

Submission on

**Nuclear Waste Governance in Canada**

**and**

**Its Impacts on the Environment**

for the study by

The Standing Committee on Environment  
and Sustainable Development

prepared and written by

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## **Nuclear Waste Governance in Canada and Its Environmental Impacts**

### **PREAMBLE**

I have lived in midwestern Ontario for almost 16 years, 13 of which were based on a two-acre countryside property in the Municipality of South Bruce, after which I relocated to the neighbouring Municipality of North Huron, in the Village of Blyth.

As a media professional and educator, through the past 10 years I have applied a lifetime of analytical and investigative skills to examine and critique the processes of both proposed deep geological repositories (DGRs) in Bruce County, the first promoted by Ontario Power Generation (OPG) for low-and-intermediate level radioactive waste, and the second high level DGR, originally for spent fuel bundles from CANDU reactors in Canada, promoted by the Nuclear Waste Management Organization (NWMO).

To say that I have not been impressed by either the OPG or the NWMO processes is an understatement. I attended every single day of two public hearings on the OPG DGR and provided two oral presentations, accompanied by written submissions (available in the CEAA archives) - and was shocked at the repeated inability by OPG, even while accompanied by NWMO consultants, to be able to answer major questions from the Joint Review Panel, which was why the second public hearing was called. Furthermore, the continuing lack of being able to provide important information, I suggest, is why Saugeen Ojibway Nation (SON) voted, no.

What I witnessed at the OPG DGR hearings has not changed at all in regard to the present trajectory – more accurately, absence thereof - regarding federal government attention to the very real threats to the natural environment, up to and including the recent sessions conducted by the Standing Committee on the Environment and Sustainable Development – henceforth to which I will refer as the ENVI Committee.

Speaking bluntly, the OPG DGR hearings exhibited an attitude towards the natural environment as implicitly a matter of ‘collateral damage,’ any ecological destruction written off merely as something which can be replaced by planting new trees, etc. The environmental illiteracy, and indifference, exhibited by the OPG was gobsmacking.

As for the ENVI Committee taking on the issue of ‘Nuclear Waste Governance in Canada’ please know that I totally applaud Bloc Québécois MP Monique Pauzé for

initiating this study. Through no fault of her own, the procedure by which the ENVI Committee carried out the four online public sessions, in my view, fundamentally violated Ms. Pauzé's intention. She felt compelled to point out to each of several 'witnesses' supporting the nuclear industry that they were off topic from addressing the issues of nuclear waste per se by choosing to focus on the benefits of what the nuclear industry provides. In the time wasted doing so, the controversies around how nuclear waste is managed were relegated to the margins of sessional conversations, or omitted altogether. I was very disappointed, but not surprised.

Ten pages would not be sufficient to point out the misconceptions from several ENVI Committee members which were not adequately addressed in the ridiculously short time limits provided, as well as for me to be able to clarify such misconceptions.

My paper here instead will focus, in part, on contrasting the problems of the systemic reliance on computer modelling - relied upon by both the nuclear industry and the CNSC - with the marginalization of the concerns of practitioners striving to pursue an ecosystem approach, to expose why the current focus on promoting experimental DGRs (which also pertains to experimental Small Modular Reactors, but which are beyond my focus here) is environmentally unwise.

I also will identify specific problems rooted in particular pieces of legislation, which calls for addressing the root causes of the systemic problem, in my recommendations.

I write this paper only based on the slim hope the current regime will be improved.

## **THE SYSTEMIC PROBLEM WHICH MUST CHANGE**

In witnessing the four sessions conducted by the ENVI Committee - aside from the serious imbalance in numbers between nuclear industry cheerleaders versus well-informed citizen witnesses who sought to communicate serious issues about how nuclear waste is being addressed – a meaningful exploration of the impacts on the environment did not happen, when participants so often were cut off in mid-sentence.

This event profoundly opened my eyes to the systemic problem, that the federal government prioritizes the interests of the nuclear industry at the expense of the well being of Canadian citizens and also the protection of the natural environment.

