

Canada's Deep Geological Repository Debate: Institutional and Procedural Insights from 2015–2017

Revisiting Canada's DGR Process: Key Lessons from Past Proposals and Their Relevance Today

A Deep Geological Repository (DGR) for the long-term management of spent nuclear fuel has been proposed in Canada on several occasions. Examination of the processes associated with earlier efforts to identify potential sites in Manitoba and Ontario provides insight into the institutional, procedural, and public engagement challenges involved. This portion of the testimony by Erika Simpson, an associate professor of international politics in the department of political science at the University of Western Ontario reflects on lessons learned from one phase of a specific proposal undertaken in 2015-17, as that phase remains directly relevant to the current stage of the process. The discussion is informed by long-standing familiarity with earlier initiatives in Pinawa, Manitoba; the Bruce Reactor site (“DGR 1”); and the Teeswater/Saugeen Ojibway Nation (SON) site (“DGR 2”).

DGR Site Selection in Canada: Past Lessons, Current Questions

In the context of these policy discussions, questions regarding the transportation of nuclear waste by vessel through the Great Lakes were articulated in Simpson's [published commentary](#). Testimony and written analysis were also provided in relation to proposals to locate a deep underground waste facility in the [vicinity of London, Ontario](#) and the Bruce Nuclear Generating Station. In addition, Dr. Simpson's opinion articles addressing the issue of underground nuclear waste storage were published in the Ontario Broadsheet of the [Postmedia Network](#), the [Globe and Mail](#) and [The Hill Times](#).

OPG's Second Proposal: DGR 2

Ontario Power Generation's proposal to construct a DGR close to the Bruce nuclear complex on the Canadian side of Lake Huron suggested a 680-metre-deep waste site would be located just 1.6 kilometres from the shores of Lake Huron. Then Federal Environment Minister Catherine McKenna requested more information from OPG; the OPG report was made available for public input for 30 days, with the deadline then extended. OPG's proposal encountered significant obstacles during this phase

from 2015-2017. On April 5, 2017 the Canadian Environmental Assessment Agency (CEAA) issued a daunting set of questions and requested considerably more information from OPG. On May 27, a new report from OPG affirmed the utility's long-held position that the Bruce site should be preferred over any alternate site in Ontario.

The following questions are therefore relevant for consideration as the current process moves forward:

- 1. Would you have felt comfortable with nuclear waste being stored just 1.6 kilometres from Lake Huron, and why or why not?**
- 2. Do you think the public had enough time and information to understand and respond to OPG's proposal, given the short comment period and the complexity of the issue?**

OPG's original proposal: DGR 1

Originally OPG planned to transport "intermediate- and low-level nuclear waste" by truck to the Bruce site. OPG's subsequent report, issued December 28, 2016 estimated 22,000-24,000 road shipments over a 30-year period at a cost ranging between \$0.4 billion to \$1.4 billion. OPG estimated, "There will be incremental radiological and conventional transportation risks which are estimated to be between 3 and 69 road collisions." The corporation's transportation record was impeccable, but critics asked whether transporting nuclear waste on Ontario's highways would need to be kept secret due in part to concerns about possible terrorism. Concerns were that some roads, like the 401, would have to be shut down so that there was no chance of a militant or terrorist strike against trucks carrying nuclear waste.

These observations suggest several questions that merit careful reflection:

- 3. How do you feel about nuclear waste being moved by truck on Ontario highways for decades?**
- 4. Would you want to know the routes and timing of these shipments, or do you think that information should be kept confidential?**
- 5. Do you think 22,000–24,000 truck trips over 30 years is a lot, a little, or about what you would expect?**
- 6. If there were an accident involving a nuclear waste shipment, what kind of consequences would you worry about most—health, environment, or traffic disruption?**

7. Do you think it is realistic to keep these shipments safe from possible attacks, and should that influence whether the plan moves forward?

Considering All the Possibilities

OPG's reporting did not consider whether roads and the Bruce site could be made invulnerable to military attack. (Soft targets are called soft for a reason – they're easy for terrorists and armed militants to threaten to strike, and nearly impossible for well-meaning businesses, individuals, and nations to defend). Moreover, no mention was made in their reports of other countries, like Japan and Germany that were encountering problems due to strong public opposition to transporting nuclear waste. For example, German television stations regularly transmitted disturbing scenes of protestors surrounding trains, and many Germans were incensed that the plan to use the Asse mine for radiological wastes backfired as it flooded and radiological wastes leaked into ground water systems.

