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Written Submission from

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In the Matter of

Ontario Power Generation Inc.

Proposed Environmental Impact Statement for OPG's Deep Geological Repository (DGR) Project for Low and Intermediate Level Waste

Joint Review Panel

September 16 to October 12, 2013

Mémoire de

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À l'égard de

Ontario Power Generation Inc.

Étude proposée pour l'énoncé des incidences environnementales pour l'Installation de stockage de déchets radioactifs à faible et moyenne activité dans des couches géologiques profondes

Commission d'examen conjoint

16 septembre au 12 octobre 2013

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DGR Joint Review Panel Hearing Written-only Submission August 13, 2013

Submission to Joint Review Panel Hearings for OPG Proposed Deep Geological Repository for Low and Intermediate Level Radioactive Wastes

Mary Lou Harley, PhD

Thank you for this opportunity to comment on the proposal[i] by Ontario Power Generation Inc. (OPG) to prepare a site, and to construct and operate a Deep Geologic Repository (DGR) Project for low-level and intermediate-level radioactive wastes (L&ILW) on the existing Bruce nuclear site. The proposal requires approval of the Environmental Assessment and the successful application for licenses to prepare the site, to construct, and to operate. Importantly, all except the application for the license to operate is under consideration by this Joint Review Panel.

The proposed DGR Project would receive L&ILW that is currently stored on the Bruce nuclear site, as well as additional L&ILW produced from the generating stations in Ontario owned by OPG. The design capacity is nominally 200,000 cubic metres of packaged L&ILW with flexibility for future expansion to handle the as-yet-unknown additional quantity of wastes of unknown characteristics. Intermediate-level radioactive wastes can include highly radioactive materials except irradiated fuel.

I am assessing this proposal from my background as educator and researcher in chemistry, and consultant in environmental issues often addressing contradictory information in controversial industrial issues. Since 1993, much of my work on nuclear issues has been on behalf of the United Church of Canada, addressing environmental, social, and economic considerations within a framework of ethical principles. I was one of the principle writers for the submission to the Nuclear Fuel Waste Management and Disposal Concept Environmental Assessment Panel[ii] and to the federal government on its response to the Seaborn Panel[iii], as well as the many submissions to the Nuclear Waste Management Organization (NWMO)[iv]. I am the principle researcher and author of the United Church resource on nuclear issues[v]. As well, I represented the United Church in dialogues and workshops held by NWMO, including the workshop to define the nature of the hazard of nuclear fuel waste. Therefore, I wish to be clear that this submission is my personal opinion.

OVERVIEW

The proposal is a concept with a significant number of proposed studies drawn together in a site-specific experiment. As such there is an unacceptable level of uncertainty and many unknowns.
The precautionary manner proposed to avoid or mitigate possible adverse effects in some aspects of the site preparation and early construction phases are reasonably presented by OPG/NWMO and critiqued for improvement by the Canadian Nuclear Safety Commission (CNSC) and some federal government departments. However, the safety case for the operation and particularly for post-closure presented in the Environmental Impact Statement (EIS)[vi] and supplementary documents is totally inadequate.

The environmental assessment fails guiding principle 2.1[vii]:
For the operation through to post-closure phases, the predicted possible environmental effects, the proposed measures to mitigate adverse effects, the predicted effectiveness of the mitigation, and the conclusions about what can be screened-out can carry no weight. Too much of the necessary input for those predictions remains to be determined by studies proposed by OPG/NWMO[viii] and by additional research including that recommended by CNSC and some federal government departments in their final submission to the Panel.

The environmental assessment fails guiding principle 2.5:
While it is not uncommon for there to be some aspect of a proposed development for which there is some scientific uncertainty in the prediction of effects, in the proposed DGR the unknowns and number of aspects for which such uncertainty exists are indicative of the experimental nature of the proposal.

Coupled with the large degree of uncertainty is the potential for high risk, given the highly radioactive wastes that can be classified as intermediate-level wastes. The Great Lakes system is at risk from the nuclear facilities on its shores; however, adding another risk into the belly of its shoreline bedrock in the form of an DGR experiment could add to, not reduce, the hazard level.

I recommend that the Joint Review Panel reject the proposal.
The current storage of L&ILW can continue safely, and research can be on-going, particularly in aspects of DGR that are not site-specific, to reduce the uncertainties and address some of the unknowns.

CONSIDERATIONS

I make these comments aware of the importance of the Great Lakes system to Canada and the United States, and the reality that this system is already under stress. These waters are important for drinking water, agriculture, transportation, industries (including manufacturing, fisheries, power generation), recreation, and for many they are a sacred trust as a life source. Contaminants in Lake Huron are retained within the Great Lakes system for decades.

