Feedback on Nuclear Industry Template Response to the CNSC Guidance Draft on DGR Site Characterization

by Dr. Sandy Greer, PhD ©

PREAMBLE

My feedback focuses on the nuclear industry template of comments regarding the CNSC draft for REGDOC-1.2.1, Guidance on Deep Geological Repository Site Characterization. The subsequent sections in this feedback will address each comment chronologically, in a methodological approach. The reader might want to printout the template to read the full industry comments, beside my feedback, for greater clarity.

To begin, I am disturbed by the `lock step' group mindset evident in the same template being submitted by four nuclear industry responders: Canadian Nuclear Laboratories, NB Power, Nuclear Waste Management Organization, and Ontario Power Generation. Interestingly, most of these nuclear players submitted a covering letter.

The exception is Ontario Power Generation (OPG), which provokes me to assume that personnel at OPG composed the letter, which then was sent out to the other players. Aside from the lack of courtesy of submitting a covering letter to identify itself, what is worse is the incorrect OPG's pdf heading, which reads: "Industry comments on RD 360 'Life Extension of Nuclear Power Plants.' " Discovering the OPG template with a heading that refers to another regulation reveals a careless arrogance when an accurate heading does not accompany a document. (Other players corrected the heading.)

What disturbs me most of all, as a Canadian citizen, is witnessing promotion of a nuclear waste repository, based on a specific conceptual design promoted through decades, yet which still has not been constructed anywhere in the world. Meanwhile, no independent thinking appears to exist within the Canadian nuclear industry, at least not as per full honesty to the wider public in regard to identifying technical and environmental issues that still are in the process of being understood, and improved upon. That is why those of us, sadly too few, who have done broader international research, are not able to trust the Canadian nuclear industry because of its lack of transparency in communications.

Instead, the Canadian nuclear industry looks arrogant and self-serving, in its belief that only its recognized experts know what is important, and repeatedly disregards the legitimacy of authentic independent research.

The Canadian nuclear industry also seems to assume that regulations exist only for its own purposes, rather than what I hope is the larger intention by any regulator, that

regulations are there - not just to guide industry so that people and the environment are protected - yet, moreover, to demonstrate its industry oversight to the wider public.

The final REGDOC-1.2.1 offers an opportunity for the Canadian Nuclear Safety Commission (CNSC) to strengthen public trust by demonstrating that its oversight upon the nuclear industry is *not* dictated by industry self-interest. Instead, the CNSC has the responsibility to stay up-to-date with the continuing improvements acquired through international research, in regard to technical processes and environmental awareness that will minimize the deleterious multiple impacts of radionuclides, through time, upon the occurrence of any unforeseen accidents, extreme weather events and human interventions that inevitably will happen.

The following sections in this sequential feedback might show some repetition, which I have tried to minimize except where "repetition" in fact happens intentionally, to highlight the pattern of industry critique regarding the CNSC draft of REGDOC-1.2.1. Each "COMMENT" refers to the sequence of `Comments' in the industry template.

COMMENT #1 – General

The industry template opens with criticism of CNSC's "extensive use of words like "should" and "recommended," arguing that such terms "could unintentionally lead readers to confuse guidance for requirements. The industry's `Suggested Change' basically "urges the CNSC to substitute the word `may' for `should' and `recommended' throughout the REGDOC."

I totally disagree with industry and, in fact, requested in my own initial comments that CNSC, instead, tighten up its guidance because its current wording sounds too lenient.

Interestingly, I discovered another CNSC document, "REGDOC 2.4.1 Deterministic Safety Analysis," in which it explains its use of the aforementioned terminology:

"The licencing basis sets the boundary conditions for acceptable performance at a regulated facility or activity and establishes the basis for the CNSC's compliance program for that regulated facility or activity.

Where this document is part of the licencing basis, the word "shall" is used to express a requirement, to be satisfied by the licensee or licence applicant. "Should" is used to express guidance or that which is advised. "May" is used to express an option or that which is advised or permissible within the limits of this regulatory document. "Can" is used to express possibility or capability" (page ii).

To sum up, CNSC has precise meanings attached to its chosen terms. Industry appears to want more leeway on the guidance, whereas I, as a concerned citizen, prefer more accountability from industry, which begins with CNSC guidance documents.

COMMENT "2 – General

Industry identifies its second comment as "Minor," even though the implications of its list of requests, from my perspective, point to several major alterations to the guidance.

The industry's narrow-minded interpretation of the guidance document's theme of `site characterization,' is perhaps the most regressive among all of the industry's suggestions for changes to the CNSC draft regarding guidance on deep geological repository (DGR) site characterization.

Industry writes: "Discussion of the **siting process** [my bold] throughout this draft distracts from the document's intended focus on site characterization." Under "Suggested Change," industry next "urges the CNSC to: (1) Remove Section 2 [titled `Overview of Siting Process'] and also (2) Remove all references to the siting process in other sections…," followed by further suggested deletions.

Section 2, however, in the CNSC draft recognizes what ought to be obvious, all four stages of an inclusive siting process are essentially interconnected from: `conceptual and planning' to a thorough `survey,' to do` site characterization' and arrive at a fulsome `site confirmation'. In contrast, the industry comment illustrates a worrisome piecemeal and disconnected perspective in regard to numerous technical processes which must be interrelated to determine the range of possible deleterious human and environmental impacts as well as ways to reduce them.

Another deletion suggested by industry in Comment #2 refers to the "opening sentence of Section 3.1.1." in which the suggested change is to remove "for tens of thousands of years" in reference to the period in which the DGR would remain safe. Here is the first time that I have seen industry indicate the human impossibility of trying to guarantee the safety of a DGR through such a long period into the future. This suggested deletion exhibits a refreshing bit of honesty, albeit fleeting.

The next suggested deletion again is problematic: "Delete the opening sentence of Section 4: `The siting process will collect information that will eventually be included in the safety case for a DGR." Why cannot industry understand the wisdom of the more inclusive meaning of "siting process," as I mentioned above?

The final suggested change by industry in its Comment #2 is to delete the first three paragraphs of Section 6, in which the purpose of the "underground research facility"

(URF) is outlined. Most importantly, the CNSC points out that – in the passages suggested for deletion by industry – URFs "have been conducted by other countries as a best practice for DGRs for high-level radioactive waste, including used nuclear fuel."

Given the repeated declarations by the nuclear industry in its public literature that it follows `international best practices,' why does it request deleting a pertinent description about a facility (URF), whose "activities reduce uncertainties and therefore provide a stronger safety case"?

COMMENT #3 – General

Here is an industry comment designated as "MAJOR," which goes so far as to suggest that, unless the current phraseology is changed, the `Impact on Industry" will result in "Potential for proponents to be misaligned with the regulatory framework.

Yet, here, as elsewhere later, the nuclear industry's criticism is premature when the Canadian regulatory framework is currently in flux, moving forward from the existing Environmental Assessment Act into an upcoming Impact Assessment Act which still is in draft phases.

More specifically, I disagree with the industry quibbling that the CNSC draft document has phraseology that is "not clearly aligned with the Class 1 regulations." For example, the industry comment reads:

"…the reference to `preliminary safety assessments' at this stage could be confused with the `preliminary safety analysis report' needed for the licence to construct… Additionally, the reference to `final safety assessment' in* Section 2.4, Site confirmation stage*, could be confused with the `final safety analysis report' needed for the licence to operate…".

The industry comment adds to the above, in reference to "initial licence application," that the latter "may only be a licence to prepare the site." But, if I recall correctly, the licence application for the DGR proposed for low-and-intermediate level radioactive waste near the shoreline of Lake Huron, combined two licences, preparation and construction respectively.

But more to the point, in reading pages 1 to 3 of the Class 1 Nuclear Facilities Regulations, both the `preliminary' and also `final' safety analysis reports refer *only* to "the adequacy of the design of the nuclear facility," apparently exclusive of other factors essential for a safety case.

Therefore, logically speaking, CNSC references for both `preliminary' and `final' "safety assessments" are much more *inclusive*, as they ought to be. Interestingly, in the 2014 reference document titled "Western European Nuclear Regulators' Association [WENRA], *Report*: Radioactive Waste Disposal Facilities Safety Reference Levels, a deeper reading of various pages reveals, first of all, a wonderful definition of `Safety assessment' on page 13: "Safety assessment entails evaluating the performance of a disposal system and quantifying its potential radiological impact on human health and the environment," followed by a full page or more, at page 78, providing a long list of factors to consider in a fulsome safety assessment.

Noteworthy is that the industry template, in later comments, dismisses the validity of CNSC including the 2014 WENRA publication, suggesting that it merely reiterates what already is published by the IAEA. But, my interpretation is that the CNSC is attempting to demonstrate the necessity to be aware of, and cite from, the latest international documents because of the ongoing improvements to tech and environmental processes.

COMMENT #4 – Section 1 (of CNSC draft)

The industry comment reads: "The term `several hundred metres or more below the surface' in the introduction could lead to confusion on how deep a DGR is expected to be."

Unless industry is requesting more specific depth ranges (doing so not evident above), the problem is that DGRs, indeed, are not appropriately distinguished from `Near Surface Facilities.' The lack of suitable measurements of depth is what can confuse not just industry but, also importantly, the wider public. Unfortunately, even on the CNSC web page focused on DGRs, the CNSC similarly refers to the underground facility as "usually at a depth of several hundred metres or more below the surface."

It took a lot of research to find a document that distinguished the depth of a DGR from the depth of a `Near Surface Facility.' My research was done a couple of years ago to challenge the misinformation given to the Canadian public by OPG's CEO at that time, who declared nationally on CTV's ***W5*** episode aired April 1, 2017, that nine DGRs were operating in the world – totally untrue then and now. This misinformation, not interrogated by investigative journalists, sadly indicates the crisis in Canadian journalism. But I digress.

In emails immediately after the TV broadcast with one of the OPG communications personnel, he tried to justify the CEO's public statement, which I strongly challenged. More to the point of my feedback on the industry comments for REGDOC-1.2.1, I recently looked up the web page of the World Nuclear Association, which has been updated as of October 2018, which distinguishes the respective depths as follows:

"Near-surface disposal at ground level, or caverns below ground level (at depths of tens of metres)"

"Deep geological disposal (at depths between 230m and 1000m for mined repositories, or 2000m to 5000m for boreholes)"

See http://www.world-nuclear.or/information-library/nuclear-fuel-cycle/nuclear-wastes/storage-and-disposal-of-radioactie-wastes.aspx

To finish my feedback on industry comment #4, I totally disagree with its suggestion to omit the vague CNSC depth measurement altogether, and not replace something more specific. If industry seeks clarity then, in turn, it ought to aspire to communicating more accurate information itself to the larger public.

COMMENT #5 – Section 1.3 (of CNSC draft)

Briefly here, as I stated previously, the industry suggestion that CNSC's Section 1.3 "should simply refer to the current legislation or note that a new process is under review" is not relevant to the reality that Canada is in a transition of legislation. Moreover, the wider public needs to be aware that this CNSC guidance is one document in a series of regulations that currently are being updated. The either/or industry proposition, to refer either to existing regulation or upcoming, does not make sense.

COMMENT #6 – Section 1.4 (of CNSC draft)

I do not understand why industry questions the CNSC statement in the final paragraph of this section - which reads in part "CNSC staff may also request data, results and materials from the site characterization activities, in order, for example, for the CNSC to conduct independent research – by the industry comment stating: "Such research may not be perceived as independent."

What I disagree with more explicitly is, under the comment segment `Suggested Change,' when industry suggests the deletion of the concluding phrase in the CNSC sentence "in order, for example, for the CNSC to conduct independent research."

The CNSC, as a regulator, has every right to conduct whatever `independent research' that it sees fit to carry out, even though sometimes the public might question how genuinely "independent from industry" certain research has been done.

I recall two public hearings on the DGR proposed for low-and-intermediate-level radioactive waste, in which the Joint Review Panel repeatedly made requests to the

OPG to provide pertinent data which was missing, and which ought to have been collected prior to the two needed public hearings on environmental assessment. The second hearing was called to gather as much of the previously missing data as possible.

As a closing remark about the significance of "independent review," I will quote from IAEA's "The Safety Case and Safety Assessment for the Disposal of Radioactive Waste (SSG-23), 2012:

"Peer review should entail a formally documented examination of a technical programme or specific aspect of work by a suitably qualified expert or group of experts who have not been directly involved in the development of the safety case and have no direct interest (e.g. financial or political interest) in the outcome of the work (PDF page 58)."

The above excerpt can be found in "IAEA, Safety Standards Series, No. SsG-23, *The Safety Case andSafety Assessment fro the Disposal fo Radioactive Waste,* Specific Safety Guide, Vienna, 2012" which is reference number 8 in this CNSC draft.

COMMENT #7 – 3 (Site Characterization Program, in CNSC draft)

The industry's suggested change is to remove a sentence in this section of the CNSC draft, a sentence which industry suggests is not clear, in reference to the second sentence of the fourth paragraph which reads:

"Specific criteria provided for the collection of baseline data may not be exhaustive and may constitute recommendations."

I totally disagree with this suggested removal, again based upon my aforementioned witnessing of the numerous requests for missing information by the Joint Review Panel (JRP) at two public hearings, the second hearing called as an attempt by the JRP to enable OPG to fill the numerous gaps in information.

My interpretation, therefore, of this sentence inclusion by the CNSC, is to avoid the same pitfall of numerous requests for belated information at future public hearings which ought to have been provided much earlier in the environmental assessment process by industry.

COMMENT #8 – 3 (Site Characterization Program, in CNSC draft)

As a citizen, I partly disagree with industry suggesting the removal of all of paragraph five, within Section 3, because it is beneficial to remind everyone, from time to time,

that the entire trajectory of a DGR project encompasses a sequence of processes through an extended time period.

However, as I stated earlier, CNSC does insert "a time frame of tens of thousands of years or more" in reference to the long-lasting `post-closure' period. I do agree with industry that this forever time frame is unrealistic as per any guarantee of safety and, therefore, needs to be deleted from any DGR documents, henceforth.

COMMENT #9 – 3.1 (Site characteristics I: geological environment, in CNSC draft)

Here I agree with industry, as per its suggested change "to clarify that future [geologic] stability can only be expected or projected – although "expected" might be stretching it.

The current sentence in the CNSC draft, that requests inclusion of factors related to "past **and future geological stability** [my bold] of the site" is simply not realistic, given climate change and yet unknown consequences from extreme weather events through time.

Industry's suggestion to change that phrase to read "expected/projected" in order to replace the existing "future" reference is an improvement. Nevertheless, such a long time frame, in my view, is beyond what human prognostications ever can know.

COMMENT #10 – 3.1.3 (Geochemistry subsection, in CNSC draft)

Industry critiques the current text of the CNSC draft in this section, as per the final sentence which reads:

"Any process that can be shown to demonstrate the potential for radionuclide migration or retardation from the DGR engineered facility through the geological environment should be documented."

I totally disagree with industry's suggested change so strongly that I also cite it here:

Revise the sentence to read, `Any process that can be shown to demonstrate the potential for credible and/or significant radionuclide migration or retardation from the DGR engineered facility through the geological environment should be documented."

The integrity of the existing CNSC sentence needs to be retained, for several reasons. First of all, no definition in Canadian regulations yet exists to define `significant

adverse effects,' which enabled OPG to be permitted to overlook potential future impacts and neglect the proper identification of potentially problematic impacts.

Secondly, the mention of "cumulative effects" is totally missing in the CNSC draft, which I suggest needs to be inserted. The fact remains – a fact that I repeatedly have identified in almost every submission through the past six years about DGRs – that the eventual, and inevitable, multiple impacts of a range of radionuclides upon various aspects of an ecological system, from single organisms and their respective internal organs to the interactions between toxins and across environmental media, are still in the early years of being scientifically understood. In other words, even what might be assumed by industry to be negligible amounts of released radionuclides can increase through time in so many ways. `Cumulative effects' need much better acknowledgment both by industry as well as by the CNSC.

COMMENT #11 – 3.1.4 (Geological stability subsection, in CNSC draft)

I disagree with the industry's suggested amendment to the original CNSC sentence which reads:

"The site should be located in a seismically stable region, with low potential for seismic or volcanic events."

The industry 's suggested change to the above-written CNSC statement reads:

"The site should be located in a seismically stable region, with low potential for ***large magnitude*** [my bold] *seismic or volcanic events."*

It is publicly known, through increasing seismic events in recent years globally, that such events are accompanied by several aftershocks. Whether a seismic event happens in and of itself, or also accompanied by aftershocks, even the initial occurrence could cause the initiation of fractures in rocks which, in turn, could cause accessibility of water which, ultimately, could rupture manmade containers in DGRs.

The original CNSC sentence addresses this fuller possibility more realistically.

COMMENT #12 – 3.2 (Site characteristics II: surface environment, in CNSC draft)

Briefly, the industry criticism, as earlier, is nitpicking and premature, in suggesting that: "The relationship between section 3.2 and the impact assessment legislation should be clarified."

The possible caveat in my own criticism is to interpret the industry comment as a request for clarification from CNSC to spell out more clearly that the Canadian legislation is in flux as per regulations pertaining to the proposed DGRs.

COMMENT #13 – 3.2.1 (Climate subsection, in CNSC draft)

I agree with industry in its suggestion to remove "snow" in CNSC's references to "precipitation and snow," because the definition of `precipitation' includes snow.

But, I disagree in regard to the industry suggested change to eliminate mention of the site, and instead the revised text to refer only to "regional"phenomena that include extreme and average data on temperature, precipitation, wind speed, and more.

`Local data' as well as `regional data,' the former which includes a potential site, needs to be included in all relevant studies and tracking changes particularly in climate phenomena, because the site could exist where anomalies are possible as per the overall ecosystem functioning and, more so, given how ecosystems will transform through time to present yet unknowable alterations at, and surrounding, the DGR site.

COMMENT " 14 – 3.2.3 (Topography, hydrology, and flooding subsection, CNSC)

Industry seems at times to contradict itself, when as above looking to regional data, yet here dismissing the validity of certain types of regional data where, in my perspective, it is highly pertinent to collect it – namely, in reference to the water table.

I disagree with the industry suggestion that "Information on regional water table characteristics, including seasonality, may not be pertinent to the site, or needed in detail; this would need to be assessed in site-specific context." I also disagree on industry's suggested change that references to drainage systems be applied *only* to "surface water along with flooding and storm water management."

Looking back once again to what I witnessed in the two public hearings for the proposed DGR for low-and-intermediate-level radioactive waste, one of the major flaws by the OPG was to focus only on local and site studies, with no regard for the interrelated larger ecosystems and bioregion, thus exhibiting no comprehension about the interrelatedness of a functioning interwoven fabric of ecosystems in the larger bioregion and beyond.

I add, however, that OPG was enabled to overlook such pertinent environmental data because of inadequate regulations. Therefore, CNSC as well as the upcoming Impact Assessment Act, must carry out more rigour in creating improved regulations.

COMMENT #15 – 4 (Human Activities and Land Use, CNSC draft)

I disagree with the industry comment that "known and potential for competing land-use activities at the proposed site" would be unclear, when you simply can look at existing land uses. For example, in mid-western Ontario where two municipalities are competing for the proposed DGR delegated to contain used fuel bundles, a primary land use is agricultural, the latter one of three drivers of economic activity regionally. Further north, where three other rural municipalities still compete as well for the same proposed DGR, I am assuming that current hunting and trapping grounds, especially designated for Indigenous traditional use, could be impacted, aside from the question about nearby areas where previous types of mining activity existed, with the prospect of future explorations not yet on record. (As per the latter, industry does recognize "resource potential" in its comment.)

Therefore, the second bullet in the second paragraph of the CNSC draft of Section 4 ought to be retained.

COMMENT #16 – 5.3 (Sampling and testing procedures subsection, CNSC draft)

I do not understand the industry comment that says "It is unclear why these items are listed in the section on sampling and testing procedures," in reference to a subsection within Section 5 which is titled "Data Acquisition and Verification Activities."

Instead, the detailed description about `borehole drilling' is self-explanatory as per its location in a separate subsection of Section 5, rather than be located under Section 3, which is the suggested change by industry.

For further clarification about the extensive attention given to boreholes, however, perhaps the CNSC could add a bibliographic reference about `borehole drilling and testing' thoroughly provided on the Nuclear Waste Management Organization's web pages dedicated to that topic at https://www.nwmo.ca/en/Site-selection/Steps-in-the-Process/Step-3-Preliminary-Assessments-of-Suitability/Step-3-Phase-2-Field-Studies-and-Engagement/Borehole-Drilling-and-Testing.

COMMENT #17 – 6.0 (Facilities for Verification and Characteristic Activities, CNSC)

Briefly, I again disagree with the industry making a second suggestion – the first made in its Comment #2 – to delete the first three paragraphs shown in Section 6.0 that outline "underground research facilities"(URFs).

In my feedback submission, go back to the two bottom paragraphs on page 3 and also read the conclusion on the top of page 4, in which I explain my disagreement.

I will add here, however, that it would be reasonable for CNSC to be more direct, as per its detailed reference to URFs, in spelling out whether it is willing to work with industry and discuss the pros and cons of setting up a Canadian URF. Such a discussion could explore the benefits and problems of already-existing URFs in other countries, as well as determine regulatory protocols if a Canadian URF were agreed upon.

COMMENT #18 – References

The industry comment here is incorrect in identifying only one location in the CNSC text where WENRA is cited. In fact, reference to WENRA is cited twice in Section 3, the Site Characterization Program. Bibliographic references usually are cited only once, as is the case for all other listed references in this guidance document.

Furthermore, contrary to what industry suggests, the WENRA publication – whose full name is "Western European Nuclear Regulators' Association, *Report*: Radioactive Waste Disposal Facilities Safety Reference Levels, 2014" – does have relevance as a citation source in this CNSC draft guidance on DGR site characterization, for reasons that I identified earlier, in the bottom two paragraphs of page 4 and top of page 5 in this feedback submission. My browsing discovered more than what industry noted.

I am left wondering whether the nuclear industry personnel who wrote the template even read the full WENRA document. Why I wonder is the fact that industry's criticism of WENRA appears to be based on WENRA's `Table of Contents,' which locates Site Characterization solely on page 42. Under Comment #18 here, the industry template reads: "site characterization is only mentioned at a very general level (p. 42)."

My Own Closing Comment

My own final suggestion to CNSC is to request that it identify the years and page numbers for its respective referenced citations, which would help readers look up the fuller context of the information. In other words, provide footnotes as well as the bibliographic references.

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