. The plan also needs to be informed by local and Indigenous Knowledge.
- We need to consider, and minimize or eliminate, the impacts of transportation on the environment, including drinking water, watersheds and other environmentally sensitive areas.
- The transportation program needs to consider carbon footprint.
- Taxpayers or future generations should not be responsible for project costs. Costs associated with the transportation of used nuclear fuel need to be fully covered by waste producers.
- Independent oversight is important, and as part of that, jurisdictional roles, responsibilities and authorities must be clearly defined and understood.
- Transparent decision-making about transportation is important. Information used to make decisions about transportation planning must be readily available to the public.
- Education, communication and engagement are fundamental to overcoming fears and misconceptions about nuclear energy and the transportation of used nuclear fuel. Fears and misconceptions should not stand in the way of implementing the project and greater public good. People also have a responsibility to learn about the project.
- Transportation planning must be able to respond to changes, including changes in technology, climate and regulations.

These can be broadly grouped into the following eight themes, which will be explored in more detail in Section 1 of this document: health, safety and security; emergency response; transportation as a component of Canada's plan; the role of transportation in site selection; informing people and building confidence; environment; greenhouse gas emissions and climate change; and planning for the future. Understanding and addressing these interests and concerns will help chart a path to collaboratively planning and implementing a safe and socially acceptable transportation plan.

The report is organized in several key sections:

- Section 1 outlines the key transportation themes from conversations with communities, interested individuals and groups to date;
- Section 2 describes the NWMO's ongoing efforts to advance conversation and learning about the APM transportation program;
- Section 3 is a reflection on the common ground emerging from thousands of conversations over the course of this and previous years, and outlines the path to implementing a socially acceptable transportation plan; and
- Section 4 outlines the NWMO's commitment to continuing the dialogue on transportation.

1. KEY TRANSPORTATION THEMES

The dialogue on transportation continues to advance understanding of a number of themes. Face-to-face conversations, questions, comments, and other engagement show an interest in knowing more about the project in general, especially health and safety aspects, and the transportation of radioactive material, including how routes would be selected, security, logistics, and emergency preparation.

As conversations continue, and more communities, individuals, and groups become involved, there is general agreement on the themes and questions that need to be addressed in transportation planning. Themes include health, safety and security; emergency response; transportation as a component of Canada's plan; the role of transportation in site selection; informing people and building confidence; environment; greenhouse gas emissions and climate change; and planning for the future.

The key transportation themes are presented as a rolling list of questions and areas of concern as the NWMO's conversations deepen. The themes are updated annually, reflecting the continuity of discussions, ongoing common ground in priorities, and key questions and concerns that must be addressed from the public perspective. Over time, the themes have evolved to become more nuanced and specific in nature. The rolling list of questions and comments can be found in Appendix A.

Theme 1: Health, safety and security

Plans to ensure the safety of people during transportation

There is a high level of interest in learning more about the NWMO's plans to protect the safety of people and the environment during transportation and the role that the Used Fuel Transportation Package (UFTP) plays in the transportation program. Generally, there is a desire to learn more about and understand radiation, including the health effects of exposure. Once the nature of the hazard is established, people are interested in how safe transportation of used nuclear fuel would be ensured for the communities along the route, as well as for staff, including truck drivers and loading and unloading personnel. Alongside wanting to understand how people will be protected from the contents of the UFTP, they also want to understand the type of transportation vehicles that are being considered and how the NWMO plans to manage general road/rail safety. People also look for information about the safety track record both in Canada and internationally.

The UFTP

Many questions focus on the design of the UFTP such as the choice of container shape and fabricating material, the purpose of the impact limiter, and the integrity of the container in case of an accident involving water, fire or terrorist attack. People also ask questions about the testing of the UFTP required for licensing the package, including whether the tests are stringent enough.

Security along the route

In recent years, the security of shipments and how loads would be secured from malicious threats (e.g., terrorism or theft) emerged as an area of interest separate from concerns about accidents. People wanted more information about potential security measures, albeit with the understanding that advance notice and details of security arrangements must be concealed from malicious actors.

Understanding logistics: transportation modes and routes

People are interested in how the used fuel would be moved from its current location to a repository, and the kinds of logistics involved in moving these materials. Questions also include the routes and modes (e.g., road, rail) that are being considered and whether the NWMO has selected preferred routes and modes yet. Additionally, people are very interested in how weather and/or climate change may impact transportation (e.g., forest fires, flooding and snow storms closing major highways).

Theme 2: Emergency response

Emergency planning and logistics

Many want information on how the NWMO will plan for emergencies along transportation routes, especially regarding communication with local authorities and emergency response personnel. Radiation risks to first responders during the unlikely event of a breach of the UFTP are top-of-mind, and people often probe to better understand the hazard and how it might be practically managed during a variety of hypothetical scenarios.

Emergency scenarios

People are starting to ask about accident scenarios related to their specific geography and wanting to understand how the NWMO will consider those scenarios in transportation planning. This includes understanding how testing of the UFTP is applicable to scenarios in remote areas, retrieval of the transportation package in those cases, and who would be involved in responding to those types of accidents.

Training

People are interested in whether first responders along transportation routes have sufficient training to respond to a road or rail accident involving used nuclear fuel. This includes questions about whether the NWMO will rely on local first responders along the route, to what extent, and whether the NWMO would provide training to first responders.

Theme 3: Transportation as a component of Canada's plan

Building understanding of APM and used nuclear fuel

People have told the NWMO that building knowledge and a deeper understanding of other aspects of the project is important context. This includes the design and radioactive characteristics of the used fuel bundles, the history of nuclear power in Canada, the NWMO's mandate, and how waste is currently safely managed on an interim basis at Canada's nuclear power plants.

