

Nuclear Waste Management Organization's response to questions from the Huron-Kinloss Nuclear Waste Management Symposium

1. Who pays for infrastructure upgrades? E.g. roads repair, road upgrades

Any requirement for infrastructure improvements can only be confirmed once a potential site for a repository is identified.

For a potential site to be considered technically feasible for a repository site, safe, secure routes for transporting used nuclear fuel from interim storage facilities in Canada to the repository site are a requirement. Transportation infrastructure must already exist or be possible to develop. We will need to demonstrate to regulatory authorities the safety and security of the transportation system before the shipments of used fuel can begin.

We would fund local infrastructure improvements needed to assure safety. Any such improvements would need to be undertaken before we could proceed with transportation activities. Any infrastructure improvements would be subject to discussion and negotiation with the appropriate agencies.

2. How is NWMO funded? Is it from Ontario electrical company profits?

The implementation of Adaptive Phased Management (APM) is funded by the major owners of used nuclear fuel in Canada. They are Ontario Power Generation, NB Power, Hydro-Québec, and Atomic Energy of Canada Limited. The Nuclear Fuel Waste Act requires these companies to establish independently managed trust funds. The companies make annual deposits to these funds; this will ensure the money needed is available by the time construction begins.

Effectively, this means it is consumers benefiting from the electricity who will, over time, fund the long-term management of the waste that is generated.

More information on funding Canada's plan for the safe, long-term management of used nuclear fuel can be found on the NWMO's [website](#).

3. Did the calculation of the cost of the project include inflation between now and 2048?

Yes, inflation was included. The entire project life cycle is estimated at approximately 150 years.

Based on the [latest projection](#), at the end of the planned operation of Canada's existing nuclear reactors, the number of used fuel bundles could total up to about 5.4 million. This places the cost of the project at an estimated \$23.6 billion (2015 \$).

More information about funding for the project, including a backgrounder on funding Canada's plan for the safe, long-term management of used nuclear fuel, can be found on the NWMO's [website](#).

4. Will it be necessary to move current stored bundles to repository? Or will the repository only be for new bundles?

The deep geological repository will need to be large enough to contain and isolate the full inventory of Canada's used nuclear fuel.

5. Do all 5 sites have same rock factors required to bury the fuel?

All five areas that remain in the site selection process have been assessed as potentially suitable for hosting a deep geological repository for used nuclear fuel. This finding is based on detailed assessments of available geoscientific information against technical evaluation factors presented in the NWMO's [site selection process document \(2010\)](#). The potential suitability of these areas is assessed in a step-wise manner as more detailed investigations are completed. Ultimately, for a preferred site, a robust safety case will need to be developed to demonstrate with confidence that the project can be safely implemented at the site and can meet or surpass the requirements of regulatory authorities.

6. Geologically, what is the difference between 5 sites? Who will decide which site is best or safest?

Both Huron-Kinloss and South Bruce are located in a sedimentary rock setting. The deep host rock formation in these areas is the Cobourg limestone. In Northwestern Ontario, between the Town of Ignace and the Wabigoon Lake Ojibway Nation, the granitic Revell batholith is being assessed. In North of Superior, potentially suitable host rock has been identified in specific areas within the large, granitic Black-Pic batholith near the townships of Manitouwadge and Hornepayne.

The safety case will also need to demonstrate that the project can meet or surpass the requirements of [regulatory authorities](#). Any site that is selected to host the project must satisfy six safety functions:

1. Safe containment and isolation of used nuclear fuel
2. Long-term resilience to future geological processes and climate change
3. Safe construction, operation and closure of the repository
4. Isolation of used fuel from future human activities
5. Amenability to site characterization and data interpretation activities
6. Safe transportation

The NWMO must address these safety functions through the development of a robust safety case.

7. You mentioned ongoing stocktaking- how are you doing this?

As new information is gathered and analyzed throughout the site selection process, the safety and appropriateness of potential sites are assessed on an on-going basis against a number of factors, both technical and social in nature. We sometimes refer to this ongoing process as stocktaking.

8. Why sedimentary rock acceptable and igneous, or metamorphic, rock is not?

Actually, the international consensus is that both crystalline and sedimentary rock formations have properties that make either potentially suitable for the safe containment and isolation of used nuclear fuel. Both of these rock formations are found in Canada and Ontario where all the study areas are located.

The site selection process, with its progressively more detailed studies, will ensure the selected site is located in a suitable rock formation. The geology must meet all scientific and technical site evaluation factors for the protection of present and future generations and the environment over the long term.

9. Seismic activity in Huron-Kinloss?

Earthquakes are one of several factors that we examine in the site selection process.

Southwestern Ontario and the Bruce region lie within the tectonically stable interior of the North American continent. This stable interior region of North America is characterized by low rates of seismicity. The Bruce region experiences sparse seismic activity.

For more information about earthquakes and the site selection process, please see the [You Asked Us](#) section of our website.

