

## A FAILURE OF RISK COMMUNICATION:

### THE ABSENCE OF RISK ASSESSMENTS IN NWMO DOCUMENTS AND ITS SIGNIFICANCE

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Risk analysis, giving rise to formal risk assessments (ideally, quantitative: QRAs), is intended to guide public-policy decision-making where dangers loom. Such guidance has to date benefited governments, the private sector, and both individuals and groups in making better decisions about many different types of risky situations. Siting and constructing a DGR (deep geological repository) for high-level nuclear waste qualifies as one of those situations. *Yet as the Nuclear Waste Management Organization seeks to successfully close its search for a DGR site by the end of 2024, a search that began in 2010, no such guidance has been provided.*

This is most serious in the case of the candidate host communities in South Bruce and the Revell area, but it has much wider significance. Both of those communities, as well as two First Nations, have been and are being asked to sign legally-binding “hosting agreements” without having been told what risks they face. This failure also affects other communities in the wider regions in which the two proposed sites are located. It also affects the communities situated along the presumptive transportation routes for bringing the waste to those proposed sites – routes which, however, have not been described by NWMO.

In what follows here I will specify precisely what risks associated with a DGR project in Ontario could be, and should be, characterized by a formal risk assessment. I will argue that this work ought to be carried out by NWMO before it concludes its search and asks two federal agencies to begin the formal regulatory process for a final siting decision.

When that formal process, involving jointly the Canadian Nuclear Safety Commission (CNSC) and the Impact Assessment Agency of Canada (IAAC), gets under way, a “probabilistic safety assessment” [PSA] will be carried out by CNSC. While a PSA is similar to a quantitative risk assessment (QRA), *it is not the same and is far less informative for the public than is a QRA* (See Reference #1)

*What is a quantitative risk assessment (QRA)?*

A QRA begins with a *hazard characterization*, which presents the kinds of impacts that can harm health and the environment. For a DGR, the most serious hazard is the radioactivity that might escape from the used fuel waste and migrate into the environment.

Then it goes on to *exposure*, that is, exactly who or what might come into contact with the hazard and might be harmed thereby. Next, it moves to a *frequency estimation*, which calculates the *probability* that such exposure will occur; if enough information is available, this will be expressed in mathematical terms, such as the familiar “1 chance in a million.” Sometimes one will encounter the question in this form: What are the *odds* of an adverse effect occurring (to some group or area)?

Thereafter, *a consequences estimation* is offered: If something bad (known as an adverse effect) does happen, just how bad is it likely to be, in terms of loss of life, injury or disease, or harm to the environment and other creatures (in other words, what is the *magnitude* of the adverse effects?). Adverse effects can also be economic costs.

We would then have a pretty good idea of what bad things might happen, over a specified period of time, population, and region, how likely they are to occur, and how serious they might be. At that point we can ask: Is this acceptable to us? In view of all the major risks we face now, how does this rank? Can we live with it, considering that there are other risks to worry about too? And if a particular risk seems too high for us to be comfortable with it, how can we *reduce* that risk to a more acceptable level? Can we require responsible authorities to spend a reasonable amount of funds to make this happen? If not, what other options are open to us?

It is *only with a well-performed QRA in hand that we can ask this last series of questions*. For many risks, we cannot avoid being exposed to them entirely. In such cases, we can then keep asking those questions until we are satisfied that the risk levels are “as low as reasonably achievable” (the ALARA principle). If we are still not comfortable with the level of risk, we may go on to ask whether new or different technologies or policies or strategies might be capable of giving us a higher level of perceived safety.

#### *Risks Associated with a DGR*

The risks in question can be grouped around the key dimensions of Canada’s plan to safely sequester high-level nuclear waste. They are: (A) transporting the waste to the DGR site; (B) repackaging the waste at least twice; (C) operating the DGR at depth.

##### *A. Transporting the Waste*

At present the high-level waste consists primarily of 3.3 million used fuel bundles withdrawn from CANDU nuclear reactors and held in temporary storage at seven widely-separated locations: Point Lepreau in New Brunswick, Gentilly in Quebec, Chalk River near Ottawa, three locations in Southern Ontario (Bruce, Darlington, and Pickering) and at the Whiteshell Labs in Pinawa, Manitoba. The total current quantity of waste is indicated by the notion that all of it would fill nine hockey rinks to the top of the boards. It is estimated that the present generation of CANDU reactors will ultimately produce 5.6 million waste bundles. (See further: [Reference #2](#))

Complicating the picture of the waste stockpile at present are two elements: (1) a planned deployment of additional new CANDU reactors and (2) construction of new types of nuclear reactors, known as SMRs [small modular reactors], which generate different types of fuel wastes. (Already NWMO is including the possibility of utilizing the first DGR for these other types of waste: See [References 3 to 8.](#)) Another complication is the growing interest in

the utilization of nuclear reactors in places other than Ontario and New Brunswick, including Alberta, Saskatchewan, and the northern territories.

According to current plans the existing stockpile of fuel waste will be moved, over decades of time, from the temporary storage sites to either South Bruce, in southwestern Ontario, a short distance south of the Bruce Nuclear Generating Station, or the Revell Site, located near Dryden and Wabigoon Lake in northwestern Ontario. *But NWMO has not done any of the following things to date:* (a) published a transportation map of along exactly what road and rail lines the waste would be moved to either destination; (b) provided a comparative risk assessment of the two options; (c) considered whether moving the waste by water, over at least a part of the route in both bases, might provide a preferable overall safety profile (as detailed in a QRA) for the transportation plan.

The principal risk associated with transporting the waste is, of course, the danger that one or more of the containers in which the waste will be packaged for the journey might be damaged during a road or rail accident, releasing radioactivity into the environment. (There *will be* such accidents, but not necessarily any such releases.) The proposed container design has been subjected to tests in various types of accident scenarios and found to be robust, but the public needs a far more detailed transportation plan to be published, looking at accident probabilities along different routings and transport modes, asking what choices can be made to maximize public safety. (See further: [Reference #9](#)) *The major risk to the waste owners in this context is that, even if no radioactive releases occur, one or more serious truck or rail accident might “spook” the public sufficiently that further shipments would be in jeopardy.*

For the Revell site, there is at least a summary of the road/rail distances involved, which are considerable (for example, the distance from Point Lepreau, New Brunswick to Dryden, Ontario, is 2750 kms). But there is no information at all, to the best of my knowledge, about *how* (along what road and rail lines) the waste would be moved from all of the temporary storage sites to the South Bruce proposed location. *A comparative transportation risk assessment would indicate clearly both the advantages and disadvantages of each site as compared to the other.* Such an analysis would help members of the Canadian public be far better informed about the transport risk profiles and achieve greater confidence in the site selection process. **It should be done, now.**

### *B. Repackaging the Waste*

Two separate repackaging efforts will be required. First, at the temporary storage sites, the used fuel cylinders will have to be removed from their large dry storage casks and assembled inside a specialized transportation package. Then, when the waste arrives at its final destination, it will have to be removed from its transport box and repackaged in the elaborate steel-and-copper cylinder designed to be emplaced deep underground. This second activity will occur in a purpose-built, above-ground (or shallow underground) repackaging facility. *NWMO has done no risk assessment of this activity or facility.* This is a serious matter, because there is, presumably, a higher risk of *surface contamination* of land and water, resulting from potential accidents at this facility, than there is of radioactive contamination leaching from the deep underground cavern and migrating to the surface.

A recent article in the *Winnipeg Free Press* ([Reference #10](#)) has raised exactly this concern. There is a reminder there that surface waters in the Dryden area move north and west, which is why Grassy Narrows First Nation suffered such devastating consequences earlier from mercury pollution originating in Dryden. Those waters eventually reach Manitoba. Given the horrors of what happened to the Grassy Narrows people, there needs to be a full and careful risk assessment of the risk of surface contamination occurring at or near the surface of the Revell site and migrating through surface waters to the communities north and west of that site.

Accidents happen (some are called “normal accidents”). Such accidents *will happen* at the repackaging facility. A risk assessment is designed to tell us, in advance of any accidents, how likely they are to occur under specific circumstances, and what their consequences might be. The purpose of such an assessment is to anticipate what might happen and seek to design appropriate safeguards against the worst expected consequences, rendering the risk “as low as reasonably achievable.” **This needs to be done, now.**

### *C. Operating the DGR*

A DGR is expected to be dug to a depth of 600-700 metres in either sedimentary rock (South Bruce) or granite (Revell). It is designed to be permanently closed at some point and monitored indefinitely thereafter. NWMO maintains that both types of rock are suitable for this purpose, although the fact of the matter is that there has never been an adequate, *independent* quantitative risk assessment of the suitability of the sedimentary rock, in comparison with granite, *for high-level waste.* (An independent expert *qualitative* assessment done in 2014 suggests that both are equally robust for a DGR.)

NWMO has prepared a comprehensive “safety case” for each of the two candidate sites; however, these are not risk assessments. (See References 11 and 12) For building public confidence in the choice of either South Bruce or Revell, a quantitative risk assessment of the DGR in two types of rock itself ought to be performed. (This is especially relevant now that a category known as “other Canadian nuclear fuel waste” is being included (Reference #8), because *there is no risk assessment at all that deals with SMR wastes.*) With this in hand, the public will have a clear sense of what could go wrong in the operation of the facility itself, what the probabilities and the consequences would be if something does go wrong, and what measures will be put into place in order to constrain all of those risks to a level “as low as reasonably achievable.” All those potentially affected by adverse outcomes deserve no less. **It should be done, now.**

In conclusion, asking citizens of Canada, Indigenous and non-Indigenous alike, to sign elaborate “hosting agreements” for a DGR, without having clearly articulated the associated risks, raises questions, in my opinion, about an organization’s ethical standards.

Finally, it should be pointed out that Canada has on hand all the necessary expertise it needs to conduct independent QRAs of high quality and within reasonable deadlines. Commissioning these studies would in my opinion not unduly delay NWMO’s decision-making process or add unreasonable levels of costs to its expenses. The time and cost factors would be offset by the significantly higher levels of public confidence in that process which can be expected to result.

### *The Wider Context*

The decision about where and how to site a DGR occurs at the intersection of three great fractures in contemporary Canadian public policy:

1. Supreme Court of Canada decisions pursuant to S.35 of The Constitution Act, 1982, followed by Canada’s *United Nations Declaration on the Rights of Indigenous Peoples Act* (2021), has changed fundamentally the responsibilities of all other parties with respect to those rights, including resource and economic development projects and all other impacts on the traditional territories of First Nations peoples.
2. The impact of climate change on Canada’s energy future, and the need for vast new electricity infrastructure project in the coming 25 years, has changed radically the discourse on considering new nuclear energy, and dealing with nuclear fuel waste, both for proponents and opponents of nuclear power, all across Canada.
3. The ongoing difficulties in finding ways to conduct reasonable public dialogues and debates about understanding environmental risks and risk acceptability present a severe challenge to public policy decision-making.

I describe these as “fractures” because they all threaten to derail or at least complexify the outcomes of projects where large financial stakes are involved. In terms of the missions assigned to the NWMO by the Government of Canada in 2002, the first-mentioned of these

fractures has moved considerably the goalposts for project decision-making for a DGR. This fact raises questions about whether it was indeed fair or appropriate for the GOC to transfer responsibility for such a vital project from itself (where it had originally been vested) to a nongovernmental body; *in my opinion, it was not*. So far as the second (new nuclear) is concerned, the provincial and federal governments now making big plans for future energy supply have been entirely silent on the implications of those plans for the location, amount, and types of nuclear fuel waste. *This too is unfair*. It is past time for all of these governments to be told to step up and take full responsibility for this aspect of those plans.

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*Final Author's Note:* No reference has been made here to the Township of Ignace, a small town 43 kms east of the Revell site, on which the NWMO hopes to confer the title of "willing host community" for that site. The reason for this neglect is that, in my opinion, Ignace would be hosting exactly nothing except the millions of dollars flowing into its coffers from the NWMO, in addition to the Centre of Expertise, which should properly be located in Dryden if indeed the Revell site is chosen. Courting *only* the people of Ignace can seem like a little piece of political theatre on the part of NWMO; it is also indifferent to the interests of many other local and regional communities in the area. Likewise, courting the residents of Wabigoon Lake Ojibway Nation, whilst ignoring the many other Indigenous communities in that region, especially Grassy Narrows and its terrible legacy, now authoritatively described in the academic journal literature, is deeply troubling. (See [References 13 to 17](#))

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