Covering costs

People have an interest in how Canada's plan is funded, and in particular, details related to the cost and funding of transportation.

Oversight

There is a strong interest in understanding the checks and balances that are in place to ensure safety, financial surety, and that all applicable laws and regulations are adhered to. Increasingly, people want to know that the NWMO has demonstrated capacity to manage a large scale transportation program. They also want to know what type of independent oversight is in place to make sure that the NWMO meets our commitments.

Transportation of used fuel, nuclear waste and other dangerous goods in other jurisdictions

As learning and conversation about the transportation of used fuel continue and deepen, the NWMO is finding that people are becoming more aware of how used nuclear fuel, nuclear waste and other dangerous goods are being transported in other jurisdictions. There is a strong interest in understanding what we can learn from other international and Canadian experience.

Theme 4: The role of transportation in site selection

Transportation as a factor in site selection

People have questions about how transportation considerations will influence decisions on a preferred site, including whether factors like distances between the interim storage sites and the potential repository sites are considered, and whether risk assessments will be completed.

Involving others in the conversation about transportation

People want to understand how transportation decisions will be made, who will be involved and how. They also want to know whether communities along potential routes will be informed, provided information, or will have a say about whether it goes through their community.

Theme 5: Informing people and building confidence

Informing people and building confidence

People consider education is key and expect the NWMO to build the needed awareness and understanding among those along the potential route and the public at large. It is the NWMO's responsibility to ensure that people are provided with fact-based information and have time to ask questions and have those questions answered. People have also said that it is important for citizens to take it upon themselves to learn about the project and transportation, especially if they feel transportation may impact them.

Transparency

Many people have encouraged the NWMO to communicate more broadly with Canadians about transportation and the project as a whole. As part of this, they have said that it is important that the NWMO is transparent about the decisions we make related to transportation. There is a general understanding that some components of a transportation plan cannot be completely transparent without compromising security; however, they encourage the NWMO to be as transparent as possible in our decision-making while planning for transportation.

Theme 6: Environment

Protecting the environment along the route

People are interested in how the NWMO plans to protect the environment. People want assurance that attention is given to the protection of land and water alongside the route, and the potential effect on plants, animals and water both under normal conditions and accident scenarios.

Protecting water along the route

Ensuring water quality and protecting water are top-of-mind subjects for many, with concern both for the areas near the repository and along the transportation route. People want to understand the potential effect of transportation on local water sources, and how water sources would be protected in case of a transportation accident along the route, including the Great Lakes and local sources of drinking water.

Theme 7: Greenhouse gas emissions and climate change

Carbon footprint of the transportation program

People are concerned about the carbon footprint of the transportation program, and how the NWMO plans to minimize or eliminate the carbon footprint of the transportation program. Carbon footprint tends to be tied to discussions around adapting to changes in technology, with an expectation that emissions-free technology will be available when the NWMO is transporting used fuel (after 2040).

Transportation planning and climate change

People have increasingly noted that climate change may have an impact on transportation. People are concerned about extreme weather events such as forest fires, flooding, tornados, and snowstorms impacting the transport of used fuel and potentially causing more dangerous driving conditions. They want to make sure that planning takes into account climate change, both at the planning stages and during transportation.

Theme 8: Planning for the future

Adapting to changes in technology

People have questions about how the plan will adapt in light of continued evolution of fast changing technology. Many people expect the NWMO to adapt to changes in transportation technology that will support environmental sustainability.

Managing changes in regulations and/or changes in government

People are interested in understanding the regulations that guide transportation and how transportation planning could be impacted by changes in regulations and/or government.

2. ENCOURAGING CONVERSATIONS AND INFORMATION EXCHANGE THROUGH ENGAGEMENT AND DIALOGUE

The NWMO continues to encourage active dialogue and learning on transportation as part of APM. We do this in a number of ways, including:

- Ongoing engagement on the NWMO's transportation program and transportation safety;
- Understanding the common ground on which to base a transportation planning framework; and
- Building understanding through media and publications.

The sections below summarize the NWMO's approach, while a complete list of activities is available in Appendix B to this report.

Ongoing engagement on safety

The NWMO has been engaging on transportation safety with siting communities since 2010. In 2019, activities designed to share information and engage in discussion on the basis of confidence in safety continued as part of a multi-faceted engagement program. Information exchange on transportation safety was promoted through the use of standing exhibits in community offices; and a multi-module travelling exhibit used at open house events, conferences and trade shows; presentations by transportation specialists and other staff; and the launch of a mobile exhibit with a transportation section. A 3D model of the UFTP was featured at a variety of events throughout the year (both as part of the multi-module and mobile exhibits). Videos demonstrating how UFTPs have been tested to withstand various accident scenarios were available and often shown at events. The NWMO's demonstration and proof testing facility in Oakville, Ont., also features transportation material and activities, and is a popular tour destination for communities and other groups.

The interactive kiosks, feature videos, brochures, backgrounders, and other materials were used extensively in siting areas, and in First Nation, Métis, and municipal community events in which the NWMO participated. In addition, formal presentations were made to local municipal community liaison committees (CLCs), and First Nation and Métis communities, and at the 4th Nuclear Waste Management, Decommissioning and Environmental Restoration Conference. Staff also attended dozens of community and organization events with First Nation and Métis communities/organizations. Through all these activities, the NWMO provided answers to questions and engaged in conversation to advance our understanding of peoples' perspectives of transportation planning.

Learning about transportation safety is occurring with a broader audience as the overall engagement program expands to include neighbouring communities in the siting areas, First Nation and Métis organizations, and regional first responder and road supervisor groups.