10. If the pellet is a powder and compress it to a ceramic- is there heat involved and will it make it radioactive?

No. Canadian CANDU fuel is made from natural uranium and the natural levels of radiation do not increase as a result of the fabrication process, including the compression and sintering of the ceramic fuel pellets.

11. If water is the potential danger, why even consider burying nuclear waste anywhere near a Great Lakes. Choose a site away from water and large populations.

The purpose of placing used nuclear fuel in a deep geological repository is to provide long-term safety and protection of the environment, including bodies of water.

The NWMO must demonstrate that any site selected to host this facility is able to safely contain and isolate used nuclear fuel for a very long period of time, essentially indefinitely.

Water safety is central to APM environmental and safety assessment studies, which will undergo a stringent and public regulatory review process.

12. How do you take the bundles out of the reactor?

Bundles are routinely removed from nuclear reactors by a fuelling machine during re-fuelling operations carried out by the reactor operators – such as [Ontario Power Generation](#) and [Bruce Power](#).

13. In a future ice age, glacial slow movement could gouge out a great deal of real estate (deep enough to affect the repository) as evidenced by Ontario's lakes ie: great lakes. How can you be sure a gouging glacier wouldn't effect this site? (Proposed site is limestone and shale as opposed to granite.)

Based on information from the Bruce nuclear site and region, the report stated that a realistic, but still conservative, erosion depth estimate would be 100 metres over 1 million years (nine glacial cycles). The preferred Cobourg formation is located at depths ranging from about 680 to 800 metres below ground surface across the Municipality of Huron Kinloss and from about 430 to 710 metres below ground surface across the Municipality of South Bruce. The Cobourg is also overlain by about 200 metres of shale acting as a hydraulic barrier.

If you're interested in more detail, a glacial erosion assessment report ([NWMO DGR-TR-2011-18](#)) was completed in 2011 as part of OPG's deep geologic repository project at the Bruce nuclear site.

14. If nuclear fuel bundles are replaced every year and a half from each nuclear power plant, how many deep repositories would be required to hold this material going forward.

The deep geological repository will need to be large enough to contain and isolate the full inventory of Canada's used fuel. As of June 30, 2017, the existing inventory of used nuclear fuel in Canada is approximately 2.8 million bundles. About 90,000 additional used fuel bundles are generated each year.

Based on the [latest projection](#), at the end of the planned operation of Canada's existing nuclear reactors, the number of used fuel bundles could total up to about 5.2 million, depending on factors such as the longevity and productivity of the nuclear reactors and decisions about refurbishments.

15. State of Michigan recently announced plans to truck nuclear waste to Port Huron for transportation through Great Lakes to Europe for processing. Thoughts?

The NWMO is not involved in that particular initiative however, the transportation of radioactive material is a well-established practice worldwide. We are in the early stages of planning for the transportation of used nuclear fuel from current interim storage to the eventual repository location.

For more information about transporting radioactive materials in Canada and in other countries, please see the [You Asked Us](#) section of our website.

16. Will the site selection and construction of the nuclear waste repository trigger a federal and provincial assessment process?

Implementation of a deep geological repository falls within federal jurisdiction and will be regulated under the *Nuclear Safety and Control Act (NSCA)* and its associated regulations. The Canadian Nuclear Safety Commission (CNSC), as Canada's independent regulatory authority, regulates the use of nuclear

energy and materials to protect the health, safety, and security of Canadians and the environment; and to implement Canada's international commitments on the peaceful use of nuclear energy. The CNSC's mandate also includes the dissemination of objective scientific, technical and regulatory information to the public.

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

This stepwise approach will require a licence for each phase of the repository life cycle. The process for obtaining a "site preparation" licence will be initiated by the NWMO. The NWMO would submit an application for a Licence to Prepare Site (and possibly construct) to the CNSC. A licensing decision by the CNSC on a repository can be taken only after the successful completion of the environmental assessment, following the process established under the *Canadian Environmental Assessment Act* (currently under review). More information about the CNSC's licensing process is available on their [website](#).

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

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

17. If no trucking is done now, why is there a truck leaving Bruce site every working day to Toronto and back?

None of the current shipments referenced are being conducted or managed by the NWMO – any shipments from the Bruce site to Toronto are not an NWMO activity.

Canada's plan involves transporting used fuel from [current storage facilities](#) to a centralized site. The site for a deep geological repository hasn't yet been selected, and we don't anticipate beginning our transportation program for several decades.

You can learn more about how radioactive materials are transported in Canada and in other countries in the [You Asked Us](#) section of our website.

18. How do you get 100 ton loads from Bruce to Ripley over bridges and road not fit for 100 ton loads (half load roads)?

There are several [transportation package designs](#) certified for use in Canada. The NWMO's current reference transportation plan has used nuclear fuel being removed from the dry storage containers and placed in our Used Fuel Transportation Package. This transportation container meets highway regulations and would weigh approximately 35 tonnes.

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19. What is shelf life of DSC's. Do they need to be relocated?

