Deep Geologic Repository Project for Low and Intermediate Level Radioactive Waste – Environmental Impact Statement and Licence to Prepare Site and Construct Application

Information Request Report # 2 to the Joint Review Panel

Prepared by: Canadian Environmental Law Association

May 2012

IR #	Sections in EIS Guidelines	Title and Section in OPG's EIS	Request for Additional Information	Rationale
1.	2.5 Precautionary Approach	3.3 Alternatives to the Project Independent Assessment of Long-Term Management Options for L&ILW at OPG's Western Waste Management Facility, by Golder Associates Ltd., 2004	Please describe how the alternatives to the proposed DGR Project were evaluated and compared in light of risk avoidance, adaptive management capacity, and preparation for surprise. Provide the following information in your response: a) Define risk avoidance, adaptive management capacity, and preparation for surprise. b) Describe how the three criteria were applied (by themselves or as components of a more comprehensive set of criteria for comparative evaluation) as a framework for evaluating and comparing the alternatives to the project, considering a range of plausible scenarios including accidents, malfunctions and malevolent acts. c) Describe how each alternative performs in relation to the three criteria, considering a range of plausible scenarios including accidents, malfunctions and malevolent acts. d) Describe why the DGR was selected as the preferred option, giving explicit attention to the three criteria.	OPG explains that the study of alternatives to the DGR project was conducted as part of the IAS, from 2003 to 2004. The IAS, however, was not subject to the obligations set out in the 2009 EIS Guidelines for the DGR Project. Despite this, OPG has adopted in the EIS the findings of the IAS without any additional analysis. OPG's analysis of alternatives to the project must be subject to the same requirements as OPG's analysis of the DGR project. Until this has been done, OPG cannot justify the DGR project as the most appropriate option for the management of long-term radioactive waste. Section 2.5 of the EIS Guidelines requires OPG to indicate how the precautionary principle was considered in the design of the project. At a minimum, OPG is obliged to evaluate and compare the alternative means of carrying out the project in light of three criteria that are central to a precautionary approach to nuclear waste management: risk avoidance, adaptive management capacity, and preparation for surprise. Because the legislative purpose applies to the entire assessment, not only to the matter of project design, we assert that OPG should adopt and apply the three generic precautionary criteria in all stages of the EIS, including evaluations and decision making related to "alternatives to" as well as "alternative means" in the design of the project. In the interests of long-term public and environmental health and safety OPG and the JRP must ensure that the preferred option for managing long-lived radioactive waste is the one that demonstratively poses the least amount of risk while providing the greatest capacity to adapt to new information and conditions.

2.	2.5 Precautionary Approach	3.4 Alternative Means of Carrying Out the Project	Clarify how the alternative means of carrying out the proposed DGR Project were evaluated and compared in light of risk avoidance, adaptive management capacity, and preparation for surprise. Provide the following information in your response: a) Define risk avoidance, adaptive management capacity, and preparation for surprise. b) Describe how the three criteria were applied (by themselves or as components of a more comprehensive set of criteria for comparative evaluation) as a framework for evaluating and comparing the alternative means, considering a range of plausible scenarios including accidents, malfunctions and malevolent acts. c) Describe how each alternative means performs in relation to the three criteria, considering a range of plausible scenarios including accidents, malfunctions and malevolent acts. d) Describe why the preferred means were selected, giving explicit attention to the three criteria.	Section 2.5 of the EIS Guidelines requires OPG to indicate how the precautionary principle was considered in the design of the project. At a minimum, OPG is obliged to evaluate and compare the alternative means of carrying out the project in light of three criteria that are central to a precautionary approach to nuclear waste management: risk avoidance, adaptive management capacity, and preparation for surprise. In the interests of long-term public and environmental health and safety OPG and the JRP must ensure that the preferred means of carrying out the proposed DGR Project are the ones that demonstratively pose the least amount of risk while providing the greatest capacity to adapt to new information and conditions.

3.	2.5 Precautionary Approach	3.4 Alternative Means of Carrying Out the Project	Provide the following information with respect to the long-term safety of the proposed DGR Project: a) How has the DGR Project been designed to ensure that future generations can modify it in response to new information and/or conditions? In your response, include detailed information about specific related components of the DGR Project. b) How does the design of the proposed DGR Project ensure that retrieval of waste packages is feasible during all stages of its development and operation, if needed, in response to new information and conditions, including accidents and other unforeseen events? c) The above requests for information relate to two design concepts that are basic requirements of a precautionary approach to nuclear waste management: reversibility and retrievability. If these concepts are not considered in the design of the DGR Project, provide a rationale for not considering them. The rationale should include an explicit consideration of trade-offs that illustrate why these design concepts are not appropriate for the long-term safety of the DGR project.	The concepts of reversibility and retrievability are basic requirements of a precautionary approach to the design of low and intermediate nuclear waste management programmes (OECD, 2001, 2012). They serve to increase flexibility and, thus, the ability to respond to changing information and conditions including, among others, • technological innovations and/or advances in scientific understanding; • new technical information regarding the design and operation of the facility; • changes in social and political opinion; • changes in policy and regulatory frameworks, including safety standards; and • unforeseen events, including natural disasters, malfunctions, accidents and malevolent acts. Reversibility and retrievability may also help to ensure that the means for the safe, long-term disposal or storage of low and intermediate radioactive wastes are provided, while allowing future generations to modify or reverse the decisions if needed. Reversibility may benefit public confidence in the long-term safety of a particular option in that it may alleviate concerns that particular decisions are irreversible. Similarly, a demonstrated possibility to retrieve the low and intermediate waste at each stage after emplacement may increase public confidence in the long-term safety of a particular project. The public needs to know that OPG's decisions with respect to the design of the DGR Project are reversible in light of future conditions, and the DGR Project has been designed so that the low and intermediate waste will be retrievable if appropriate. OPG and the JRP must ensure that the three criteria (risk avoidance, adaptive management capacity, and preparation for surprise) cover the concepts of reversibility and retrievability. If these design concepts are not considered, OPG must provide an adequate rationale for not considering them. The rationale should include an explicit consideration of trade-offs that illustrate why these design concepts are not appropriate for the long-term safety of the DGR project.

4.	2.5 Precautionary Approach	9. Long-Term Safety of the DGR	Provide the following information with respect to the long-term safety of the proposed DGR Project: a) What back-up storage or repository alternatives does OPG have in place for any future scenario in which OPG's observations (e.g., as a result of site or repository monitoring, or advances in scientific understanding) reveal unexpected characteristics or phenomena that are detrimental to the long-term safety of the DGR Project? b) What redundancies have been incorporated in the design of the proposed DGR Project to ensure safety? c) What plans does OPG have in place to maintain, protect and enhance the financial, technical and administrative capabilities that are required to ensure the safe operation of the proposed DGR Project, given the significant uncertainties and potential for unanticipated developments over the lifetime of the project?	Diversity and redundancy are major sources of adaptive management capacity (see Walker & Salt, 2009). In the context of managing long-lived radioactive waste, the diversity requirement seeks to ensure that decision makers evaluate and compare the advantages and disadvantages of a range of different alternatives to and alternative means that could achieve the same objective or end, and that they seek means of ensuring backup options remain available. If the preferred option fails or proves to be problematic there should be sufficient knowledge and associated capacity related to other options to make adaptation feasible. A precautionary approach to nuclear waste management, then, requires the maintenance of alternatives throughout the lifetime of a particular project (OECD, 2001). Redundancy pertains to the technological components of a particular alternative. The concept of redundancy has long been central to enhancing the safety and reliability of complex technologies. An element of a system has redundancy if there are backups to do its work if it fails. This can mean that there are several elements that work simultaneously but are capable of preforming the same function by themselves if required, or it can mean having idle elements that perform when/if the system needs them. Diversity and redundancy also relate to important socioeconomic aspects of nuclear waste management systems. It is conceivable that the organizational-administrative arrangements that currently oversee Ontario's nuclear waste management programme will change over time in response to socioeconomic pressures. There should be diversity, therefore, with respect to the range of organizations that could maintain scrutiny and that could assume responsibility over nuclear waste management in Ontario. Similarly, there should be redundancy in the way that knowledge, skills, decision-making power and responsibility are distributed among organizational-administrative units so that current capacities are maintained, protected and enhanced over the long term.

5.	2.5 Precautionary Approach	12. Follow-Up Program	Provide the following information with respect to OPG's Follow-Up Program: a) Describe how risk avoidance, adaptive management capacity, and preparation for surprise are incorporated in the development of the Follow-Up Program. b) Describe how the Follow-Up Program addresses the issue of surprise, i.e., the social, economic, and ecological effects that are not currently anticipated in the EIS. c) Describe how the Follow-Up Program addresses the issue of change in scientific understanding, public opinion, technological innovations, and new regulations related to repositories for radioactive waste.	OPG's Follow-Up Program should provide a critical source of risk avoidance, adaptive management capacity, and surprise preparedness. As it stands now, however, OPG's Follow-Up Program is insufficient in this regard because it does not aim to address unanticipated events as well as new information and/or conditions. Rather, the Program is primarily focused on verifying predicted effects and confirming the effectiveness of mitigation measures.

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1.	7.2 Alternatives to the Project	3.3 Alternatives to the Project	Provide all of the studies that were undertaken concurrent with the IAS in support of the engineering and geotechnical feasibility of the range of concepts for LLW management at the WWMF.	In Section 3.3 of the EIS, OPG asserts that the IAS was undertaken concurrent with studies in support of the engineering and geotechnical feasibility of a range of concepts for LLW management at the WWMF. But OPG does not explicitly name these studies and their authors. Nor does OPG provide a clear description of the aims, methods and findings of these studies. Thus, it is unclear to the reader which studies OPG is referring to and, consequently, a comprehensive critical review is not possible. Because the IAS evaluates alternatives to the proposed DGR project, it is important that a critical independent review of these supportive studies should be possible.
2.	7.2 Alternatives to the Project	3.3 Alternatives to the Project	Provide the safety assessment studies that were undertaken by Quintessa Ltd. concurrent with the IAS.	In the IAS, OPG asserts that Quintessa Ltd. conducted a safety assessment of the enhanced processing and storage, surface concrete vaults, and deep rock vaults options. According to OPG, Quintessa's assessment *indicates* that some ILW can be safely stored in the surface concrete vaults options, and all of the expected ILW can be stored safely in the deep rock vaults options. Again, however, the IAS does not provide sufficient information for a critical public review of Quintessa's studies. Because the IAS evaluates alternatives to the proposed DGR project, it is important that a critical independent review of Quintessa's safety assessment should be possible.
3.	7.2 Alternatives to the Project	3.3 Alternatives to the Project	Provide the following additional information to establish and validate OPG's rationale for only considering LLW in the Engineering Feasibility and Safety and Licensibility analyses for the alternatives to the DGR project, including the deep rock vault options: • Explain how incorporating a consideration for ILW would affect the engineering feasibility analysis of the options. Be sure to cover all of the engineering feasibility considerations covered in the IAS (conceptual designs, cost estimates, construction schedules, geotechnical feasibility, etc.). • Explain how incorporating a consideration for ILW would affect the safety and licensibility analysis of the options. Be sure to cover all of the safety and licensibility considerations covered in the IAS.	OPG's evaluation of alternatives to the DGR project does not consider ILW in the Engineering Feasibility and Safety and Licensibility analyses. Only LLW is considered. This is a serious omission, given the purpose of the EIS to determine the most appropriate solution for managing L&ILW waste. Incorporating consideration for ILW could affect the results of the evaluations. At a minimum, OPG should provide a rationale for its decision to exclude ILW from the Engineering Feasibility and Safety and Licensibility analyses. OPG's rationale should explain how incorporating consideration for ILW would affect the analyses.

4.	7.2 Alternatives to the Project	3.3 Alternatives to the Project	Please provide the following additional analyses in order to ensure that OPG's consideration of alternatives to the project meets the requirements of the EIS Guidelines. These analyses must adopt a spatial scope that extends around the criteria listed in section 9.1 of the EIS Guidelines, and a temporal boundary that meets the requirements set out in section 9.2 of the EIS Guidelines: • a comparative analysis of the options relative to their net contributions to sustainability, as required by section 2.4 of the EIS Guidelines; • a comparative analysis of decommissioning and abandonment phases for all options, as required by section 4.1 of the EIS Guidelines; • a comparative analysis of the options relative to their environmental effects on the full list of VECs, as required by section 9.3 of the EIS Guidelines; • a comparative analysis of the options relative to the mitigation measures that OPG could adopt to eliminate, reduce, or control the adverse environmental effects of each option, as required by section 11.2 of the EIS Guidelines; • a comparative analysis of the options relative to the potential adverse environmental effects associated with possible accidents, malfunctions and intentional malevolent acts, as required by section 12 of the EIS Guidelines; and • a comparative analysis of the long-term safety of the options, considering the requirements set out in section 13 of the EIS Guidelines.	OPG explains that the study of alternatives to the DGR project was conducted as part of the IAS, from 2003 to 2004. The IAS does not meet the requirements for consideration of alternatives as set out in the EIS Guidelines. Despite this, OPG has adopted in the EIS the findings of the IAS without any additional analysis. OPG's analysis of alternatives to the project must be subject to the same requirements as OPG's analysis of the DGR project. Until this has been done, OPG cannot justify the DGR project as the most appropriate option for the management of long-term radioactive waste.

5.	7.3 Alternative means of Carrying out the Project	3.4.2 Choice of Site	Provide a rationale for the lack of systematic comparative evaluation of alternative sites. The rationale must explain why OPG selected the Bruce site as opposed to other sites with suitable geologic attributes. Provide detailed information about the suitability of the Bruce site relative to other sites with different suitable geological attributes.	OPG did not undertake a systematic evaluation of alternative sites for the proposed DGR project. International standards for siting geological disposal facilities recommend selecting one or more preferred sites from several, possibly many, prospective sites on the basis of geological setting and with account taken of other factors (IAEA, 2011). International EA experience in relation to the geological disposal of radioactive waste has emphasized the importance of performing detailed analyses of the differences between and among alternative sites in terms of their radiation safety (Swedish Radiation Safety Authority, 2011; O'Sullivan et al., 1999). Many authorities hold that the most important issue with respect to siting is the long-term safety of the site in relation to the geosphere (OECD, 1999; OECD, 2009; Wallace, 2010; IAEA, 2011). Sykes (2003) notes that one required attribute of the geosphere for a deep disposal system for radioactive waste is stagnant or sluggish groundwater flow at repository depths. Sykes asserts that the plutonic rock of the Canadian Shield has this attribute. In fact, historically and conventionally speaking, the preferred host medium for long-lived nuclear waste in Canada has been the plutonic rocks in the Canadian Shield (Dormuth et al., 1989). As Sykes notes, Ontario has significant quantities of plutonic rock for such projects as deep geologic repositories. We do not mean to imply that plutonic rock should be considered as the most suitable host for long-lived radioactive waste and the DGR project. Rather, we assert that the mere presence of other potentially suitable geological settings in Ontario should compel OPG and the Panel to ensure that a systematic comparative evaluation of alternative sites is undertaken. The current lack of such a comparative evaluation is a serious omission, especially given the long-term safety risks inherent in the management of long-lived radioactive waste. OPG must provide detailed information about the suitability of the Bruce site relative to other sites in order to present a sound rationale for the proposed DGR project. In particular, OPG must provide additional information on alternative sites with different geological attributes. At a minimum, OPG must justify its lack of analyses of alternative sites. OPG's justification must present a strong case for selecting the Bruce site as opposed to sites with other suitable geologic attributes.

6.	2.4 Sustainable Development	3.3 Alternatives to the Project 3.4 Alternative Means of Carrying out the Project	Provide the following additional information to clarify how OPG considered the extent to which the proposed DGR project will contribute to sustainability: • Describe the sustainability-based criteria that OPG adopted to evaluate and compare the effects of the proposed DGR project, alternatives to the project, and alternatives means of carrying out the project. • Describe the relative contributions to sustainability of the alternative means of carrying out the project. • Describe the relative contributions to sustainability of the alternatives to the proposed DGR project.	OPG's description of need and purpose should rest, in part, on a recognition that the proposed project must, in comparison with other options, contribute the greatest net social, economic and ecological benefits to society while avoiding significant adverse effects. OPG should have incorporated throughout the EIS a concern for the extent to which the proposed DGR project will contribute to sustainability relative to the other options. Application of this "contribution-to-sustainability test" by various joint review panels (the Voisey's Bay Nickel Mine and Mill Joint Review Panel, Kemess North Gold-Copper Mine Joint Review Panel, Whites Point Quarry and Marine Terminal Joint Review Panel, Mackenzie Gas Project Joint Review Panel, and Lower Churchill Hydroelectric Generation Project Joint Review Panel) has shown the way generally. Additionally, Gibson (2000, 2005, 2006) sets out the basic steps for adequate attention to the contribution to sustainability obligation. OPG should • set out a comprehensive set of sustainability-based evaluation criteria that combine the generic requirements for progress towards sustainability with particular attention to the key considerations surrounding selection among options for best management of low and intermediate level radioactive wastes; • identify the potentially reasonable options, including those that would be included under the parameters of "alternatives to" and "alternative means" discussed in the EIS Guidelines; • show how the criteria have been applied in the comparative evaluation of the options, including in the evaluation of proposed means of mitigating adverse effects and enhancing positive ones; and • show how the preferred alternative has been selected as the proposed project, in light of the criteria, and with clear justifications for any trade-offs among the criteria that may be entailed by proceeding with the proposed project.

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