Working together to develop a transportation planning framework

In response to the interest of communities involved in the siting process, in late 2016, the NWMO published a transportation discussion document. The document was designed to explore areas of interest being raised by communities using five key questions (see *Discussion questions*) and invite people to add to these questions through the conversation. Dialogue on these questions is being used to develop a transportation planning framework that will be released in draft in 2020 for further discussion.

Discussion questions

1. What basic requirements or factors should form the starting foundation for the APM transportation plan?
2. Which objectives, principles and key questions should guide development of an APM transportation plan?
3. How can we ensure the design and implementation of the APM transportation plan is sufficiently inclusive to ensure good decisions are made?
4. What information will we need from technical specialists to develop the plan and support decision-making?
5. What factors should be considered in future decisions about modes and routes?

The transportation discussion document is available at www.nwmo.ca/transportationplanning.

The discussion document has been shared with municipalities, First Nation and Métis communities and organizations, and first responders during events such as conferences, trade shows, open houses, CLCs, community briefings and presentations, and tours of the Oakville or interim storage facilities. At all these events, the NWMO distributed the document and engaged people on its key concepts, including the five questions.

In 2018, a short pamphlet was developed to further stimulate conversation about transportation planning through summarizing key themes emerging from conversations to date. This pamphlet, titled *Working together to develop a transportation planning framework*, has become part of the package of material that is shared in engagement activities in order to encourage further discussion.

Throughout 2019, the discussion document and the brochure were distributed at all transportation-related events the NWMO attended (Appendix B). They were also used as supporting materials for presentations that were given to all siting area communities, and First Nation and Métis communities interested in talking about transportation. The purpose of the presentation was to report back to communities on what the NWMO has been hearing through our engagement and dialogue on transportation and further stimulate discussion.

Implementing public attitude research on transportation planning

As a complement to this ongoing transportation planning engagement, in 2017, 2018 and 2019, the NWMO commissioned third-party research firms to lead focus groups, workshops and public dialogue sessions. This work involved engaging a cross-section of citizens from Ontario, Quebec and New Brunswick on the five questions outlined in the discussion document and their perspectives on transportation planning more generally. In 2019, an Indigenous research and engagement consulting firm was commissioned to support dialogue sessions with First Nation and Métis communities to enhance the NWMO's understanding of Indigenous perspectives on the NWMO's transportation program and planning.

The findings of these sessions tended to echo the types of questions, concerns and perspectives that the NWMO has been hearing through our ongoing engagement with municipalities and First Nation and Métis communities/organizations involved in the site selection process. Reports from this work are available on the NWMO website (www.nwmo.ca/reports).

Building understanding through media and publications

We continue to make use of a range of material to deepen the conversation. This includes the *Assessing Radiological Dose to Members of the Public and Workers during UFTP Transportation*. This publication was originally developed in response to commonly posed questions about effects of radiation along transportation routes. It describes comparative exposure times, distances and frequencies between workers and members of the public, and a passing UFTP along a hypothetical transportation route. For example, transport crew members receiving the highest dose would still receive only about 15 per cent of the dose of a typical jet airplane flight crew.

We also share the *Safe and Secure Transportation of Canada's Used Nuclear Fuel*. This booklet provides information about used nuclear fuel transportation, current storage, the Canadian regulation and oversight regime, and future risk management strategies along a transportation route. And finally, we use the *Safe and Secure Transportation of Canada's Used Nuclear Fuel – Questions and Answers* booklet, a compact review and response to some of the most common questions we hear about transporting used nuclear fuel. Questions relate to public safety, security and emergency response, the different modes of transportation, and public involvement in transportation planning.

A range of short videos are also available through the NWMO website, including on international experience transporting used nuclear fuel, regulations for transportation of used nuclear fuel, and modes of transporting used nuclear fuel.

The NWMO's social media presence has expanded over 2019, and information about the NWMO's transportation program is regularly featured using the NWMO social media outlets (Twitter, Facebook and Instagram). Public questions and comments have also been shared through the NWMO and CLC websites, and through social media sites. We monitor publicly shared social media conversations as well, and find the interests congruent with what we hear from in-person exchanges, though sometimes with a broader focus on international events.

The NWMO has added answers to commonly posed transportation questions on our website, which is designed to facilitate user-friendly searches for specific information such as brochures, technical reports, or answers to questions. A dedicated frequently asked questions search box is available from the www.nwmo.ca homepage, and there are more than two dozens transportation-related questions and answers for visitors to review, such as "What sorts of security measures will be in place?" and "What type of vehicles will be needed to transport used nuclear fuel?"

3. REFLECTION ON LEARNING TO DATE

The NWMO continues to broaden our outreach and engagement activities with communities, interested individuals and groups, and First Nation and Métis peoples. The areas of interest and themes that are emerging through the thousands of conversations to date show a general alignment on the types of things people expect the NWMO to consider when making decisions about transportation. These considerations, and the work to address them, begin to form a common ground on which the NWMO can chart a path to collaboratively planning and implementing a safe and socially acceptable transportation plan.

Demonstrating safety

Safety continues to be the pre-eminent theme for people new to the process. They want to learn more about safety associated with the transport of used nuclear fuel from interim storage locations to a repository. Interests range from learning more about: radiation associated with used nuclear fuel; where used fuel is currently stored; used fuel container packaging; measures to protect residents of inhabited areas along the route, truck drivers or rail personnel, workers loading and unloading used fuel transportation packages, and emergency responders; and measures to protect land, waterways, and wildlife alongside the route.