The CEAA did ask OPG to report back on “disruptive scenarios,” including the potential environmental effects of accidents and malfunctions during all phases of the project on site and during transportation. And it took OPG to task for not considering other less-likely scenarios, such as “inadvertent human intrusion,” “undetected major fracture” and “shaft failure” after the proposed DGR would be closed. OPG's official response was that the release of radioactivity would be the primary risk but “These postclosure scenarios are all very unlikely. At any location, the repository would be sited and designed to meet regulatory criteria for [the] public and [the] environment at the facility fenceline.”

According to the CEAA, OPG would also need to more precisely figure out the cost and environmental effect of transporting the waste by rail and by road; and clarify why roads are preferred over railway. OPG's reply explained the existing road infrastructure in Ontario was sufficient and flexible, but the construction of a short branch line from the nearest rail terminal at Goderich “60 to 70 kms away” would cost \$2-3 million dollars “not including land acquisition costs which would be substantial.”

As OPG flatly pointed out in a statement accompanying their report, “Alternate locations in the Canadian Shield or southwest Ontario, while technically feasible, would result in greater environmental effects and higher costs, as well as a project delay of 15 years or more, while offering no additional benefits in safety.”

The information above suggests that the following questions warrant attention:

8. **Should a nuclear waste plan include a full assessment of the risk of deliberate attacks, even if those risks are considered low?**
9. **If other countries have experienced strong public opposition to transporting nuclear waste, should Canada take that into account before moving forward?**
10. **Do you think it matters that the CEAA asked for “disruptive scenarios” to be considered, but the proponent treated some of them as “very unlikely”?**
11. **If a problem could occur long after the site is closed (such as a shaft failure), should that still be a major concern today?**
12. **Would you feel more comfortable if waste were transported by rail instead of road, even if it cost more?**
13. **Is it reasonable for OPG to dismiss alternative locations because they would take longer or cost more, even if they might reduce public concern?**
14. **Should the public have a say in whether roads or railways are used, given the potential risks and disruptions?**

Indigenous Approval

The OPG reports suggested extensive negotiations would be needed with Canada’s Indigenous people about hosting the nuclear waste site, especially given any proposed site in Ontario would most likely be situated on a mix of Crown and First Nation’s land. But OPG did not delve closely into cultural, legal, and socio-economic issues related to land ownership and sovereignty.

For its part, the CEAA emphasized that Indigenous peoples’ perspectives must be captured by much better reporting. The Government of Canada would need to take into account the input provided by Indigenous groups, including a comparative qualitative analysis of their health, socio-economic conditions, physical and cultural heritage, use of lands and resources for traditional purposes, burial sites, and their use of “any structures, sites, or things that are of architectural, archaeological, historical, or paleontological significance.” Moreover, OPG should answer all the same sorts of questions about any alternate locations.

Early on a few Indigenous groups were given thousands of dollars by OPG to study its original proposal to bury waste adjacent to the Bruce reactor close to Goderich.

The Historic Saugeen Metis received \$89,872, the Metis Nation of Ontario received \$65,150, and the United Chiefs and Councils of Mnidoo Mnsing received \$47,105. A few environmental associations, like the Huron-Grey-Bruce Citizen's Committee on Nuclear Waste and the Sierra Club, were allotted tens of thousands of dollars to hurriedly report back about the OPG study by March 8. Due to a prior 2004 Hosting Agreement, local councils in the Kincardine area had already received hundreds of thousands of dollars in exchange for not opposing the proposal until the assessment period ended.

As a result, the following questions emerge:

- 15. Should Indigenous groups have a stronger role in deciding whether a nuclear waste site is located on or near their lands?**
- 16. Do you think it matters that OPG did not fully address cultural and legal issues related to land ownership and sovereignty?**
- 17. If Indigenous communities are asked for input, should the government require a detailed analysis of health, cultural, and socio-economic impacts?**
- 18. Is it fair for the public to expect the same level of information for alternative locations as for the proposed site?**
- 19. Does it raise concerns that some Indigenous groups and local councils received money from OPG—especially if it may influence their ability to oppose the project?**
- 20. Should funding for consultation be seen as support for participation, or could it create pressure to agree with the proponent?**
- 21. If local councils were paid to refrain from opposing the project during the assessment, does that affect the legitimacy of the process?**

Safety Issues

What about accidents? There was little mention anywhere in OPG's original statements of the dangerous possibility – highlighted by Fukushima in Japan – that accidents caused by earthquakes, fires, hurricanes, or human error could limit access to its constructed underground chambers. The Japanese were using robots and drones – and had not admitted defeat at trying to clean-up their sites – which were already leaking into the Pacific. Notably, the Bruce reactors comprised the world's largest

operating nuclear site and were located within an area of low seismic hazard that is often hit by hurricanes.

Since underground facilities, like offices, tunnels, and emplacement rooms must be constructed according to the National Building Code's seismic regulations, OPG's original statement was deemed "ambiguous" and it was told all kinds of in-design mitigation measures needed explaining now, not later. The CEAA also advised that OPG would need to answer many more questions about emissions, construction, gas pressure, greenhouse gases, seismic factors, temporary power generation, and the use of fossil fuels.