The dry storage containers (DSC) have a minimum design life of 50 years. They are actively monitored, and studies indicate that with ongoing maintenance and inspections these containers can be safely used for much longer periods of time.

After 50 years the life of the container could be extended, or the used fuel could be repackaged. These decisions will depend on a number of factors, including the timeline for implementing Adaptive Phased Management.

By way of background, DSCs are the containers used today to manage Canada's used nuclear fuel in facilities licensed for interim storage. When used nuclear fuel bundles are removed from a reactor, they are placed in a water-filled pool where their heat and radioactivity decrease. After seven to ten years, the bundles are placed in DSCs, silos or vaults.

DSCs are made of reinforced high-density concrete about 510 millimetres (20 inches) thick and are lined inside and outside with 12.7-millimetre-thick (half-inch) steel plate. The thickness of concrete provides an effective barrier against radiation.

20. 2.8 million Bundles in June 2017- how many by 2043 or 2085?

There are currently about 2.8 million used nuclear fuel bundles safely stored in interim storage facilities that require long-term management. As of 2017, it is expected that up to 5.2 million used fuel bundles could be produced to the end of the life of the current nuclear generating facilities.

21. Why does the plan have to be adaptive to new technologies? Is it not perfect now?

Canada's plan, called Adaptive Phased Management, emerged from a three-year dialogue with both specialists and the general public to assess possible approaches. One of the things we learned was that Canadians wanted a flexible approach that would allow succeeding generations to make improvements based on new knowledge or changing priorities.

For this reason, a fundamental tenet of Canada's plan is the incorporation of new knowledge. We adapt plans in response to advances in technical learning, international best practices, ongoing input from the public, insight from Indigenous Knowledge, changes in public policy, and evolving societal expectations and values.

The implementation of this plan will span many decades. Because of the timelines involved, it includes numerous opportunities to refine and adjust plans. Each step in the process provides an opportunity to take stock and make any adjustments before proceeding.

22.

a) Will all community have a vote and what % need to agree?

b) When will a referendum be held?

c) Site Selection- what is procedure re final decision- is it a vote? If we choose to opt out, how is that decision made?

d) Why not have all 5 communities have a referendum now and set the parameters of the referendum i.e. what percentage of "pro" votes would be needed in order to proceed.

e) Kincardine proposed site for Low and Intermediate DGR. How did they test community agreement?

f) Repository would proceed only with "involvement" of the community. Why not with "approval" of the community?

g) How do we show final support – referendum? What percentage is needed? In the event this site is chosen – who has the final say? Residents or the government? In the end the site chosen should be the safest location to protect all Canadians.

These are important questions about how a community will determine 'willingness', what that would look like, and when it would happen.

The community-driven site selection process that is designed to ensure, above all, that any location selected is safe and secure, and has an informed and willing host.

Best practice and experience suggest there are a range of approaches a potential host may use to demonstrate its willingness in a compelling manner. These might include documented support expressed through open citizen discussions, a telephone poll, online meetings or surveys, and/or a formal referendum.

New approaches may also emerge over the intervening years as societal expectations and decision-making processes continue to evolve. Communities will be encouraged to identify processes that meet their specific needs and demonstrate clearly to the NWMO whether the project has the support of citizens.

As the siting process has evolved, and engagement has broadened to include First Nation, Métis and other communities in the area, the need for partnership to support the implementation of the project is emerging as an important objective. The project will only proceed with the involvement of the

interested community, First Nation and Métis communities in the area, and surrounding communities working together to implement it.

23. What would happen if all 5 communities choose to leave the process? What is Plan B if all 5 shortlisted communities say No via a community vote or First Nations vote?

If an informed and willing host is not identified, then used nuclear fuel will continue to be safely stored at the interim storage facilities located at each nuclear reactor site. We would continue to work with Canadians to decide the best way forward for its safe, long-term management.

24. Why are the meetings being held in the communities during the weekdays when the majority of people are at work? Can meetings be held evenings and weekends when people can attend? People need to be able to participate.

The [Huron-Kinloss Nuclear Waste Community Advisory Committee \(HKCAC\)](#) holds meetings at 7 p.m. on the first Tuesday of each month at the Township office in Ripley. These meetings are open to the public and residents are encouraged to attend.

The NWMO also regularly holds open houses and workshops, which are often hosted on Saturdays. We will continue to look for more opportunities to engage with residents at convenient times.

25. Why the need to throw a lot of money at the community for years before a site is chosen?

The NWMO has a series of resource programs in place to ensure that communities, including First Nation and Métis communities involved in the process, are not out of pocket for learning about Canada's Plan.

Like any good corporate citizen, it's also important to us to invest in the well-being of these communities – as a good neighbour it's important to us that they benefit from having invested significant time and effort in advancing this project in the national interest.

We regularly review and update our resource programs to ensure they meet communities' needs as they undertake activities to:

- consider how this project might fit in their area,
- build capacity and skills to take on the project if it were sited in their area, and invest in community well-being and sustainability as they move into more intensive phases of study.