For those familiar with the project, the safety case is well-understood, which has allowed dialogue to deepen and become more participatory in nature. The NWMO has heard that communities are interested in understanding how the NWMO is incorporating accident (or "what-if") scenarios into our safety planning and decision-making. An example of a scenario might include a multi-vehicle collision along a transportation route. As a result of these "what-if" scenario questions/concerns and as part of our technical transportation work, the NWMO has prepared risk assessment presentations that show how these scenarios are being considered. Communities and other groups that have seen these presentations or had more detailed discussions with the NWMO's technical experts about risk assessment have expressed high levels of confidence in the NWMO's safety case and indicated that it shows the NWMO is taking people's concerns seriously.

Related to accident scenarios, people are also curious about how the UFTP would perform in accident scenarios specific to their geography (e.g., falling off a local bridge). They want to be sure that the package testing required to certify the package for transport bounds even the most extreme accidents in their immediate geography. People have told us that although they generally have confidence in regulatory requirements for packaging, they find visuals (videos) of extreme accident simulations more powerful in conveying that message.

Emergency response planning

As a component of safety and further to the accident scenario questions/concerns, people also want to know about emergency response plans in case of emergencies along transportation routes. Emergency response is one of the most frequently stated concerns, after the robustness of the transportation package has been established. People told us it is important that work address how we would equip and support municipal and Indigenous first responders and other emergency response personnel, including plans for advanced training and capacity building. They have also asked about response times and accident rates in remote areas, and how the NWMO plans to incorporate that information into our planning and decision-making. People want assurance that additional costs associated with route emergency preparedness are not borne by the community, and that there are plans for involving emergency response providers and other relevant specialists and authorities in discussions about transportation planning. Additionally, people want to know that clear roles and responsibilities in the event of an accident have been defined as part of emergency response planning. Finally, the topic of prevention also arises in the form of logistics. This usually involves questions about whether the NWMO will avoid bad weather, times of day with traffic congestion, and areas with high accident rates.

Security planning

People are interested in the practicalities of transporting used fuel securely. Although many people enter this topic with qualifying statements such as "I know this is unlikely, but…," they express interest in understanding procedures to secure shipments from threats such as terrorism or theft. This includes questions about how the shipments will be tracked, and whether security personnel would travel with the transportation package. People appreciate the complexities that arise in the context of sharing advanced information on a shipment schedule or route. For example, people noted, "tensions between the public's desire to be informed about used fuel shipments, and the need to keep advanced notice and details of shipment arrangements out of the hands of malicious actors." That said, they further noted a distinction regarding the importance of communications plans with authorities and emergency response providers. People's confidence is typically bolstered when they understand that a security plan is a requirement of package certification.

Understanding and minimizing environmental impacts

Environmental protection, and in particular, water protection emerged as important concerns for many people in conversations about transportation. People want to know that drinking water and watersheds along with other environmental aspects along a route will not be put at risk. People ask about plans to prevent environmental damage, and plans to mitigate and repair environmental damage in the unlikely event of a release of radioactive material. We are seeing a close linkage between safety and the environment in the way people talk about environmental protection, specifically on the topic of accident scenarios. When talking about accident scenarios, people have said that their confidence in environmental protection would be linked to how confident they are in plans to protect people along the route and workers. Finally, people have started to ask about the NWMO's detailed plans to ensure environmental protection, and about the regulatory processes that will be in place to ensure the environment is considered at the planning stage and during transportation.

Carbon footprint

More recently, and sometimes independently of discussion about environmental impacts, people have brought up the carbon footprint of the transportation program. This comes up in two ways: 1) people wonder about how the carbon footprint might vary between siting regions; and 2) as an expectation that the carbon footprint of the transportation program will be considered. Specifically, people will reference the use of electrical vehicles or some other future technology that would not rely on fossil fuels. Given the public attention to climate change, greenhouse gas reduction and electric vehicles, this consideration will likely continue to feature heavily in discussions about transportation.

Demonstrated capacity

People have told us that to have confidence in a transportation program, they need to know how decisions are made and who makes those decisions both at the planning stage and during the transportation of used nuclear fuel. This includes understanding who will be responsible for transporting the used fuel and what regulatory processes apply. Related to decision-making considerations, people generally have strong opinions one way or another about mode and route options. However, most people agree that it is important that technical experts make those decisions, informed by international best practice, as well as local and Indigenous Knowledge. Additionally, information about the NWMO's strong relationships with other countries that regularly transport used fuel safely is of interest. From these conversations, we understand the importance of clearly communicating who will make decisions, how decisions are made and why.

Financial surety

We have also heard that people are interested in understanding how much the transportation program will cost and who will pay for it. People have expressed that they do not want future taxpayers to bear the burden of a transportation program, specifically related to unknown decisions about future transportation technology and potential infrastructure requirements and/or upgrades. People have questions like: "Who pays?", "Are we creating a burden for future taxpayers?", and "What about the cost of building and maintaining infrastructure?" When talking about project finances, people will often reference major infrastructure projects that have gone over budget and ask how the NWMO's planning accounts for unanticipated future costs. People are generally impressed by how funding of the overall project is managed; however, they stress that continued transparency about financial decision-making over the life of the project will be important.

Independent oversight

Given the scope of the transportation program, people have indicated that there must be independent oversight. People talk about independent oversight in a number of ways, but generally focusing on safety, security, environmental, and financial considerations. Specifically, people want to know that there are checks and balances both at the planning stages and over the life of the transportation program. For many people, this means that roles and responsibilities of the NWMO and oversight bodies (e.g., regulators) are clearly defined and communicated.

