

**DGR Joint Review Panel Hearing Written Submission
in Support of an Oral Intervention**

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**Deep Geologic Repository for Low and Intermediate
Level Radioactive Waste Project:**

A proposal by Ontario Power Generation to prepare a site, and construct and operate a facility for the long-term management of low and intermediate level radioactive waste at the Bruce Nuclear site, within the Municipality of Kincardine, Ontario.

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Introduction

The Canadian Nuclear Society (CNS), established in 1979 and independently incorporated in 1998, is a not-for-profit learned society with a national membership of about 1200. The CNS is dedicated to effective communication on the peaceful applications of nuclear science and technology, both within the technical community and with the general public. CNS members join as individuals (there is no corporate category of membership), and are drawn mainly from the various fields within the nuclear science and technology community, including R&D, operations, designers, academia, and administration.

The CNS welcomes this opportunity to comment on Ontario Power Generation's (OPG's) proposed Deep Geologic Repository (DGR) for Low and Intermediate-Level Radioactive Waste (L&ILW). The safe, efficient and effective long-term management of waste materials produced by Canada's nuclear industry is a vital part of Canada's nuclear infrastructure. The proposed DGR can play an important role in ensuring that Canada's L&ILW materials are managed for the long term.

This document will focus on three aspects of the proposed DGR project: justification, technical support, and public consultation.

Justification

The nuclear power industry in Canada has operated in an ethical and responsible fashion for over 50 years, managing its waste radioactive material (low, intermediate, and high level) with due respect for the material's unique technical requirements, as well as the safety of citizens and the environment. The generation of this waste radioactive material, at all levels, stems from an industrial process that supplies half of Ontario's electricity with minimal impact on the environment, through a sustainable life cycle. Canadians enjoy a high standard of living due to this process, and expect a high standard of environmental stewardship to accompany the process from start to finish, for as long as its waste products remain a significant hazard.

Since 1976 OPG (initially as Ontario Hydro) has managed its L&ILW waste through treatment and storage at its Western Waste Management Facility (WWMF), a centralized facility located at the Bruce nuclear site in the Municipality of Kincardine. Currently about 84,000 m³ of waste material are stored at the WWMF – almost 90% of it classified as Low-Level Waste (LLW - common industrial items from clean-up and maintenance at power reactor sites), and roughly 10% as Intermediate-Level Waste (ILW – more highly radioactive disposable items from reactor operation and refurbishment). Over the remaining lifetime of Ontario's current reactor fleet (including life extensions after refurbishment), about 200,000 m³ in total volume of L&ILW (including added DGR container volume) are expected to be produced.¹

¹ *Environmental Impact Statement Summary, OPG's Deep Geologic Repository for Low and Intermediate Level Waste*, Ontario Power Generation, March 2011.

It is appropriate that an industry take responsibility for the management of its waste material, over both the short term and the long term. In this respect, the nuclear industry is a leader among other industries, and this despite the fact that radioactive waste is the only form of industrial waste that, without external influence, becomes less toxic on its own (through radioactive decay). This unique characteristic plays an important role in the long-term safety of the proposed DGR, but is only one of many physical barriers, both engineered and natural, that ensure the long-term isolation of the L&ILW material from the biosphere.

The current interim storage of L&ILW material at the WWMF is safe, and the initiative by the Municipality of Kincardine and OPG to pursue a DGR project does not reflect a lack of confidence in the current process. Rather, it reflects a sense of social responsibility and environmental sustainability, and a recognition of the increasing resources needed to actively manage the growing volume of L&ILW in above-ground structures. Given the current and projected volumes of L&ILW at the WWMF, it is appropriate for OPG and the Town of Kincardine to begin a process now for long-term management of this material.

This process included choosing between a number of potential options for future L&ILW management. This decision process followed an Independent Assessment Study (February 2004), which verified the technical feasibility of the various options, and a period of stakeholder and aboriginal consultation. It is notable that OPG's decision to choose the DGR approach was based upon a recommendation by Kincardine Council, citing reasons that this option offered the highest margin of long-term safety among the technical options studied, was consistent with best international practice, provided economic benefit to the residents of the municipality, and offered a permanent solution for all L&ILW (i.e., deep geologic disposal is the only option that can manage long-lived ILW).²

Technical Support

The primary purpose of the DGR is the long-term sustainable management of L&ILW, and therefore the science to support minimal short-term and long-term risk to the biosphere must be present. There can be no undue uncertainty in the conclusions of technical experts, in all relevant fields of physical and social science, as to the sustainability of the project if it is to proceed.

This determination is at the heart of the Environmental Assessment (EA) process. We note that the DGR project, through the EA, has undergone a broad scope of technical evaluation looking at potential impact on the biosphere – including atmospheric environment, hydrology and surface water quality, geology, aquatic environment, terrestrial environment, socio-economic environment, aboriginal interests, radiation and radioactivity, and malfunctions, accidents and malevolent acts. The outcome of these evaluations, reported in the Environmental Impact Statement (EIS) and summarized in the EIS Summary, is that there will be no long-term impact from the DGR on the biosphere.