The failure of the ENVI Committee to include the grassroots citizens who are directly being impacted by the present NWMO strategies has exposed a deterioration in the functioning of a participatory democracy in which the voices of concerned citizens now are disregarded. Worse, no press release was created to inform the wider public, and I only found out by accident, even as a concerned citizen who has devoted a decade to trying to engage with the federal government on this issue at every opportunity offered.

My conclusion is that the federal government is much more interested at a level of what I call “nation state ego” to sustain, and build upon, its own recognition and status within a conscribed international nuclear community led by the International Atomic Energy Agency (IAEA), as a Tier 1 pro-nuclear nation state, rather than pay attention to the ongoing controversial issues about experimental nuclear projects. In doing so, the federal government undermines a ‘participatory democracy’ public engagement.

I was appalled by the arrogance of not only one of the ‘Witnesses’, nuclear scientist Dr. Jeremy Whitlock, but as well, on a different day, the disgraceful castigation upon rural citizens by one of the Committee members in their characterizations of any opposition as being “uninformed.” How dare they make such insulting assumptions about rural people and, in turn, remote communities (and implicitly many First Nations) who, in fact, *have* proactively informed themselves to express their opposition to the proposed NWMO DGR. These people are not fools, yet are slandered by arrogant public servants who are much less informed than grassroots citizens engaged on the ground. Through my personal interactions, I know how extensively these folks - who will be directly impacted - have been gathering information not limited to NWMO but, moreover, also studying points of view independent from the conscribed international inner circle who promote nuclear energy and who use strategies to marginalize valid criticisms.

Indeed, the ENVI Committee sessions illustrated that the whole discussion about nuclear waste is a ‘closed loop’ of actors and, moreover, self-fulfilling to meet the needs and wants of the nuclear industry. Is public consultation only a game, in which concerned citizens can be under the illusion that their voices will be heard? Thus far, the majority of politicians who have decision-making power seem not to care about any point of view beyond that which will perpetuate the desires of the nuclear industry.

Despite the above-outlined pattern of treatment, perhaps better attention will be paid by ENVI Committee members regarding concerns identified in citizens’ written briefs, by including them in the ENVI Committee report to Parliament, where a public debate, ultimately, is needed.

My later recommendations will identify the doors to open, which can break apart the collusion of the present-day federal government as per its deference to the wishes of the nuclear industry at the expense of future generations who depend upon the well being of the natural environment, the latter so obviously under jeopardy.

## **A PARTIAL LIST OF CONCERNS**

The NWMO continues to be unable to answer many important questions for concerned citizens and, worse, continually produces misinformation about the NWMO DGR not just in local news media but also voiced at the sessions conducted by the Standing Committee on Environment and Sustainable Development (ENVI) on Nuclear Waste Governance in Canada, which I witnessed with dismay.

I speak, citing two examples (on transcript PDF pages 7 and 17), in assertions from Laurie Swami, president and CEO of the NWMO, to the ENVI Committee. She incorrectly suggests that “proof of concept” exists for the NWMO DGR, because the same process is used in international facilities for low-and-intermediate level waste. But even the World Nuclear Association distinguishes DGRs from the latter which are “Near Surface Repositories (NSRs). In contrast, DGRs are “mined repositories” at a much deeper depth, which require “a combination of engineered and natural barriers.”

In the third of my three latest letters to the midwestern Ontario PostMedia newspaper chain – I further exposed misinformation about the international consensus which supports DGRs. In my letter, I corrected the information from a Letter to the Editor written by Tareq Al-Zabet, NWMO Director of Site Selection – South Bruce. The title of his letter - which can be googled to read - is: “Letter to the Editor: Sweden shows leadership and environmental stewardship with repository decision.” My own letter in response is titled: “Letter to the Editor: The fuller truth on Swedish government’s DGR decision”<sup>1</sup> Please read my letter, because it exposes the cracks in the “international consensus” repeatedly declared by the NWMO as well as by the international nuclear players in the broader “closed loop.” Please also look up the ***World Nuclear Waste Report 2019***<sup>2</sup> for independent international insights, as an overview which points out how major uncertainties are caused by inconsistencies, contradictions and data gaps.