Adapting to change

Adapting to change, especially with respect to transportation planning, has emerged as a more recent topic of discussion. This is typically positioned as an opportunity for the NWMO to make the best use of the time between now and when transportation of used fuel begins. We have heard that transportation planning should reflect the most up-to-date knowledge and best practices internationally for the design of safe and secure transportation. As referenced above, people are interested in adapting to environmentally sustainable forms of transportation and actively thinking about those possibilities. They express an interest in how the plan can adapt to potential environmental challenges posed by climate change (e.g., unpredictable weather, forest fires and floods). And finally, people are also interested in how the plan will adapt to both changes in government and regulations which may come over time. We have heard that it is important that the transportation program have administrative continuity through changes in government while being able to respond to changes in regulations.

Education as a responsibility

People have shared with us that education, communication and engagement are fundamental to gaining public acceptance of the transportation of used nuclear fuel. People feel that all Canadians should have some measure of awareness and understanding of Canada's plan, and that those who are more directly affected by transportation have the opportunity to understand potential impacts on them. People have said that the NWMO has a responsibility to inform and educate people along the route in order to ensure that their questions are fully answered and concerns are addressed. People stress the importance of engaging early and providing multiple opportunities for people to ask questions and receive answers. We have heard that the involvement of experts such as emergency response providers, transportation specialists, scientists, and the various levels of government are important in the process of developing the plan. People also express an interest in learning more about how Indigenous peoples would be involved in decisions related to transportation.

Alongside the NWMO's responsibility to educate, people have also expressed that if the NWMO makes information available to people, it is also the responsibility of citizens to learn. People generally come away from conversations about transportation indicating that they feel as though they have learned a lot about a topic they knew little about and want other people (their friends, family and colleagues) to have the same information and opportunity to learn.

Looking forward

We have heard that people believe future success relies on social acceptance of transportation, and that this requires overcoming people's natural tendency towards nimbyism, the public's inherent fear and misconceptions about nuclear energy, and the fact that most Canadians do not know the NWMO. Looking forward to future engagement on the topic of transportation planning, it appears that exposure to fact-based information, combined with the opportunity to ask questions and discuss the issues with others, can significantly increase comfort and confidence levels in Canada's ability to transport used nuclear fuel safely and securely. People have said that early, ongoing and transparent engagement and education on the transportation of used nuclear fuel is key.

4. CONTINUING DIALOGUE

Dialogue continues on transportation safety and future planning. The NWMO has observed that bringing accurate and balanced information into the conversation is important as there is substantial misunderstanding and misinformation on this topic. It also invites deeper conversation and greater reflection on the choices that face us as a society, and how we will ensure safety at every point in the long-term management of used nuclear fuel.

The NWMO has observed that as conversations continue, and more communities, individuals and groups become involved, there is substantial agreement on the themes and questions that need to guide and be addressed in transportation planning. However, more conversation is needed to establish the social foundation for APM transportation.

The NWMO looks forward to continuing with this dialogue. We invite all interested Canadians to become involved by attending an open house, dropping by a community Learn More office, providing input to the questions posed in the transportation discussion document, or sharing your thoughts through visiting the NWMO website (www.nwmo.ca).

APPENDIX A: ROLLING LIST OF QUESTIONS AND AREAS OF CONCERN

Theme 1: Health, safety and security

Plans to ensure the safety of people during transportation

1. What is radioactivity? Where does it come from? What is a half-life?
2. How does radiation affect people? Is natural background radiation harmful to my family?
3. What is the relationship between a milliSievert (mSv) and a Becquerel (Bq)?
4. How does the radioactivity level in this waste compare to levels in other minerals? What types of radiation and doses can be expected from this waste?
5. Are low doses of ionizing radiation harmful to health?
6. How will the truck driver and loading/unloading personnel be monitored for radiation exposure? Will they receive high doses?
7. How will communities along the transportation route be affected? Will people along the route be exposed to radiation and their health be affected?
8. In the unlikely event of a breach in shielding, how much radiation would be released? Would it be harmful to my family, children and/or fetus? Is there an evacuation zone?
9. What is the demonstrated track record for safe transportation in Canada and around the world?
10. What other type of dangerous goods are travelling by road or rail today, and how does used nuclear fuel compare to those goods?
11. Has the NWMO done a comparison or risk assessment of road transport compared to rail?

The UFTP

1. How does the design of the UFTP shield radiation? Why is shielding different for the transportation package and that proposed for the deep geological repository?
2. How much does each package weigh, and can they be transported by road?
3. What are the package standards? Do all the proposed APM packages meet the same safety standards?
4. Is the container certified for transporting nuclear fuel waste? Did you test the transportation containers with used nuclear fuel inside them?
5. Do the package certification tests adequately reflect real-world scenarios? Are the containers robust enough to handle fires in enclosed spaces (i.e., tunnels)?
6. Can the UFTP survive extreme heat for short periods of time, double or triple the temperatures used in the transportation video, as would be necessary if an incident involved compressed natural gas?
7. What independent testing has been done on the container? Has its integrity been tested against an attack using military-type weapons?
8. Who sets the testing requirements, and are they strict enough to cover all possible accident scenarios?
9. Has the package been tested to its upper limits (as in, have you tried to break the package)?
10. Why is redwood used for the impact limiter?
11. Why is the container square? Is this the strongest shape?
12. Would metal seals between the lid and body of the package be stronger than rubber ones?
13. How will the waste be placed inside? Will it be encased in anything first?
14. Would the UFTP be emplaced in the repository/go underground?
15. Will the current transportation package design be relevant in 30 years? Or might we be dealing with a different model?
16. How many times will the waste need to be packaged, unpackaged and repackaged from the nuclear power plant to the repository site? Can/will dry storage containers be transported?
17. How often can a package be reused?
18. How many packages will be required?
19. Can the dry storage containers be moved instead of repacking the used fuel into the UFTP?