² Ibid.

One of the important and unique physical characteristics of L&ILW that plays a role in this analysis is the natural radioactive decay of the material itself – in effect, transforming the material into non-radioactive material over the period that it is isolated within the repository. This immutable, natural process is one of many physical barriers, both engineered and natural, that ensure the long-term isolation of the L&ILW material from the biosphere. The principle of relying upon a multiplicity of diverse and layered barriers, both natural and engineered, to provide confidence in the long-term isolation of L&ILW, is known as “Defence in Depth”. This principle is central to the safety approach behind most critical infrastructures in modern society, from air travel to agriculture – and including the nuclear industry.

A key feature of the Defence-in-Depth principle applied to the proposed DGR is the geology of the site itself, which determines the site’s suitability as a long-term repository for L&ILW. In other words, regardless of the robustness of containers used in the emplacement of L&ILW, it is the natural host and surrounding environment of the DGR that ensures the long-term isolation of the waste material. In the case of the DGR project, specialists from over 20 universities, specialized laboratories, and consultant groups contributed to the four-year site-specific geoscientific investigation, supported by experience of the international scientific community with similar investigations. These studies considered the predictability of the host environment (ease of characterization), the degree of multiple natural barriers to release from the DGR (such as low-permeability rock), the mechanism by which contaminants might move in the rock if they could, the geomechanical and seismic stability of the rock, the future economic attractiveness of the rock, and the level of isolation of nearby shallow groundwater sources.

These studies have concluded that the DGR site suitability is high, mainly due to the low permeability of the host rock, and the long-term isolation of groundwater at the DGR’s depth from shallow water supplies. This is an important point: the site is suitable because Nature herself has isolated the water in the host rock for hundreds of millions of years. There are several examples around the world where “natural analogues” of similar isolation capability exist, lending credibility to the DGR concept – including in Saskatchewan, where the world’s richest deposits of uranium have sat for millions of years without movement and with no radioactive signature at the earth’s surface, protected from groundwater flow – much greater than that which the DGR will ever experience – by naturally-occurring, low-permeability buffer material.^{3,4}

It is noted that the process of emplacement is reversible, should retrieval of L&ILW be required – although this is not expected.

Public Consultation

As an organisation dedicated to effective communication on nuclear issues with all stakeholders, the Canadian Nuclear Society views with interest the level of public engagement associated with the DGR

³ "Natural Analogues of Waste Repositories," *Nuclear Energy*, vol. 29, no. 2, p.86, April 1990.

⁴ J. Cramer, "Cigar Lake: A Natural Example of Long-Term Isolation of Uranium," *Radwaste Magazine*, vol. 2, no. 3, p.35, May 1995.

project. We note that, regardless of the convincing justification and technical merit for the DGR, a project of this nature will often stand or fall on its public perception.

Stakeholder engagement is of course an integral part of the EA process, and there appears to have been significant public consultation to date, as well as that currently in progress and planned for the future. Nevertheless a number of aspects of the DGR project have the potential to be points of concern for certain stakeholders, particularly those living on the shores of Lake Huron and in the downstream communities. On the face of it, the simple proximity to the lake itself can cause concern, particularly if one doesn't fully appreciate the geoscience arguments that likely make the DGR one of the safest and most sustainable proposals from any Canadian industry for dealing with its long-term waste legacy.

The proponent is encouraged to continue engaging the public on this issue, and to seek effective ways to communicate the safety of the project to all stakeholders – in particular, the role played by the natural barriers, and the high level of confidence that the scientific community has in these barriers, based partly upon natural analogues. Although relying heavily upon natural processes and characteristics, this remains a highly technical subject, and therefore the value of effective communication of this key concept to a general audience cannot be underestimated.

The proponent is also encouraged to engage as wide a stakeholder community as possible, beyond that typically engaged for the purposes of EA consultation. The CNS observes that both the *management of radioactivity* and the *management of water resources* are top-of-mind concerns for Canadian and American citizens alike. Put another way, the enormity of the lake that this project proposes to sit beside, is matched only by the enormity of the nuclearphobic meme that sits at the root of the average stakeholder's perception of this project.

Summary

The proposed DGR project is an ethical approach to sustainable waste management, addressing a large volume of current L&ILW that is destined to grow significantly larger in the near future. The technical risks associated with the proposed DGR are minimal, as shown by a broad scope of environmental interaction studies, and the study of the geology of the site itself. Of most importance to the well-being of stakeholders in this project, and therefore to the well-being of the project itself, is the breadth and clarity of public communication on the safety of the DGR. The value of effectively addressing the social side of the safety risk analysis cannot be underestimated.

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