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<sup>1</sup> <https://owensoundsuntimes.com/opinion/letter-to-the-editor-the-fuller-truth-on-swedish-governments-dgr-decision>

<sup>2</sup> <https://worldnuclearwastereport.org>

As for the questionable ethics of the NWMO Adaptive Management Plan regarding its disruption of small communities and taking control of local councils, I only hope that the citizen opponents living in South Bruce (and also in northwestern Ontario) will deliver submissions which will elaborate on how NWMO carries out its so-called community engagement. It has become very aggressive in South Bruce, to the degree that well-informed citizens who oppose the DGR continually are being discredited even for speaking out against becoming a 'willing host' community.

Secondly, the Canadian Nuclear Safety Commission (CNSC) appears to follow the desires of the nuclear industry, which I have witnessed as a person who volunteered extensive time to prepare research to submit in responses for various documents on nuclear waste management, and also for a public hearing on the decommissioning of the Douglas Point Waste Facility in Bruce County.

Third, the Ministry of Natural Resources is totally in a conflict of interest, given its responsibilities to promote the nuclear industry juxtaposed to what merely is an illusion in regard to the moral responsibility to protect the natural environment and human health of Canadians. Such protection is no longer authentic nor believable.

Fourth, the opening of the closed loop to allow a more authentic dialogue with the Canadian public calls upon addressing the root causes of the closed loop, which reside in various types of legislations, such as the current Impact Assessment Act and also the Nuclear Fuel Waste Act.

Before examining recommended changes, the next section will provide insight on yet another fundamental problem, the systemic reliance upon computer modelling as more important than the gathering of knowledge about the natural environment, in real time and real space, the latter towards the development of an 'ecosystem approach.'

## **COMPUTER MODELLING – A SKETCH OF THE ISSUES**

I will begin by citing an excerpt from one of the books<sup>3</sup> written by quantum physicist Fritjof Capra, in which he interviewed computer scientists who elaborated on the following multi-layered and significant fact:

*“A computer processes information, which means that it manipulates symbols based on certain rules. The symbols are distinct elements fed into the computer*

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<sup>3</sup> *THE WEB OF LIFE: A New Scientific Understanding of Living Systems* (1996)

*from the outside, and during the information processing there is no change in the structure of the machine. The physical structure of the computer is fixed, determined by its design and construction.*

*The nervous system of a living organism works very differently... [I]t interacts with its environment by continually modulating its structure, so that at any moment its physical structure is a record of previous structural changes. The nervous system does not process information from the outside world but, on the contrary, brings forth a world in the process of cognition...*

*Human decisions are never completely rational but are always colored by emotions, and human thought is always embedded in the bodily sensations and processes that contribute to the full spectrum of cognition.*

*As computer scientists Terry Winograd and Fernando Flores point out ... rational thought filters out most of that cognitive spectrum and, in so doing, creates a “blindness of abstraction” [Capra, 1996, p.274-5].*

The U.S. Nuclear Waste Technical Review Board (NWTRB) held its “Fall 2021 Virtual Board Meeting – November 3-4, 2021<sup>4</sup>, publicly accessible – see below link – to review the Geological Disposal Safety Assessment (GDSA) framework, regarding which the U.S. Department of Energy (DOE) is engaged with international partners. The focus was to discuss the latest stage of developments in a range of computer models, as per DOE’s Spent Fuel and Waste Disposition Program.

What is unsettling is the powerful evidence revealing the reliance upon computer modelling by the (closed loop) international community for all stages of DGRs from ‘site characterization’ up to and including ‘post-closure’ which refers to long-term safety as the trajectory of the GDSA.

Here I provide just a few bits of testimonies which reveal the paradox of how these profoundly intelligent and well-intentioned scientists are blind-sided by their belief in computers. They are oblivious to the flaws in the human input, and the limitations of the human mind which cannot mimic the natural world, nor can second guess the trajectory of how planetary processes will unfold at multiple unseen levels, when triggered by climate change and unknowable extreme weather events through time.

Emily Stein, geoscientist and manager at Sandia National Laboratories, USA, in her opening presentation gave proof that DGRs are experimental, by saying: “We want to be able to apply this simulation and analysis capacity to generic disposal concepts”....