Theme 1: Health, safety and security

Security along the route

1. What kinds of threats need to be considered and planned for?
2. How will the NWMO track vehicles along the route, monitor environmental and road conditions, and train truck drivers?
3. Would an emergency "rapid response" team travel with the shipments or be deployed along the route?
4. Would a truck convoy be accompanied by an escort, like with oversize loads?
5. How does transportation of highly enriched uranium by another organization differ from that of the CANDU fuel by the NWMO?
6. Will there be security guards accompanying the shipments?
7. Are there opportunities for communities to provide security and/or escort vehicles through their communities and/or traditional territory?

Understanding logistics: transportation modes and routes

1. What modes of transportation are being considered? Is transporting over water being considered?
2. How many shipments are anticipated per day, week and month? Will shipments occur only during daylight hours? How long will this take?
3. Will existing roads have to be upgraded, and will new roads be needed? Will four-lane or two-lane roads be required?
4. What impact will the used fuel transportation program have on existing infrastructure?
5. What other infrastructure upgrades will be needed (i.e., communication systems in remote areas)?
6. Does transportation planning consider increased traffic on our highways?
7. How will traditional and environmental knowledge of the area be used to inform transportation mode planning, e.g., local topography and wildlife areas that might affect road and rail infrastructure improvements?
8. The roads get very dangerous during the winter. Is truck transport really the smart thing to do?
9. Can the existing rail system accommodate the NWMO's transportation requirements?
10. Will the NWMO own the trucks and employ the drivers, or will they be contracted?
11. Are transportation packages intermodal (i.e., can they be transferred from rail to road, or vice versa)?
12. Has the NWMO selected a preferred transportation route? Will there be alternate routes?
13. Why would the NWMO consider shipping the waste long distances instead of choosing a site close to where it is currently stored? How many containers will need to be shipped?
14. Would the UFTP be expected to stop at truck weigh stations?
15. Will the NWMO rebuild any highways or rail lines?
16. Will routes be designed to avoid populated areas?
17. Will road routes consider seasonal requirements such as half loads during the spring?
18. Has the NWMO considered how climate change will impact transportation?
19. Will the NWMO transport during all seasons, and how will you manage extreme weather and road closures due to snow, flooding or forest fires?

Theme 2: Emergency response

Emergency planning and logistics

1. Is safety affected by extreme winter weather and road conditions in the North, e.g., snowstorms, winter road closures that often last days at a time, and sudden extreme weather?
2. What kind of contingency plans will be in place if roads are closed?
3. How will you ensure there is a “safety culture” at the NWMO?
4. Where would the dispatch centre be located? When would planning for dispatch centre protocols begin?
5. How will you sort out jurisdictional mandates and organizational responsibilities among first responder organizations?
6. Will used nuclear fuel be transported with other kinds of dangerous materials such as fuel, chemicals, etc.?
7. Will there be a dedicated emergency response team for nuclear materials?
8. Will an emergency response team travel with the truck or train?

Emergency scenarios

1. What accident scenarios are being planned for, and how will they be addressed? Are you looking at worst-case scenarios in your planning?
2. Exactly how far would emergency workers have to stand from the UFTP to remain safe?
3. If an accident downed a high-voltage wire and it fell on the UFTP and shorted to ground through the container, could the electrical arc open the UFTP?
4. Can used nuclear fuel spill out of the transportation container, and if it did, what would be involved in cleaning it up?
5. How would a rail accident in a remote location (i.e., far away from access roads) be handled, including recovery?
6. How would an accident where a truck/train fell off a bridge into water be managed (e.g., a scenario that includes multiple impacts to the package)?

Training

1. What would emergency response planning and training protocols look like for my community or region? Will there be evacuation plans?
2. How will the NWMO support the community with emergency response planning?
3. How will first responders be trained, and how will different agencies be co-ordinated in case of an emergency?
4. Will emergency responders in communities be trained and receive the equipment they need?
5. Will costs associated with emergency preparedness be covered by the NWMO rather than left to communities along the route?
6. Is emergency response equipment required to manage an accident available in my area, and are people trained to use it? How would this equipment be dispatched?

Theme 3: Transportation as a component of Canada's plan

Building understanding of APM and used nuclear fuel

1. Is used nuclear fuel a liquid, gas or solid?
2. Is the bundle still radioactive? How hazardous is it, and for how long?
3. What are the effects of exposure to a fuel bundle, with or without barriers, and how will the NWMO ensure that site workers and the communities along the transportation route are safe during transportation?
4. Can the bundles explode spontaneously?
5. Are the ceramic pellets durable, or will they break and release radiation?
6. How many fuel bundles will ultimately be transported?
7. Can the bundles "go critical," i.e., spontaneously start a nuclear reaction?

Covering costs

1. Who will pay for transportation of wastes?
2. Who will pay for infrastructure upgrades and maintenance? Taxpayers or the NWMO?
3. What is the cost of the transportation vehicles and UFTPs that will be used to move fuel bundles to a deep geological repository?
4. Will the cost be a major factor in selecting a preferred site?
5. How will funding be assured over the very long term?
6. Will the cost of long-term wear and tear on infrastructure be considered in determining the best mode and route for transportation?
7. Do the estimated costs of transportation consider differences in using public modes (i.e., roads) versus private infrastructure (i.e., rail)?
8. What are the implications for taxpayers and/or electricity ratepayers, now and into the future?
9. Who will be responsible for community costs related to emergency response and training of emergency response personnel?

Oversight

1. Who will oversee the transportation of used nuclear fuel?
2. What regulations are in place?
3. How will the NWMO respect Indigenous jurisdiction with respect to transportation?
4. How will the NWMO address the United Nations Declaration on the Rights of Indigenous Peoples in the storage of hazardous materials in Indigenous territories?
5. What is the role of [federal and/or provincial] governments? Who are the ultimate decision-makers?