Safety of a proposal from a technical perspective requires reliable evaluation of inherent hazards and potential risks. Then safety is a societal evaluation to determine the acceptability of that level of risk. I contend that the safety of the proposed DGR has not been adequately demonstrated; consequently, the risk of negative impacts to the Great Lake system is unacceptable

The time was short between the final postings of Panel Member Documents and government departments, and the deadline for this submission. I list some points briefly and address points in the CNSC submission in more detail.

General Comments

Submissions[ix] point out the need for further refining of and more conservatism in the models; for more baseline data; for more conservatism in the design; and for additional mitigation measure. There are repeated comments on potential effects and recommended monitoring to determine the level of effects and effectiveness of the proposed mitigation

Inadequate information to allow for a complete review with respect to provincial environmental permits and approvals is cited in the submission by the Ontario Ministry of the Environment[x]. Compliance with the Ministry's limits and guidelines must be properly demonstrated; those requirements are known to OPG and should have been demonstrated in the EIS as they are basic requirements.

There appears to be overconfidence in the predictive modelling by OPG of radiological releases during the Abandonment and Long-term Performance Phase. Government departments that concur with OPG's conclusion that a radiological ERA is not warranted are overlooking the significant fact that the characteristics of the wastes that will be in the DGR are in question. Further, the modelling has been termed in need of updating and there are significant unknowns relevant to this modelling.

The assumptions that support the conclusions need verification. Given the uncertainty of wastes characteristics to be emplaced during facility's operation, it would be imperative that alpha emitters be part of on-going monitoring, mitigation, and response plans, as well as tritium and gross beta. For example, the assumption of no need for monitoring for alpha emitters has been countered by a recommendation by Environment Canada[xi] for radon to be included in monitoring of ventilation exhaust to verify levels predicted.

In general, plans are missing from the EIS for response and mitigation that could be deployed in time to prevent local area or downstream effects from unanticipated parameters of concern, and events such as spills, beyond-design events, releases in higher concentrations than predicted, and releases of unpredicted radionuclides or other hazardous chemicals.

The need for institutional controls to restrict access to a DGR has to be addressed by OPG and NWMO to determine options for longer term safety.

Comments Specific to CNSC PMD 13-p1.3A

In the website article on *CNSC Research on Geological Repositories*[xii], CNSC acknowledges that significant research is required on specific aspects of geological repositories.

> *The CNSC participates in collaborative research with several Canadian universities and international research institutes. . . Future research projects will focus on waste characteristics, engineered barriers (in particular the sealing material), and geosphere issues.*

It is not surprising then that these very areas of future research: waste characteristics, sealing material, and geosphere issues, are primary aspects of the DGR proposed by OPG that are riddled with unknowns and uncertainties, contested points in modelling, questioning of assumptions and calls for research and verification of conclusions.

In CNSC (Panel Member Document) PMD 13-p1.3A[xiii], support for the DGR project is couched in optimistic expectation of adequate and supportive outcomes of future research by OPG outlined in a Geoscientific Verification Program and the additional research by OPG itemized in the CNSC staff recommendations, including

- a research program on the longevity of shaft seals
- an experimental program to characterize the time-dependent properties of the host and cap rock
- a review and revision of the long-term geomechanical model
- a review and revision of the safety assessment
- improved waste characterization.

The Geoscientific Verification Program of research is to try to address a number of uncertainties including uncertainties in methods, such as the uncertainty of the ability of seismic surveys performed from the surface to detect deep faults, and site-specific uncertainties, such as the properties and extent of the Excavation Damaged Zone.

CNSC is recommending OPG develop and conduct a research and development program on the longevity of shaft seals because no precedent exists for the long-term stability of sealing shafts. Anticipating an engineering solution to this as-yet-unsolved issue, CNSC is recommending that this research can be done during the term of the site preparation and construction licence.

Accurate characterization of waste inventory (quantity, activity level, types of emitters, chemical profile, changes over time) is critical in safety assessment. OPG has poorly characterized the waste both in its method of estimated measure for beta and alpha emitters, which has associated uncertainties, and its failure to address the highest risk materials that can be classed as intermediate level waste. CNSC has stated in PMD 13-p1.3A

> *Should OPG apply for an operating licence in the future, CNSC staff would require an enhanced waste characterization program to provide statistically valid data for the updated long-term safety case that will be required in the licence application.*

Importantly, by this statement, CNSC is admitting that the assessment of the long-term safety case in the EIS is unacceptable for assessing long-term safety, that the waste characterization done for the EIS does not provide statistically valid data.