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<sup>4</sup> <https://nwtrb.gov>

Here are a couple of Stein’s fully transparent statements, which give evidence that the science is **not** there, despite the widespread misconception fed by NWMO and others in the international closed loop who are single-minded to push forward DGRs:

*“So construction of the models and the simulation and analysis tools for a quantitative analysis requires making some assumptions about what the safety assessment strategy should be and what the post closure technical bases are”... [page 36, transcript]*

*“GDSA is going to prioritize development of simulation capability for the FEPs, the features, events, and processes that are likely to occur, regardless of site and design specifics.” [page 39, transcript]*

Reflect upon the following words above, such as **assumptions** and also **likely to occur**. The above illustrates the longstanding systemic posture by DGR proponents such as the OPG and the NWMO, and obviously their international partners as well, that the entire enterprise of justifying DGRs is not really based on empirically proven science at all, but instead “assumptions” and second-guessing what might occur.

Next are further excerpts, this time from the presentation by Caitlin Condon, an environmental health physicist at the Pacific Northwest National Lab, who described features about a biosphere computer model, and how its functioning draws upon the codes from a variety of other computer programs which continually being improved:

*“Our team looked at the International Atomic Energy Agency or IAEA programs, including BIOMASS and MODARIA for recommendations on development of long-term assessments models. The IAEA program BIOMASS began in the nineties and was an exploration of movements of radionuclides within the environment.”... [page 9, transcript]*

*“One important take away from the BIOMASS program, was that you shouldn’t attempt to perfectly simulate the biosphere.”... [page 10, transcript]*

*“... we consider not only the radionuclides defined by the output of PFLOTRAN, but also the progeny ingrowth and decay as it moves from the groundwater to the soil through irrigation to a plant during growth and the plant is harvested and stored until it is consumed by the receptor. Also, uncertainty and sensitivity analysis can be applied throughout the model using the Dakota code,” ... [page 15, transcript]*

I recommend reading the full transcripts and/or watching power-point presentations which provide an in-depth exploration of ever-evolving computer models, which could raise concerns in your mind. A key question raised for me, and why I quoted the



passage above about some pathways of radionuclides is, why is such extensive effort being placed upon the attempt to track radionuclides (for the ultimate purpose to estimate doses upon the `receptor`), unless it is recognized by the scientists who develop modelling that, indeed, radionuclides sooner or later will be released from containers which will corrode?

The NWMO refuses to speak about this eventual reality and, instead, focuses on public relations about the latest series of studies being done on an NWMO design version for controversial copper canisters, currently being done at University of Western Ontario.<sup>5</sup>

Also worrisome, at the end of Condon's presentation, was this question from NWTRB Board member Paul J. Turinsky, a nuclear engineer: "Are you going to assess things like the economic impact if large acreages have to be taken out of service from farming? Things like that." To which Emily Stein replied: "Assessing the economics has not been part of our safety assessment in the past, so that developers at this time have no intention to add that capability." DOE's William Boyle then added: "Typically economic effects are considered in EISs. None of the people here today are directly working on EISs [which refers to Environmental Impact Statements]."

PLEASE NOTE: In the agricultural-based Municipality of South Bruce, hundreds of farmers are fighting against the NWMO DGR. The "willing host" community decision must be made by 2023 in the NWMO process. Is this fair to the livelihoods of farmers that longer term economic impacts will not be discussed unless a later federal Impact Assessment happens? The NWMO assures farmers that, beyond the 250 acres needed for the DGR shaft and the above-ground replacement packaging facility, all of the surrounding acreage will remain workable for farming. But where is the evidence?

A final observation in reading only some of hundreds of NWTRB transcript pages was learning that impact on vegetation was **not** included in the biosphere model prototype, which would be of interest to the First Nations communities whose reliance on hunting and fishing for food security could be impacted. My reference is to northwestern Ontario, the second site being considered by the NWMO, and just as questionable as a location because of the range of environmental impacts the NWMO fails to discuss.

By the way, the current biosphere model is only focused on humans as the identifiable `receptor` and totally neglects the interactions across species, as well as impacts on multiple levels of organisms, water and sediment. Is computer modelling acceptable?

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<sup>5</sup> <https://news.westernu.ca/2021/08/nwmo-research-used-nuclear-fuel/>

## THE NEED FOR AN ‘ECOSYSTEM APPROACH’

“Integration of ecosystem science into radioecology: A consensus perspective,” published in the June 9, 2020 edition of *Science of the Total Environment*<sup>6</sup>, is a good introduction to the history of radioecology and its challenges to be embraced by the international nuclear sector, even when projects are being promoted globally.

Some credit is given to the International Commission on Radiological Protection (ICRP), for which CNSC is one among several global partners. I even cited the ICRP about its innovative ‘Reference Animals and Plants (RAPs)’ approach at one of the OPG DGR hearings. But, henceforth, ICRP was criticized for its limited focus, which this journal paper explains, and adds that ICRP Committee 5 has been discontinued.

The International Union of Radioecology (IUR) organized a 2016 conference, to challenge the “anthropocentric view, which currently dominates risk assessment - [for example, clearly evident in what I wrote above about computer model tendencies] – and advocate the incorporation of ecosystem science into risk assessments:

*“which still basically rest on understanding of effects of stressors on individual organisms or species rather than on the cumulative stress to populations and communities of organisms at higher levels of biological organization, such as the ecosystem. ...*

*“Weight of evidence approaches to risk assessment are no longer sufficient to address the demand by the public for reliable information on how they and the environments that they live in are threatened by the presence of contaminants.”*  
[O.E. Rhodes et al, 2020, page 9]

Among other international resources which I research to expose the limited types of information provided by Canadian nuclear proponents and CNSC is *International Journal of Radiation Biology*<sup>7</sup> for example, as communicated in “From tangled banks to toxic bunnies: a reflection on the issues involved in developing an ecosystem approach for environmental radiation protection,” published April 6, 2020.

Again, the content of this paper was based upon knowledge shared at a workshop organized by the International Union of Radioecologists (IUR). I strongly recommend reading it to see what is missing in the current NRCan draft report on nuclear waste:

*“A key focus of the workshop was not only to reach areas of agreement, but also to (a) better understand areas where consensus may not be reached; (b)*

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<sup>6</sup> Here is an example of a scientific journal article, not publicly accessible for free, unless you are a university student or graduate.

<sup>7</sup> The same dilemma about restricted access, as noted in Footnote 6, which is an elitist issue in limiting wider access to knowledge.

*understand what we disagree on and why; (c) identify what the knowledge gaps are and (d) propose what studies and experiments are required to fill those gaps.”*

The above-identified workshop was part of the International Congress of Radiation Research (ICRR) held on August 26<sup>th</sup> and 27<sup>th</sup>, 2019 in Manchester, United Kingdom.

I provide the examples of these two papers (the latest of my own independent research) to prove there is a wide field of expertise in the global nuclear sector who function beyond the “closed loop” of international players led by the IAEA, the latter attempting to push forward – without empirical scientific evidence - experimental projects such as DGRs and SMRs, despite huge information gaps about the environment impacts.

In other words, the oft-repeated refrain from OPG, NWMO and CNSC in reference to an “international consensus” is exaggerated and not true.

## **RECOMMENDATIONS**

**#1** – (a) Conduct an investigation independent from the nuclear industry to gather evidence from the citizens in opposition to the currently proposed NWMO DGR, to expose the NWMO public relations spin about how it is engaging communities;

(b) Significantly reduce the power of the NWMO, after doing the above study, by updating the Nuclear Fuel Waste Act to strengthen the consensual rights of citizens.

**#2** – Create a federal study to investigate ‘Rolling Stewardship’ authentically, to fill in information which is *intentionally ignored* by the supporters of experimental DGRs as a legitimate option to allow a longer time period in which improved environmental knowledge is available and also to improve more genuine safety for future generations. (See Impact Assessment Act, section **22 (1) (e)**, which enables such an investigation.)

**#3** – To regain the trust of the Canadian public, remove the CNSC control to choose the chairperson and also other members of nuclear sector Impact Assessment reviews and, better, recreate a nuclear regulator body more independent from nuclear industry. Furthermore, delegate oversight of the nuclear industry to ECCC instead of NRCan.

**#4** – A public parliamentary debate is long overdue and essential, for the federal government to demonstrate its willingness to break apart the closed loop of nuclear control on information and decisions, and instead recognize the fuller democratic rights and legitimate environmental and human health concerns of Canadian citizens.