Transportation of used fuel, nuclear waste and other dangerous goods in other jurisdictions

1. Do other countries transport used nuclear fuel? If so, how do they do it?
2. Have there been any accidents transporting used nuclear fuel in other countries?
3. What are the distances that used nuclear fuel travels in other jurisdictions?
4. I have heard that nuclear fuel is already transported in Canada. How many shipments occur in Canada each year?
5. Does used nuclear fuel get transported between Canada and the United States? Will Canada ever take used fuel (with enriched uranium) from the United States?

Theme 4: The role of transportation in site selection

Transportation as a factor in site selection

1. Are the current sites being considered because they are close to major highways that could be used to move the used fuel?
2. What factors are considered in choosing routes? Is weather considered? Can one-lane highways be used? What about bridges?
3. Is transporting used nuclear fuel a shorter distance safer than transporting on a longer distance?
4. Considering that the risks involved with the transportation of spent nuclear fuel will be a highly controversial issue, and that it may travel through communities that derive no benefits from the nuclear industry, to what degree (big or small factor) will the geographical proximity of a possible site play in the selection of the preferred site?
5. How will transportation be addressed in regional studies?
6. Will the NWMO do a risk assessment between sites, and will that support a decision about siting?

Involving others in the conversation about transportation

1. When and how will transportation route communities be engaged, and how will this be managed?
2. What is the timing of the selection of a preferred transportation route? When will communities along the route be identified?
3. Will local first responders be engaged and be provided with opportunities to better understand the project?
4. How will you include Indigenous communities along potential routes in transportation planning?
5. Will a broad used fuel transportation committee be established that would include all communities located along the used nuclear fuel transportation route and that would be responsible for communicating and disseminating information to the communities about risks and emergency response?
6. What benefits and supports will be available to these communities, and how might they be involved in decision-making? Should transportation route communities receive a benefit, and should they need to agree?
7. How will public outreach and support be maintained over the long term?
8. Will communities along potential route(s) have a veto?
9. Will communities have input on transportation modes?

Theme 5: Informing people and building confidence

Informing people and building confidence

1. People along the route are going to be fearful because they are not informed and will not want used fuel going through their communities.
2. This is waste that our generation has generated. It is the NWMO's responsibility, as part of Canada's plan, to take the time to educate people about used nuclear fuel early so that this plan can be implemented.
3. People need enough time to think about information provided, ask questions and have those questions answered. Early engagement is key.
4. Informing/educating people along the route is a challenging and complex task.
5. Some people and organizations will oppose the transportation of used fuel. The NWMO needs to inform and engage with those people and organizations early.

Transparency

1. How does the NWMO plan to be transparent about transportation planning (e.g., decisions about routes and modes of transportation)?
2. If people feel they may be impacted, they need to have access to as much information as possible about the planning and decision-making to help them understand.
3. Will there be environmental or radiation monitoring along the routes to which people can have access?
4. It is important that the NWMO tells people as much as it can about its transportation plan, but it should not tell people when the shipments are travelling.

Theme 6: Environment

Protecting the environment along the route

1. What is the effect of transportation on the environment during normal transportation operation?
2. Where does radiation go when it is released into the environment? Does it accumulate on surfaces? Does it bio-accumulate?
3. Will radiation be released into the air while being transported?
4. Will the NWMO monitor radiation levels in the air and trees/plants along the route?
5. If there is an accident, what is the area that would be impacted by radiation?
6. If cleanup were necessary, how would this be done? Who would be called in to do the cleanup? Does the NWMO have sufficient funds to cover the cost of cleanup and rehabilitation?
7. Is the NWMO looking at the environmental effects of an accident where the container does not open (e.g., fuel spill and recovery efforts of a truck/train)?

Protecting water along the route

1. If the UFTP became submerged at depth during a transportation accident, would the water body and watershed be safe?
2. How would the UFTP be retrieved from deep water? What equipment would be used, and what would the impacts to the water be?
3. How will the safety of local drinking water sources, including the Great Lakes, be preserved?
4. Will the NWMO avoid transporting used fuel next to large water bodies, including the Great Lakes?
5. If the transportation container opens and a fuel bundle or pellet falls into the water, how far would the radiation spread?

Theme 7: Greenhouse gas emissions and climate change

Carbon footprint of the transportation program

1. What is the carbon footprint of the transportation program?
2. Will the NWMO choose the mode of transportation that has the smallest carbon footprint?
3. Will the NWMO choose a site that requires the least distance travelled to minimize the carbon footprint?
4. If a transportation technology that is greenhouse gas-free becomes available mid-way through the transportation program, will the NWMO begin to use that technology?

Transportation planning and climate change

1. Nuclear energy is a low-emission technology. Will the NWMO make sure that transportation of the used fuel does not contribute to our climate crisis?
2. Are you thinking about the effects of climate change on transportation? We are dealing with a lot of different weather and climate patterns now (flooding, forest fires, mega snowstorms). Does your plan account for these types of events?
3. If there is a major weather event (tornado, earthquake, forest fire) during transportation, will the NWMO be able to respond fast enough to make sure people are not at risk?

Theme 8: Planning for the future

Adapting to changes in technology

1. Will the project use driverless trucks/trains if that technology is available in the future? How will you ensure the cyber safety of the vehicles?
2. Would the NWMO consider using electric vehicles or any other type of reduced emission vehicle that is available in the future?
3. Would you consider other modes of transportation apart from road or rail if new technology makes those modes safer and more efficient?
4. Will the NWMO use the greenest transportation technology possible (the technology that emits the lowest greenhouse gases)?
5. If a new transportation technology becomes available 20 years into the transportation program, will the NWMO switch to that technology?
6. We expect that the transportation technology the NWMO uses will be new and would look new. It would not be confidence-inspiring to be transporting used fuel on old diesel technology.
7. Is there a plan to review the transportation package design before shipments of fuel start moving to ensure the most recent technology is being used?