There is no justification for acceptance of a long-term safety case in support of establishing a development when that safety case will not meet the requirements that apply to an operating licence. It appears that CNSC is accepting it in this instance not as a development but as a research project, for which safety can only be assessed at this time if it remains non-operational.

For uncertainties in Generated Gas Pressure, the dependence of the calculation of the potential for gas generation on the detailed characterization of the inventory is critical. Calculation of the potential for gas generations based on the characterization of the waste inventory used by OPG is not acceptable because the waste characterization is not acceptable.

Additionally, factors affecting gas generation and migration depend on physical and chemical process, including microbial processes for which modelling is at the early research stage. While CNSC concluded that OPG

made the best use of existing information for these processes, the uncertainty in the modelling added to the poorly characterized inventory renders the calculations on gas generation meaningless.

OPG has committed to do research on gas generation processes. It is yet another aspect indicating that is premature to move toward a DGR.

In the report describing the Geoscientific Verification Plan (GVP), it is acknowledged that the planned research studies are required to support the DGR safety case. In other words, the safety case submitted in the EIS is not sufficiently supported.

OPG commitment to do research must not be accepted in place of valid information in the decision to be taken on the EIS and licensing applications. Much of this work needs to be done **before,** not after commitment is made to accept this concept, and site preparation and construction are licensed. Clearly, some uncertainties relate to site-specific or waste-specific characteristics; however, significant aspects requiring research to reduce the uncertainties and unknowns are general issues for geological repositories or methods and modelling.

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[i] OPG. 2005. *Deep Geologic Repository for Low and Intermediate Level Radioactive Wastes – Project Description*. November 2005. 00216-REP-07722.07-00001. http://www.ceaa-acee.gc.c+a/050/documents/39411/39411E.pdf

[ii] UCC (United Church of Canada). 1996. *A Submission from The United Church of Canada to the Public Hearings of the Canadian Environmental Assessment Panel Reviewing the Nuclear Fuel Waste Management and Disposal Concept*.

[iii] UCC (United Church of Canada). 1999. "Comments Relating to the Government Response to Recommendations of the Nuclear Fuel Waste Management and Disposal Concept Environmental Assessment Panel." A Submission to Natural Resources Canada.

[iv] See the archives at NWMO website

[v] United Church of Canada (principle author ML Harley). 2008. *Always Changing Forever Yours: Nuclear Fuel Wastes*. Three Workshops and Leaders Guide available at www.united-church.ca

[vi] OPG. 2011. *OPG's Deep Geologic Repository for Low and Intermediate Level Waste – Environmental Impact Statement Volume 1: Main Report.* Prepared by Golder Associates Ltd. March 2011. 00216-REP-07701-00001-R000. http://www.ceaa-acee.gc.ca/050/documents_staticpost/17520/49818/vol1.pdf

[vii] CNSC. 2009. *Guidelines for the Preparation of the Environmental Impact Statement for the Deep Geologic Repository for Low- and Intermediate-level Radioactive Wastes*. January 2009. e-DOC: 3808854. http://www.ceaa-acee.gc.ca/050/documents/39323/39323E.pdf

[viii] OPG. 2011. *OPG's Deep Geologic Repository for Low & Intermediate Level Waste-Geoscientific Verification Plan.* Prepared by Nuclear Waste Management Organization. March 2011. NWMO DGR-TR-2011-38. e-DOC: 3709321. http://www.aceeceaa.gc.ca/050/documents_staticpost/17520/49820/geoscientific.pdf

[ix] for example:
NRCan submission to the Joint Review Panel. July 23, 2013 http://www.ceaa-acee.gc.ca/050/documents/p17520/92038E.pdf
Environment Canada submission to the Joint Review Panel. July 23, 2013 http://www.ceaa-acee.gc.ca/050/documents/p17520/91967E.pdf

[x] Ontario Ministry of the Environment submission to the Joint review Panel. July 27, 2013 http://www.ceaa-acee.gc.ca/050/documents/p17520/92382E.pdf

[xi] Environment Canada submission to the Joint Review Panel. July 23, 2013 http://www.ceaa-acee.gc.ca/050/documents/p17520/91967E.pdf

[xii] http://nuclearsafety.gc.ca/eng/about/regulated/radioactivewaste/research-geological-repositories.cfm

[xiii] CNSC (Panel Member Document) PMD 13-p1.3A submitted to the Joint Review Panel. July 19, 2013 http://www.ceaa-acee.gc.ca/050/documents/p17520/91965E.pdf