Moreover, the CEAA expressed difficulty understanding OPG's claim there would be no changes to the above ground "footprint", despite clearing and excavation. Back in 2016, the federal government wanted to know how the construction could affect the land and whether fragmentation of the sedimentary location could in turn affect "traditional land use."

In light of this, the following questions arise:

- 22. Do you think the risk of an accident (like an earthquake or fire) should be a major concern even if the area is considered low risk. If a major accident occurred underground, would you feel confident that it could be managed safely?**
- 23. Should a plan for a nuclear waste site include clear explanations of how it would withstand natural disasters and human error?**
- 24. Is it reasonable to expect detailed answers about emissions, construction impacts, and seismic safety before the project moves forward?**
- 25. If the project requires significant excavation, should the public be told how the land and local ecosystems might be affected?**
- 26. Would you want more information about how the project might affect traditional land use and local communities?**
- 27. Should the claim of "no change to the above-ground 'footprint'" be questioned if construction clearly requires clearing and excavation?**

Timelines and Cumulative Effects

OPG's original proposal put forward for consideration a very long time frame of one million years. The crystalline rock of the Canadian Shield is more than one billion years old, and the sedimentary rock formation of southern Ontario is 354 to 543

million years old. OPG's plan would have been to abandon the underground shaft in 30 years once it was built. In one report, OPG asserted no less than four times that "the proximity of a water body to the DGR is not relevant because the movement of water or gas, even if it was released from the DGR, would not reach the water body until the radioactivity of such water or gas had diminished to the levels generally found naturally occurring throughout Ontario."

On the other hand, the CEAA wanted to know more about the potential for cumulative effects from radiation and radioactivity on deep groundwater. "Radionuclide diffusion from the two repositories could eventually reach more active ground water systems in the Cambrian sandstone and Guelph Formation, which are connected across the region. The consequences of such movement could have potentially adverse effects," it said. In its reply, OPG argued, on the other hand that such diffusion was unlikely.

The CEAA further wanted a reassessment of geological and hydrogeological factors, the incremental effects to freshwater species caused by warm water effluent discharging into colder waterbodies, and the ecological risks to terrestrial species with large-habitat ranges, including mammals such as white-tailed deer, and birds such as wild turkey. It seems the snapping turtle was observed in the wetlands around the Bruce site, so Environment and Climate Change Canada advised it could be possible for the eastern ribbonsnake and the eastern milksnake to move in as well. OPG's official reply to all these criticisms was to admit, succinctly that "residual adverse effects remain likely and further site-specific mitigation may be required." As they put it, "Avoidance of critical habitat for Species at Risk would be taken into consideration as part of a site selection process."

Taken all together, it looked like it would be a long time before OPG would be able to come up with compelling answers to so many complex questions. Against this background, it is appropriate to ask:

28. Is it reasonable to plan for a nuclear waste site with a timeline of one million years?

29. Would you feel comfortable if the plan assumes that any leaked radioactivity would diminish before it could reach nearby water bodies?

30. If experts disagree about whether radiation could eventually reach groundwater, should that uncertainty be a major concern?

31. Should cumulative effects—like radiation building up over time—be taken more seriously, even if the risk seems small?

32. Do you think the environmental impact on local wildlife (including species at risk) should be a deciding factor in whether the project moves forward?

33. If the site could harm wetlands or local habitats, should that be a reason to consider alternate locations?

34. Is it acceptable for a company to say “residual adverse effects remain likely” and then leave mitigation to future site selection?

35. Would you want to know more about how the project might affect the broader region, not just the immediate site?

OPG’s Overall Comments in the Context of the “DGR 3” Proposal

OPG’s own reports concluded the waste site could, technically, be situated anywhere in the province’s vast crystalline rock or sedimentary rock formations, so long as it would be accessible by road. According to OPG, an important deciding factor was that hundreds of local residents around the Bruce site were supportive. Atomic Energy Canada Limited first suggested site construction would create many local jobs because the construction project would cost about \$13 billion dollars. Then OPG projected the cost would be \$2.4 billion; but choosing an alternative nuclear burial site other than the Bruce site could add costs anywhere from \$381 million to more than \$2 billion.

All OPG’s reporting avoided comment on cost over-runs and who would bear the cost of site construction. Although they precisely estimate the number of traffic accidents that can be expected over 30 years, no information is available on the number of jobs the DGR could create for construction workers, local councils, maintenance workers, and security personnel. OPG also refrained from delving into monetary issues, such as whether the advantages of creating a few jobs over a few human generations might be offset by the risks incurred, especially given possible leakages into underground water systems, sky-high insurance plans, and the necessity for advanced emergency planning.

OPG’s report asserted there was little interest regarding the DGR project among the general public outside the area. But, what about protests outside the Kincardine area,

especially in southwestern Ontario, Michigan, and other states surrounding the Great Lakes basin? By September 2016, 187 municipal resolutions passed resolutions opposing OPG's proposed nuclear waste dump, and hundreds of thousands of people signed petitions. In the U.S., 23 members of congress wrote Canada's minister of foreign affairs urging Canada to explore options outside of the Great Lakes basin. U.S. Representative Paul Mitchell also sent a bipartisan letter with 12 of his house colleagues asking the Trump administration to stop OPG's proposal. The bipartisan letter pointed out "The Great Lakes make up one fifth of the world's fresh surface-water supply and are a source of drinking water for 40 million people. This plan poses a danger to a crucial water source and a failure at the site would disrupt both Michigan and Canadian tourism and commerce."

These developments prompt the following questions:

- 36. Should the fact that some local residents support the project be a major deciding factor, even if many people outside the area strongly oppose it?**
- 37. If the site could be located "anywhere" in Ontario's rock formations, should the decision be based more on safety and public confidence than on convenience or cost?**
- 38. Is it a concern that OPG did not clearly address who would pay for cost overruns or long-term site maintenance?**
- 39. Should the potential number of jobs created be weighed against the possible risks to water and public safety?**
- 40. Does it matter that so many municipalities and citizens opposed the proposal, including people in the United States?**
- 41. Should the fact that the Great Lakes supply drinking water to millions of people in both Canada and the U.S. have made this a shared international concern?**
- 42. If a project could have affected tourism and commerce across the Great Lakes region, should that be a central consideration in deciding whether to proceed?**
- 43. Should the government consider how a decision could affect Canada's international relations with U.S. states that share the Great Lakes?**

Short-Sighted Solutions to Long-term Challenges in Disputed Inter-State Water Basins?

Questions about how to manage the nuclear waste generated by the current generation of nuclear power plants will likely remain relevant for hundreds of thousands of years—long after nuclear power has ceased to be a dominant energy source in Canada. In that context, proposals to bury nuclear waste near water basins (*i.e.* Great Lakes, Hudson Bay, *etc.*) raise concerns about whether they represent short-sighted responses to long-term problems. The foregoing summary raises 43 questions for further consideration.

Earlier proposals have raised significant questions regarding the long-term management of nuclear waste. In the case of the Teeswater proposal, for example, the permeability of limestone and the proximity to the Great Lakes raised concerns about long-term safety and the potential vulnerability of the site to deliberate attacks. The current proposal in the Canadian Shield, while geologically different, similarly raises questions about whether Canada's decision could be perceived as a solution to the United States' unresolved challenges with Yucca Mountain in Texas. If that perception were to arise among Republicans, it could create pressure for additional waste shipments northward, with uncertain political and diplomatic consequences.

In the long run, the potential for interstate disputes over nuclear waste management should not be dismissed. International politics is shaped by such resource and security considerations, and the Great Lakes and Hudson's Bay regions are shared water basins with significant economic and environmental value. It is therefore important that the current process be approached with careful deliberation, transparency, and a full appreciation of both the technical and geopolitical dimensions.

As a result, the following questions emerge:

- 44. If nuclear waste management decisions made in Canada could affect international neighbours, what responsibilities does Canada have to ensure the process is not only technically sound but also geopolitically defensible?**
- 45. How should the long-term security risks—such as vulnerability to deliberate attack or future geopolitical pressure—be weighed against the immediate technical and economic advantages of a particular site?**
- 46. What principles should guide decisions about nuclear waste disposal when the consequences may extend far beyond the lifetimes of current institutions, communities, and governments?**
- 47. What ethical obligations do we have to future generations when deciding where and how to store nuclear waste, especially when the risks and impacts may persist for hundreds of thousands of years?**

- 48. How should the principle of “do no harm” be applied when the harms of a decision may not become apparent until far beyond the lifetime of the current decision-makers?**
- 49. If a community agrees to host a nuclear waste site today, how can we ensure that the costs and risks are not simply shifted onto future generations who had no role in the decision?**
- 50. What would “seven-generation thinking” require in terms of transparency, consent, and long-term “rolling” stewardship—especially when the future cannot be predicted and institutional continuity cannot be guaranteed?**

I hope that the observations and questions presented in this testimony encourage further discussion and careful reflection on this issue.

Kind regards,

<Original signed by>

Erika Simpson, Associate Professor of International Politics, Department of Political Science, University of Western Ontario (“Western University”), Social Science Centre (SSC), London, Ontario, Canada, N6A 5C2, telephone <contact information removed> and email: <email address removed>