Managing changes in regulations and/or changes in government

1. Could changes in government affect this project financially and in terms of approvals?
2. If regulations change before shipments start moving, will transportation planning be impacted?

APPENDIX B: 2019 TRANSPORTATION ENGAGEMENT SCHEDULE

Date	Event and location	Type of transportation information provided
Feb. 24-27	Ontario Good Roads Association conference	Transportation handout materials: • Safe and Secure Transportation of Canada's Used Nuclear Fuel – Brochure • Safe and Secure Transportation of Canada's Used Nuclear Fuel – Questions and Answers • Planning Transportation for Adaptive Phased Management – Discussion Document
April 2-4	Northwest Response Forum	Transportation handout materials
April 8	Red Sky Métis	Transportation planning – Presentation (includes information on the transportation safety case and what we heard themes)
April 9	Hornepayne CLC	Dose consequences from used nuclear fuel transportation incident – Presentation
April 10	Manitouwadge Fire Department	Dose consequences from used nuclear fuel transportation incident – Presentation
April 11	Manitouwadge CLC	Dose consequences from used nuclear fuel transportation incident – Presentation
April 16	Interjurisdictional Used Nuclear Fuel Transportation Planning Group	Transportation planning – Presentation
April 24-26	Northwestern Ontario Municipal Association conference	Transportation handout materials
May 7	Huron-Kinloss CLC	Transportation planning – Presentation
May 8-10	Federation of Northern Ontario Municipalities conference	Transportation handout materials
May 9	South Bruce CLC	Transportation planning – Presentation
May 14	Hornepayne CLC	Transportation planning – Presentation
May 16	Manitouwadge High School	Transportation planning – Presentation
May 16	Manitouwadge CLC	Transportation planning – Presentation
May 30	Conference Board of Canada – Council on Corporate Aboriginal Relations	Transportation planning – Presentation

Date	Event and location	Type of transportation information provided
May 31	Ontario Coalition of Indigenous Peoples (Sudbury)	Transportation planning – Presentation
May 30-June 3	Federation of Canadian Municipalities conference	Transportation handout materials
June 1	Tour of Oakville facility with Ignace community representatives	Transportation planning – Presentation
June 5-6	Association of Ontario Road Supervisors conference	Transportation handout materials
June 18	Ignace CLC	Transportation planning – Presentation
July 1	Ignace open house	Transportation handout materials
July 8	Wabigoon Lake Ojibway Nation	Transportation planning – Presentation
July 16-17	Wabigoon Lake Ojibway Nation learning and sharing gathering	Transportation planning – Presentation
July 21	Manitouwadge ATV Jamboree	Mobile Learn More Centre
July 22	Hearst – Meeting with Nord-Aski Regional Economic Development Corporation	Mobile Learn More Centre
July 23	Constance Lake First Nation open house	Mobile Learn More Centre Transportation planning – Presentation
July 24	Hornepayne community barbecue	Mobile Learn More Centre
July 26-27	Ignace annual men's golf tournament	Mobile Learn More Centre
July 29	Eagle Lake	Mobile Learn More Centre
July 29	Dyment	Mobile Learn More Centre
July 30	Dryden	Mobile Learn More Centre
Aug. 1	Ignace open office	Mobile Learn More Centre
Aug. 8	Mildmay – South Bruce CLC meeting	Mobile Learn More Centre
Aug. 15	Lac Seul First Nation	Transportation planning – Presentation
Aug. 22	Métis Nation of Ontario Annual General Assembly	Transportation planning – Presentation

Date	Event and location	Type of transportation information provided
Aug. 23	Ripley – Huron-Kinloss Nuclear Waste Management Symposium	Mobile Learn More Centre Transportation planning – Presentation
Aug. 23	Teeswater Fall Fair	Mobile Learn More Centre
Sept. 2	Wabigoon community barbecue	Mobile Learn More Centre
Sept. 3	Ginoogaming First Nation	Transportation planning – Presentation
Sept. 4	Long Lake #58 First Nation	Transportation planning – Presentation
Sept. 5-7	FireCon	Transportation handout materials
Sept. 7	Mildmay-Carrick Fall Fair	Mobile Learn More Centre
Sept. 8-11	Ottawa – Nuclear Waste Management, Decommissioning and Environmental Restoration Conference	Mobile Learn More Centre Transportation planning – Presentation
Sept. 12	Union of New Brunswick Indians	Transportation planning – Presentation
Sept. 21	Lucknow Fall Fair	Mobile Learn More Centre
Sept. 21	Ontario Coalition of Indigenous Peoples (Thunder Bay)	Transportation planning – Presentation
Sept. 22-23	Port Elgin – Women in Nuclear Canada conference	Mobile Learn More Centre
Sept. 26	Mildmay – South Bruce Family Science Night	Mobile Learn More Centre
Sept. 27-28	Ripley Fall Fair	Mobile Learn More Centre
Sept. 27-28	Ontario Coalition of Indigenous Peoples Annual General Assembly	Transportation planning – Presentation
Sept. 29-30	Congress of Aboriginal Peoples	Transportation handout materials
Oct. 10	Manitouwadge Fire Department open house	Transportation handout materials
Oct. 16-18	King City – Council of Elders and Youth meeting	Mobile Learn More Centre Transportation planning – Presentation
Oct. 27-30	3rd International CNS Conference on Fire Safety and Emergency Preparedness for the Nuclear Industry	Transportation handout materials

NUCLEAR WASTE MANAGEMENT ORGANIZATION

SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES