March 7, 2012

Mr Albert Sweetnam
Executive Vice President
Darlington New Nuclear Project
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Subject: Information Request Package 1 from the Deep Geologic Repository Joint Review Panel

Dear Mr Sweetnam,

Attached to this letter, please find the first package of requests for additional information from the Deep Geologic Repository Joint Review Panel (the Panel). The Panel has determined that response to these requests is required to ensure that the information available adequately responds to the Environmental Impact Statement Guidelines issued by the federal government for the project.

In developing these requests, the Panel referred to the following document:

- *Panel Member Document - Proposed Information Requests for Completed Technical Scan of the EIS and Licence Application to Prepare the Site and Construct*, CEARIS # 325, submitted to the Panel by the Canadian Nuclear Safety Commission.

Note that at this early stage of the review, the Panel has yet to finalize an overall framework for its information requests. All future information requests will be developed within this framework. However, in the interest of efficiency, the Panel has decided to send this first set of information requests to OPG in order that responses can be developed in a timely manner.

Please inform the Panel of the time that Ontario Power Generation anticipates will be required to provide responses to the Package 1 information requests. As detailed in the Joint Review Panel agreement, the maximum 6-month EIS review and comment period does not include the time required for Ontario Power Generation to respond to the information requests of the Panel.

Please do not hesitate to contact either of the Panel Co-Managers if you require clarification with regard to these information requests or the information request process. The Panel requests that your responses be numbered to correspond to the attached table and that detailed references to existing information be provided via accurate and precise cross-references to the EIS and/or supporting documents. Further, the Panel requests that the original information requests be re-stated in full in the response.

Yours truly,

<original signed by>

Dr. Stella Swanson
Chair, Joint Review Panel

cc. Dr. James F. Archibald, Joint Review Panel Member
Dr. Gunter Muecke, Joint Review Panel Member

Frank King, Nuclear Waste Management Organization
Allan Webster, Ontario Power Generation

/Attachments

Attachment 1
Deep Geological Repository Project
Joint Review Panel EIS Information Requests
Package 1 – March 7, 2012

IR#	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
EIS 01-01	▪ EIS Guidelines: Section 8.2, Site Preparation and Construction; ▪ Section 10.1.1, Geology and Geo-morphology; ▪ Section 11.1, Effects Prediction	▪ *EIS*: Section 4.7.4.1 Shaft Excavation, pg 4-46; ▪ *EIS:* Section 7.2.1.2: Overburden, Shallow Bedrock, Intermediate Bedrock and Deep Bedrock Solute Transport	Provide additional information on the surface facility construction and the excavation of overburden associated with the development of the shaft collar in relation to geotechnical and hydrogeological considerations. Sufficient data or information is required to enable confirmation of the possible impacts of the excavation and associated dewatering (e.g. zone of influence or ZOI and rate and quality of groundwater seeping into the excavation). Where on-site data is not available, the evidence needs to be sufficient to indicate it is conservative in nature for the EIS. In particular information is needed in the following areas: ▪ the expected safe slope and general design for excavations in the tills and dense sand overburden expected at the site, supported by geotechnical data; ▪ the proposed method(s) to dewater the excavation, particularly if the middle sand is encountered at the location, with information supporting flow estimates; ▪ any proposed overburden ground improvement associated with overburden excavation activities and during the shaft sinking (following backfilling); ▪ a description of the backfilling of the excavation, including the fill material and its placement; ▪ areal recharge distribution before and after excavation ▪ groundwater flow patterns, seepage rate and water quality resulting from the potential interactions with any existing groundwater contaminant plume adjacent to the DGR site; and ▪ surface water/groundwater interactions (e.g., recharge rate to, and water level of, Stream C).	OPG concludes that the impact of surface construction on the groundwater flow and contaminant transport is negligible. For the impact of dewatering during shaft sinking, OPG concludes that “The ZOI was estimated to be approximately 54 m, with an inflow of approximately 50 L/min over the top 170 m of the shaft.” The information in the EIS is not sufficient to allow reviewers to confirm the predicted effects on groundwater from surface construction and the dewatering associated with excavation of the overburden for the shaft collar. There is an existing groundwater contaminant plume associated with several low level storage buildings at the adjacent Western Waste Management Facility. Whether and how the project would interact with the plume (e.g., whether it would change the plume migration path and intercept the contaminant plume into the seepage to be dewatered), needs to be assessed. EIS Guidelines section 10.1.1 indicates “Geotechnical properties of the overburden must also be provided … to allow the assessment of slope stability…”. No general information was provided on the geotechnical properties of the overburden in the EIS or in Geology TSD.
EIS 01-02	▪ EIS Guidelines: Section 8.2, Site Preparation and Construction	▪ *EIS*: Section 4.7.5.2 Hazardous Materials, pg. 4-50	Provide additional information describing: ▪ the possible above ground storage of explosives at the Bruce site; and ▪ any potential effects from the above ground storage site.	The information in the EIS describing surface storage of explosives at the Bruce site, prior to the establishment of underground storage, is not sufficient to allow the assessment of any potential effects of such storage. While section 4.7.5.2 indicates “During shaft construction, explosives are required on a daily basis. Explosives will be delivered as required by the

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				explosive supplier to the underground magazine once the underground services area is completed. … Handling explosives on the DGR Project site (both surface and underground) will be in accordance with Part VI of the Mines and Mining Plants Regulations (O. Reg. 854 [29]).", no information is provided on what, if any, storage on the Bruce site will take place prior to the establishment of the underground storage area.
EIS 01-03	▪ EIS Guidelines: Section 12, Accidents, Malfunctions and Malevolent Acts	▪ *EIS*: Section 8.1 Initiating Events, page 8-1 – 8-2 ▪ *EIS:* Section 4.7.4.1:Shaft Excavation, page 4-46 ▪ *Malfunctions, Accidents, and Malevolent Acts TSD*: Section 3.2 Initiating Events, page 17 - 18	Provide additional information on initiating event frequencies as follows: ▪ provide an explanation on how the initiating event frequencies were determined; ▪ provide specific explanations for any non-credible events that are not being assessed further; and ▪ clarify how an explosion is a non-credible initiating event.	Initiating events are an important component of the assessment of malfunctions and accidents. In the documentation, all initiating events are assigned a frequency and then ranked as possible events, unlikely events and non-credible events. Given the information provided, it is unclear how these frequencies were determined. Also, any initiating events with an annual frequency ≤10-7 were classified as non-credible events and were not considered further. These non-credible initiating events were listed but no further explanation was provided. Finally, the list of non-credible initiating events includes "explosion"; however, in the EIS, page 4-46, the project plan discusses using explosives and storing 30 to 40 tonnes underground during the construction phase. Natural and waste generated methane is identified as a concern in the same report. So it is unclear how an explosion can be a non-credible event.
EIS 01-04	▪ EIS Guidelines: Section 12, Accidents, Malfunctions and Malevolent Acts	▪ *EIS*: Section 8.2.3: Mitigation, Contingency Plans and Emergency Procedures, page 8-16 ▪ *Malfunctions, Accidents and Malevolent Acts TSD*: Section 4.4.1 Contingency Planning, page 35 ▪ *Preliminary Safety Report*: pages 431 - 432, Tables 7-27	Provide additional information regarding contingency planning that specifically addresses the radiological event bounding scenarios. Each bounding scenario requires a description of any contingency, clean-up or restoration work in the surrounding environment that would be required during or immediately following the postulated malfunctions and accidents	The EIS Guidelines includes a requirement to provide a description of any contingency, clean-up or restoration work in the surrounding environment that would be required during or immediately following the postulated malfunctions and accidents. The EIS and the Malfunctions, Accidents and Malevolent Acts TSD's radiological malfunctions and accidents sections do not give specifics on possible contingency, clean up or restoration work. There are generic statements on mitigation measures and that contingency plans will be in place for accidents with larger consequences. The statements do not address the specific bounding scenario events that were identified in the EIS and the supporting documentation. The Preliminary Safety Report had identified 5 above ground bounding scenarios and 6 underground bounding scenarios that should be addressed. Sufficient information is needed to allow the assessment of any potential effects from the contingency clean-up or restoration work.

IR#	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
		and 7-28		
EIS 01-05	▪ EIS Guidelines: Section 8.1, General Information and Design Description: 12th and 14th bullets	▪ *Reference Low- and Intermediate-Level Waste Inventory for the Deep Geologic Repository:* Section 2.2	Provide additional information/clarification on the following items regarding the characterization of the inventory of radionuclides: ▪ methods or procedures used to measure important beta and alpha emitters (e.g. difficult to measure (DTM) radionuclides, other than gamma spectrometry) during the characterization of radionuclides in the wastes to develop the inventory. ▪ cross-checking of radionuclide measurements made by the proponent with those made by independent laboratories on the same samples.	It is essential in the assessment of environmental effects that there is confidence that post closure safety assessment predictions are reasonably conservative. This requires confidence that the activity concentration of radionuclides has been adequately bounded in each waste stream based on sufficient measurements of waste packages. It is unclear why gamma spectrometry was used to "measure" DTM radionuclides. The docmentation indicates that "The scaling factors were generally based on actual measurements of difficult-to-measure radionuclides obtained from gamma spectrometry of waste packages and/or samples of waste". As most DTM radionuclides are alpha or beta emitters, this statement is questionable. Confidence is also required in the quality assurance/quality control of the radionuclide measurements One check on quality assurance/quality control is to cross check a specimen through analysis by a number of laboratories. Information indicating the cross-checking of radionuclide measurements is important in understanding the postclosure safety assessment.
EIS 01-06	▪ EIS Guidelines: Section 8.1, General Information and Design Description: 12th and 14th bullets	▪ *Reference Low- and Intermediate-Level Waste Inventory for the Deep Geologic Repository:* Main text and Appendices B and D	Provide additional information on the characterization of uncertainty with the radionuclide measurements as follows: ▪ provide graphical relationships between easy to measure (ETM) radionuclides and difficult to measure (DTM) radionuclides for each nuclide in waste streams that most contribute to dose in the post-closure safety assessment; and ▪ elaborate from Appendix D of the Reference Low – and Intermediate-Level Waste Inventory for the Deep Geologic Repository by providing a discussion of the level of confidence in each scaling factor, based on the number of samples analysed to derive the scaling factors and to characterize the inventory, and whether the number of samples and the confidence in the scaling factors is sufficient or not.	A thorough understanding of the uncertainty associated with the radionuclide measurements is needed in order to be confident that the post closure safety assessment predictions are reasonably conservative. This is in alignment with IAEA (2011), section 5.3 that indicates: "Waste intended for disposal has to be characterized to provide sufficient information to ensure compliance with waste acceptance requirements and criteria". OPG needs to elaborate on the analyses that were done to derive each scaling factor in order to better describe the current uncertainty in the inventory measurements. The uncertainty in the estimated activity of radionuclides is provided in tables in Appendix D of the Reference Low – and Intermediate-Level Waste Inventory for the Deep Geologic epository. OPG states that an uncertainty of a least square distance less than 10 is acceptable uncertainty. However, it is difficult for the reviewer to fully grasp what a least distance of 10 really means in terms of uncertainty. Graphical relationships for ETM and DTM radionuclides (similar to IAEA 2009 and Thierfeldt and Deckert 1995) would more clearly depict the

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				amount of data used to derive each scaling factor. Comparisons with other available databases supporting scaling factors may also facilitate a better understanding of the uncertainties. For instance, how does this database compare to the EPRI database (Best 1986; Deltete 1987; Best and Miller 1987). Clearer presentation of uncertainties is needed to increase CNSC staff confidence around the uncertainty associated with each scaling factor for radionuclides in waste streams that contribute significantly to the dose in the environment or humans at any given time into the future.
EIS 01-07	▪ EIS Guidelines: Section 8.1 ▪ CNSC Regulatory Guide G-320: Section 4.3.3	▪ *Reference Low- and Intermediate-Level Waste Inventory for the Deep Geologic Repository*: Tables 2.1, 2.4, 2.5, 2.6 and 2.7, 3.2, 3.3, B.1, B.2 and B.3 ▪ *Post closure Safety Assessmen*t: Table 4.4 ▪ *Post closure Safety Assessment*: Data Tables 3.12, 3.16 and 3.17	Provide all the necessary information in order to verify calculations leading to the quantity of radionuclide in the current and past inventory. More specifically: ▪ provide specific dates from which OPG starts to account for decay in their calculations; ▪ OPG should clearly indicate the sources of their half-life data and verify their consistencies within the documentation; and ▪ provide the approach used to consolidate the types of wastes and the data to support the consolidation, the sources of data presented in the tables and an explanation for any changes.	It is important to the assessment of environmental effects that there is confidence that the post closure safety assessment of long term performance is reasonably conservative. Confidence can be achieved by tracing the use of supporting data through different calculations and through independent calculations to verify the values used and to confirm results. The reporting of some of the radionuclide inventory in the submission is not consistent and could not be fully verified. The elemental inventory could also not be fully verified. Sufficient detail should be included to allow independent calculations to confirm assessment results, whether by means of simplified calculations or by complete reproduction of the results. Tables 2.4 to 2.7 in the document, Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository, summarize the estimated total decay corrected radionuclide inventory of the projected wastes in storage in the DGR at two future dates. However, specific dates are not provided that start the accounting process for decay and are necessary to permit verification of inventories. The aforementioned report presents the half-life of radionuclides in Tables 2.4, 2.5, 2.6, 2.7, 3.2, 3.3, B.1, B.2 and B.3, which are important to the process of accounting for decay. However, another table in a secondary reference containing waste inventory data, the Postclosure Safety Assessment: Data report provides somewhat different half-life values supported by their source. As no source was provided for the half life values presented in the Inventory report it was not possible to check their validity. In the Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository report, the information presented in Tables 2.4

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				through 2.7 are identified as based on Appendix B, Tables B1 through B.3 which present the nuclides in each waste 'as received'. Appendices C through E provide additional information on the wastes (data sheets in E). An examination to the information indicates that the waste 'types' vary somewhat in description through the sequence of appendices and vary with the types presented in Tables 2.4 to 2.7 of the report. It is not apparent how to rationalize and verify the information. As an example, from Appendix E in the 'Reference Inventory' the net volume of old bottom ash is 950 m3 in 2018, and the net volume of new bottom ash is 671 m3 in 2018 for a total of 1621 m3, but Tables 2.4 and 2.5 give the volume of bottom ash in 2018 as 1352 m3. In the Post closure Safety Assessment report, Table 4.4 presents inventory data extracted from the 'Reference Inventory' report, however it is not stated where in the referenced report the data are from. Tables 2.5, 2.7 and 3.3 in the Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository and Table 4.4 in the Post closure Safety Assessment report are not in agreement. There is more difficulty in finding the source for the elemental inventory since no tables in the reference inventory report presents the data as entered into Table 4.4. Again, data cannot be readily verified.
EIS 01-08	▪ EIS Guidelines: Section 8.1 ▪ CNSC Regulatory Guide G-320: Section 6.2.1	▪ *EIS*: Section 6.6.4 - Radioactive Releases to the Environment; Table 6.6.4-1: Footnote a, Page 6-137	Provide summary data on measurements of fugitive emissions of H-3 species from low level storage buildings in the context of existing radioactivity and contaminant releases and mobility. Information should include a discussion of whether levels are consistent with tritium inventories (i.e. any species present are only a very small fraction of total inventories). Where useful measured data are available, there should also be a discussion on inventory sources (i.e., which waste category might be responsible) and on mechanisms (microbial, chemical, radiological) for formation of species other than tritiated water (HTO). If no site-specific data are available, then the general literature on tritium speciation in the environment should be discussed and used for whatever inferences might be applicable to low and intermediate level wastes (e.g., Akata et al., 2011).	EIS section 6.6.4.1, Releases to Air, provides information on radiological releases from the four major sources at the Bruce site. It includes measurements of tritium oxide (HTO) releases from the Western Waste Management Facility, but does not include the quantity of fugitive emissions from the waste in the low level storage buildings (LLSBs). Nor does it include the "difficult to measure" species of tritium such as HT. The very high levels of HTO, known to accumulate in the air inside the LLSBs, suggest that fugitive emissions of the tritium gas HT are also occurring from the diverse wastes stored there (e.g. OPG 2007). A better understanding is needed of ongoing releases of "difficult to measure" species of tritium from different categories of wastes to make a risk informed decision about dose consequences to both workers and the public from these same wastes in the DGR through all phases of the project.

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EIS 01-09	▪ EIS Guidelines: Section 11, Effects Prediction, Mitigation Measures and Significance of Residual Effects	▪ *EIS*: Section 6.7.5 ▪	Provide information on the baseline conditions and subsequent effect predictions, for acrolein from an air quality perspective.	Acrolein is discussed from a human health context (i.e., Section 6.11, Table 6.12-1 of the EIS; Appendix C of the EIS; Appendix J of the Atmospheric Environment TSD) but is not discussed relative to air quality. Background conditions and predicted emissions are required to put the effects analysis into perspective for air quality.
EIS 01-10	▪ EIS Guidelines: Section 11, Effects Prediction, Mitigation Measures and Significance of Residual Effects	▪ *EIS*: Section 6.7.3; Table 6.7.3-1; page 6-165 reference to data from the Meteorological Services of Canada station ▪ *Atmospheric Environment TSD*: Page 39	Provide the following air quality-related information / clarifications: ▪ a description of the quality assurance/quality control performed on the meteorological data to check on accuracy, reliability, etc.; ▪ clarify whether any correction has been done due to temperature being taken by the on-site tower at a 10 metre height compared to that taken at a 2 metre height at the Wiarton and Paisley stations; ▪ clarify why the data from the 10 metre height on the on-site tower was used in the model when the 50 metre height data from the same tower are more reliable and what kind of changes in the predictions of air quality effect would be noted due to this change; and ▪ a list of parameters taken from the on-site tower and the parameters taken from other sources (with references) for use in modeling.	Modeling is an important method to allow for the assessment of environmental effects and confidence is needed that the appropriate inputs have been used to accurately predict effects (e.g., to air quality). Further information and rationalization are needed on various items with respect to the air quality modeling to allow for the confirmation that appropriate and accurate data are used for the predictions of air quality effects.
EIS 01-11	▪ EIS Guidelines: Section 11, Effects Prediction, Mitigation Measures and Significance of Residual Effects	▪ *Atmospheric Environment TSD*	Provide information on the relevance of any lake-land effect at the site, and subsequent possible impacts on emissions and predictions of air quality effects from the project.	Influence from shoreline fumigation on atmospheric dispersion is considered minimal as per CSA Standard N288.1-08, Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities. However, consideration of other characteristics that may affect plume transport, specifically land/lake breeze wind circulation, are not discussed in the EIS. It is unclear whether this phenomenon is of relevance to this project.
EIS 01-12	▪ EIS Guidelines: Section 11, Effects Prediction, Mitigation Measures and Significance of	▪ *Atmospheric Environment TSD:* Tables F4.2-1 and F4.2-2	Adjust the bounding scenario to be more conservative (i.e., include the highest emission estimates per parameter, regardless of the stage within the site preparation and construction phase) and describe the subsequent effects to the dispersion modeling and air quality predictions; or provide the rationale for the derived air emission bounding scenario, outlined in the Atmospheric Environment TSD, which is used as inputs for dispersion modeling.	The bounding case should reflect the most conservative parameters based on the available information. It is not clear, based on the documentation provided, that this is the case for air emissions during the site preparation and construction phase. This is important as it serves as the inputs to the air dispersion modeling used in predicting effects to air quality.

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	Residual Effects			Table F4.2-1 breaks down emission rates for various air quality parameters by stage within the Site Preparation and Construction Phase. Table F4.2-2, which represents the bounding values used as inputs into the dispersion modeling, did not use the most conservative emission estimates from Table F4.2-1. Rather, it used the emission estimates from Stage 1 of the Site Preparation and Construction Phase reported in this table, which did not always represent the most conservative emission estimate for a given parameter.
EIS 01-13	▪ EIS Guidelines: Section 11, Effects Prediction, Mitigation Measures and Significance of Residual Effects	▪ *EIS*: Table 7.4.2-1	Provide the basis for the predictions that air quality standards will be exceeded 1% of the time for NO2 and 5.5% of the time for particulate matter.	Table 7.4.2-1 shows NO2 and particulate matter exceeding standards during the site preparation and construction phase; however, it is reported that the exceedance would not be continuous. This is presented as 1% of the time for NO2 and 5.5% of the time for particulate matter on page 7-59 of the EIS. The basis for these estimates is not provided, and therefore, the exceedance predictions cannot be verified
EIS 01-14	▪ EIS Guidelines: Section 10, Existing Environment	▪ *Aquatic Environment TSD*: Section 5.2 Aquatic Habitat and Biota	Provide summarized quantitative fish and fish community data in the site study area especially in Stream C, south and north railway ditch, from 2007 fish survey and any other historical fish studies.	In order to properly assess effects, sufficient information on the baseline environment is needed. Section 10 of the EIS Guidelines requires the proponent to summarize all pertinent historical information on the size and geographic extent of animal populations as well as density. This information is lacking for fish species and communities from the documentation submitted to date.
EIS 01-15	▪ EIS Guidelines: Section 10, Existing Environment; ▪ Section 11, Effects Prediction, Mitigation Measures and Significance of Residual Effects	▪ *Aquatic Environment TSD*: Section 5.2 Aquatic Habitat and Biota	Describe any aquatic species of natural conservation status within the site study area and include an assessment of the likely environmental effects of the project on these species.	The EIS Guidelines direct the proponent to identify any biological species of natural conservation status (e.g., rare, vulnerable, endangered, threatened, and uncommon) at a federal, provincial, regional or local level and their critical habitats; and to describe the effects of the project on these species. The proponent has not provided any information on aquatic species of natural conservation status in the documentation submitted to date.
EIS 01-16	▪ EIS Guidelines: Section 13.2, Selection of Assessment	▪ *EIS*: Section 9.2.1 Normal Evolution Scenario	Provide an assessment of how the Lake Huron coastal line would migrate in relation to the DGR site due to geomorphologic changes in the future (e.g. before the next glaciation arrives) and how the coastal line change would impact on the DGR, during the Normal Evolution Scenario	In accordance with section 13.2 of the EIS Guidelines, “Long term assessment scenarios should be sufficiently comprehensive to account for all of the potential future states of the site and the environment.”

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	Scenarios			Geomorphologic studies (e.g., Lewis et al, 2008) have shown that the coastal line of Lake Huron has been going through constant geomorphologic changes in the past 10,000 or so years. It is essential to have an understanding on how the trend will continue, even before the next glaciation arrives. The effect of the change on the DGR project needs to be considered in the Normal Evolution Scenario, given that this scenario represents the most likely long-term outlook.
EIS 01-17	▪ EIS Guidelines: Section 13.2, Selection of Assessment Scenarios	▪ *EIS*: Section 9.2.1 Normal Evolution Scenario ▪ *Preliminary Safety Report*: Section 4.5.1 - Future evolution of the Bruce site-glaciation	Assess the impact of future glaciation cycles on the groundwater regime with the presence of the repository, shafts, seals and associated zones disturbed through excavation.	The EIS Guidelines, section 13.2, requires that the anticipated evolution of the repository has to be supported by a combination of expert judgement, field data, and also mathematical models. Glaciation cycles are expected to occur during the lifetime of the DGR, and mathematical modelling should be performed to assess their impact on the flow regimes around the repository, and verify that contaminant transport would remain diffusion-dominant. Currently, the proponent concludes that the effects of glaciations at the depth of the repository would be unimportant based on arguments derived from field data and mathematical modeling. However the above arguments are applicable for the geosphere without the presence of the deep geological repository.
EIS 01-18	▪ EIS Guidelines: Section 13.4, Confidence in Mathematical Models ▪ CNSC Regulatory Guide G-320: Section 4.3.3	▪ *EIS*: Section 9 Long Term Safety of the DGR ▪ *Preliminary Safety Report*: Section 1.9.1 Management Strategy ▪ *Preliminary Safety Report*: Section 8 Post Closure Safety Assessment	Provide peer review summaries from the Geoscience Review Group, the Design Technical Review Group, and the International Review Group for Safety Assessment. These summaries should contain the overall conclusions of the Review Groups, their recommendations, and a description of how the proponents addressed those recommendations.	Peer review is an important process in building confidence in the safety assessment and the safety case, as mentioned in both the EIS Guidelines and in CNSC Regulatory Guide G-320. Although the proponent mentioned peer review by the Geoscience Review Group, the Design Technical Review Group, and the International Review Group for Safety Assessment, no summaries from the above groups regarding their main findings have been submitted; nor is any information provided on how the proponent considered the findings.
EIS 01-19	▪ EIS Guidelines: Section 13,: Long-Term Safety of the DGR	▪ *EIS*: Section 9 Long Term Safety of the DGR ▪ *Post Closure Safety Assessment*: Section 6	Assess the implication of the reduced volume and discontinuous nature of the repository created by the access tunnel closure walls on gas generation and migration. Demonstrate that the model assumption of waste homogeneity and uniform distribution across the panel, and subsequent application of repository averaged values for gas impact and transport modelling,	Gas generation and transport modelling is used to evaluate source term pressures and concentrations that influence contaminant migration in and around the repository mainly for post-closure safety assessment. The gas generation model does not take into account the presence of closure walls in the repository that will serve as a barrier to gas flow; the repository has been modelled as a contiguous void space. The Post Closure Safety Assessment indicates that the purpose of the closure walls, which consist

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		Assessment Models; ▪ *Post Closure Safety Assessment*: Section 7 Results and Discussion; ▪ *Post Closure Safety Assessment*: Section 4.2.3.1 Repository Level	captures effects of localized pressures and concentrations that may develop as a result of uneven waste distribution (along with reduced/restricted volumes created by access tunnels).	of thick concrete walls to be placed in the access tunnels (up to six walls may be required), is to isolate parts of the repository to limit the release of gases and any potentially contaminated water during the operational period; they are not designed to provide any long-term postclosure isolation and containment. The gas modelling also does not take into account spatial differences in waste composition; the model assumes that the waste composition is spatially homogeneous. The post-closure safety assessment needs to assess the impact of access barriers on gas generation and migration. The analysis should also demonstrate that the repository averaged values used for gas modelling and impact effectively capture elevated pressures or concentrations that may develop from spatial differences in waste composition and/or reduced volumes.
EIS 01-20	▪ EIS Guidelines: Section 13, Long-Term Safety of the DGR ▪ CNSC Regulatory Guide G-320: Section 6.2.1	▪ *EIS*: Section 9 Long Term Safety of the DGR ▪ *Post-closure Safety Assessment*: Section 7 Results and Discussion ▪ *Preliminary Safety Report*: Section 8	Provide the degree of conservatism used in the scenarios considered in Postclosure Safety Assessment and Preliminary Safety Report, and supporting rationale	It is not clear if the uncertainties and the necessary conservatism in the radionuclide inventory have been carried into the postclosure safety assessments and preliminary safety report. The documentation should provide reasonable assurance that the regulatory radiological dose limit for public exposure (currently 1 mSv/a) will not be exceeded. The uncertainties arising from direct measurements and the use of scaling factors, used fuel ratios and neutron activation calculations and from the apparent inconsistencies in the reported inventories have been highlighted in proposed IR #s 6 and 7. The Postclosure Safety Assessment includes scenario NE-IV, having 10 times the radionuclide inventory. This is intended to compensate for the uncertainty in estimating the radionuclide inventory, but it is not clear whether that is sufficient to compensate for the uncertainty in most estimates of radionuclide inventory, the inconsistencies in reporting the inventory estimates and the uncertainties in future generation rates. Further, it is not specified for the other scenarios, what degree of conservatism was used to account for uncertainty.
EIS 01-21	▪ EIS Guidelines: Section 13, Long-Term Safety of	▪ *EIS:* Section 9 - Long Term Safety	Provide a detailed review of the international literature on expected microbial effects (features, events and processes) in gas generation and corrosion processes in a deep geological repository setting for low and	Due to the presence of considerable organic matter in wastes, microbial processes will account for a significant proportion of the gas generation that will occur in the repository through both the degradation of organic

IR#	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
	the DGR ▪ CNSC Regulatory Guide G-320: Section 6.2.1	of the DGR ▪ *Post-closure Safety Assessment:* Data Appendix F Review of Microbial Degradation Data ▪ *Geosynthesis Report:* Section 4.3.3	intermediate level waste in order to assess the appropriateness of how microbial effects have been modeled and quantified for the DGR project.	matter and through enhanced corrosion of metals. For scenarios that could result in releases of contaminants to the surface environment within about 60,000 years of closure, C-14 (mostly from intermediate-level waste moderator resins) is the key radionuclide, largely generated from methane and carbon dioxide by microbial processes. A full understanding of microbial processes (known and possible) and confidence in the levels of conservatism incorporated into gas modeling is fundamental to the safety case. Presently, in the submitted documentation, there is very little data or review/discussion on microbes and their complex roles in gas generation and corrosion processes in a repository setting (e.g. Small et al. 2008). In the DGR site-specific context, there is only brief reference to the preliminary experiments of Stroess-Gascoyne (2008) in the documentation. The EIS recognizes the importance of microbial processes in modeling contaminant releases, but it fails to inform the reader of what has been discovered or inferred for analogous situations. For an example, see Humphreys et al. (2010). This major review was prepared for the Nuclear Decommissioning Authority in the United Kingdom for high level waste, but contains considerable information on geomicrobiology of general relevance to repository issues. The need for this type of information is critical in a site-specific context, given the location of the repository in sedimentary rocks, and the clear biogenic signature of microbial activity (methane and stable isotope signatures) near the proposed location of the repository (see section 4.4.3 in the Geosynthesis Report). These issues should be thoroughly discussed in the EIS, based on site-specific data and/or analogy and extrapolation from other situations.
EIS 01-22	▪ EIS Guidelines: Section 13, Long-Term Safety of the DGR ▪ CNSC Regulatory Guide: G-320: Section 6.2.1	▪ *EIS* Section 9: Long Term Safety of the DGR ▪ Reference *Low- and Intermediate-Level Waste for the Deep Geologic Repository*: Table	Provide additional information and analyses on the nature and relevance of the experimental data supporting degradation rates of ion exchange resins as follows: ▪ discuss the applicability of key references from the *Post-closure Safety Assessment: Data* report on degradation of ion exchange resins (i.e., Bracke et al., (2004), Husain and Jain (2003) and Wiborgh et al. (1986)) and any ongoing research on this issue nationally or internationally to the DGR-specific issues, and summarize any insights that can be gained relative to other	The summary information provided on the degradation of ion exchange resins is not sufficient for CNSC staff to assess whether the parameters chosen are applicable to the main resin of interest. It is also not clear if this information is applicable to all resins for the diverse environmental conditions under which they will degrade in the long term. Table 2.7 of the *Reference Low- and Intermediate-Level Waste Inventory for the Deep Geologic Repository* report indicates that 96% of the C-14 inventory is found in Moderator IX resins. Gas generation from these exact

IR#	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
		2.7 ▪ *Post-closure Safety Assessment*: Table 5.5 ▪ *Post-closure Safety Assessment*: Data: Appendix F Review of Microbial Degradation Data; F.3 Ion Exchange Resin Degradation	studies on ion exchange resin stability and gas generation; for example the headspace gases quantified in OPG (2003); and ▪ analyze and discuss the consequences to the EIS prediction of "containment" of gases in the geosphere for a degradation rate in gas modeling that is higher than the value chosen as an upper bound.	materials (under postclosure repository conditions), and the resulting dose from C-14 to humans (in the long term), is a critical pathway for certain scenarios. It is not clear why minimal quantitative, experimental information has been provided and/or why this topic has not been addressed in the follow-up program. Altogether, more information is needed on the sensitivity of gas generation predictions to extreme ion exchange degradation rates which may evolve in the repository with time (microbial, corrosion, oxidation, etc.). The foundation for this key process needs to be better justified and then the consequences of uncertainties discussed. In particular, more clarity is needed on whether high degradation rates are plausible; the upper bound chosen for modeling is not justified. The most important question to specifically address is: would high degradation rates compromise the predictions for low doses in the biosphere as a result of the prediction for effective containment of gases in the geosphere (e.g., Table 5.5 of the *Post-closure Safety Assessment*)? Similar clarity is needed on whether this issue has been or can be addressed in a simpler way, e.g. through a bounding calculation.
EIS 01-23	▪ EIS Guidelines: Section 13, Long-Term Safety of the DGR ▪ CNSC Regulatory Guide G-320: Section 6.2.1	▪ *EIS*: Section 9.4 Assessment Results and Comparison with Acceptance Criteria ▪ *Post Closure Safety Assessment*: 6.2.1.1 Waste and the Repository, and 7.3.2.4 Gas Generation ▪ *Post-closure Safety Assessment*: Data Appendix E Review of Corrosion Rates; Appendix F Review of Microbial	Provide an analysis of the probability of formation of unique species of gases in the repository (e.g. containing both C14 and H3 as in methane (C14H3T)) relative to chemical and/or biological processes that may occur in the long-term. Similarly, the formation of organochlorines (Cl36) should be discussed in terms of any relevant impacts on how Cl36 environmental behaviour is modeled (e.g. the relevance of literature Kd values and their uncertainties). The dosimetry of any credible complex species should be discussed and put into an appropriate risk context if information is lacking. If any issues or major uncertainties are encountered on environmental behaviour or dosimetry; follow-up program activities should be identified	Gas generation is important in assessment of a repository's ability to keep contaminants contained, and the kinds of gases produced influence possible impacts on persons and the environment in the event of releases from the repository. While the EIS assesses a number of gases, the possibility of microbial or other processes causing unusual species of C14, H3 and Cl36 compounds being formed is not addressed in the documentation provided. The presence of organic wastes with high inventories of C14 may provide the right conditions for unique chemical and biological processes. Features, events and processes related to this topic should be analyzed in a quantitative sense based on whatever insights are available from the literature and the effect on the performance of repository determined.

IR#	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
		Degradation Data; F.3 Ion Exchange Resin Degradation		
EIS 01-24	▪ EIS Guidelines: Sections 12, 13.2 and 15 ▪ CNSC Regulatory Guide G-320: Section 7.5.2	▪ *EIS*: Section 6.2.6.3 ▪ *Preliminary Safety Report*: Section 3.3 ▪ *Geosynthesis Report*: Table 2.8	Provide an assessment of undiscovered oil, gas and mineral resources at the regional, local and site scale and also the uncertainties that are associated with this assessment. In providing the above assessment, the proponent should clearly distinguish between resources and reserves. Reserves are generally understood to comprise those accumulations that have been discovered and measured, and that can be produced economically under present-day conditions. Reserves are only a sub-set of total resources, which also include potential future additions to reserves that are currently sub-commercial and/or that have yet to be discovered and measured. The requested quantitative assessment should also be correlated to the geological processes responsible for the formation of the resources.	In the EIS Guidelines, section 13 outlines the expectations with respect to the long term safety of the DGR, for which isolation is an important factor. The absence of natural resources reduces the likelihood of inadvertent intrusion that can jeopardize the isolation function of the DGR system. In addition, if natural resources exist at or in the vicinity of the site, the EIS should identify how the proposed project could affect their use (i.e. land use). The exploratory boreholes that penetrated the Middle Ordovician strata at the Bruce nuclear site seemed to indicate the presence of liquid and gaseous hydrocarbons (Table 2.8 of the *Geosynthesis Report*). The above observations are consistent with the findings of Obermajer et al. (1999), who reported that the Middle Ordovician limestones of southwestern Ontario are expected to have “good to excellent petroleum source potential” and to be “within the zone of prolific oil generation”. The petroleum liquids and gases that were observed in cores from recent exploratory boreholes at the Bruce nuclear site may be an indication of a potential future petroleum resource that could be extracted using new technologies such as horizontal drilling and hydro fracturing. The proponent indicates, however, that the presence of these potential resources is not such that there will be future intrusions; however, no supporting evidence is provided
EIS 01-25	▪ EIS Guidelines: Section 14 Cumulative Effects	▪ EIS: Section 10 Cumulative Effects, specifically 10.6.6 (Radiation and Radioactivity)	Assess the cumulative effects from past and existing projects and activities, certain and planned projects and activities, and reasonably foreseeable projects and activities, on DGR workers (nuclear energy workers (NEWs) and non-NEWs), or provide a rationale for why a cumulative effects assessment was not conducted.	In the EIS Guidelines, section 14 outlines the expectations with respect to cumulative effects. Section 10 of the EIS addresses cumulative effects related to exposure to radiation by members of the public from the DGR project and other existing and reasonably foreseeable projects, but similar information related to exposure to radiation by workers (NEWs and non-NEWs) is not presented. This information is needed, given the greater exposure to radiation that NEWs and non-NEWs are predicted to receive.

IR#	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
EIS 01-26	▪ EIS Guidelines: Section 11 Effects Prediction, Mitigation Measures and Significance of Residual Effects	▪ *Preliminary Safety Report*: Section 7.4.4.2	Indicate whether workers will be carrying out activities associated with more than one receptor location, within a given scenario (summarized in the *Preliminary Safety Report*: Table 7-22, page 415). If so, the annual estimated dose to the maximally exposed worker(s) should be provided, based on activities at more than one receptor location.	Table 7-22 in the *Preliminary Safety Report* identifies estimated dose rates at specific receptor locations across various scenarios. It is not clear whether a representative worker could undertake activities at more than one receptor location within a given scenario. All activities which will result in exposure that a representative worker may carry out should be considered. This ensures that estimated doses are conservative. Section 11.5.6 of the EIS Guidelines states that the predicted doses to workers resulting from activities within the scope of the project must be included.
EIS 01-27	▪ EIS Guidelines: Section 11 Effects Prediction, Mitigation Measures and Significance of Residual Effects	▪ *Preliminary Safety Report*: Section 7.4.4.2	Provide supporting information for selected examples of the worker and public dose estimates presented.	Section 11.5.6 of the EIS Guidelines states that predicted doses to workers, including doses to contract workers, and to members of the public resulting from activities within the scope of the project must be included. While doses have been provided, sufficient information has not been included to permit CNSC staff to conduct any verification of the calculated doses to workers and to the public. Additional information in the form of selected case summaries, which include information concerning any calculations completed using Micro Shield and Sky Shine, is needed for this verification.
EIS 01-28	▪ EIS Guidelines: Section 11: Effects Prediction, Mitigation Measures and Significance of Residual Effects	▪ *Preliminary Safety Report*: Section 7.4.4.2	Provide dose estimates to persons who will be transferring waste from the Western Waste Management Facility to the DGR.	Section 11.5.6 of the EIS Guidelines requires that the EIS provide information on the predicted doses to workers, including doses to contract workers, and to members of the public resulting from activities within the scope of this project.
EIS 01-29	▪ EIS Guidelines: Section 11: Effects Prediction, Mitigation Measures and Significance of Residual Effects	▪ *EIS*: Appendix C Section C3.2.1	Provide an assessment of the inhalation risk of acrolein to persons on-site.	Inhalation Hazard Quotients (HQs) for acrolein during site preparation, construction phase, and operations phase of the project exceed 2.0 (an HQ of 1.0 is an acceptable health-based limit) for local residents and members of aboriginal communities. Persons on-site would be exposed to higher levels of acrolein and may result in even higher HQs for acrolein. This information is needed to properly assess the effects to human health from the project.

IR#	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
EIS 01-30	▪ EIS Guidelines: Section 11.5.2 Land Use and Value	▪ *EIS:* Section 6.10.5 Physical Assets; 7.10.2.13 Other Social Assets ▪ *Socio-Economic Environment TSD*: Section 5.6.1 Housing; Section 8.4.1 Employment	Provide the following information on the housing/rental market: ▪ confirm that the proponent's use of the term 'permanent private dwellings' is referring to the number of private dwellings that are occupied by usual residents (i.e. year-round / usual place of residence vs. seasonal); ▪ provide details on the number of 'permanent private dwellings' there were in Kincardine and the other area municipalities as of the 2006 census; ▪ provide details on what proportion of the 'permanent private dwellings' the other area municipalities were owner-occupied vs. rental units; and ▪ provide historic and existing vacancy rates for rental housing for the local and regional study area; or, provide a rationale for why it was not collected / considered.	Additional information is required on the effects on the housing/rental market in alignment with expectations of the EIS Guidelines (i.e., Section 11.5.2); more specifically on permanent private dwellings and historic and existing vacancy rates for rental units. Table 5.6.1-1 of the TSD illustrates the 'Housing Stock' within the Local and Regional Study Area for 2001 and 2006. For 2006 a total of 5,447 housing units are shown in this table for Kincardine and that as of the 2006 census, approximately 82% of the permanent private dwellings in Kincardine were owner-occupied and that the remainder were rental units. However, no definition is provided for the term 'permanent private dwelling'. Based on IBI Group's review of Statistics Canada data it appears that the proponent is suggesting that 82% of the private dwellings occupied by usual residents in Kincardine were owner-occupied, and therefore 18% were rental. Neither the TSD nor the EIS present the actual number of permanent private dwellings (i.e. dwellings occupied by usual residents) in Kincardine or the other area municipalities or the proportions of owner-occupied vs. rental dwellings for the municipalities of South Bruce, Saugeen Shores, Brockton, Arran-Elderslie and Huron-Kinloss Section 7.10.2.13 of the EIS and Section 8.6.2.4 of the Socio-Economic Environment TSD, notes that, "The demand for rental and permanent housing across the Local Study Area is not expected to be substantial and so is not expected to indirectly contribute to adverse effects on community cohesion." However, Section 8.4.1 of the TSD does show that an estimated 24,330 person years of direct, indirect and induced employment may result from the DGR project. As such, the existing availability of rental housing should be identified in the EIS. It is noted that the *Bruce County Census Update* (prepared by SHS Consulting for the Bruce County Housing Services Affordable Housing Division) includes some residential vacancy data for Kincardine and Saugeen Shores (prepared by the Community Mortgage and Housing Corporation), but only for the years 2007 and 2008. *The Canada Mortgage and Housing Corporation Rental Market Report 2011*, which is available on-line, shows vacancy rates for these two municipalities.

IR#	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
EIS 01-31	▪ EIS Guidelines: Section 2.2 Public Participation and Aboriginal Engagement; Section 11.5.2 Land Use and Value	▪ *Socio-Economic Environment TSD*: Section 5.1.1.1 Field Studies ▪ *EIS*: Appendix D2 Communication and Consultation Materials Related to the Independent Assessment Study	Provide additional information on seasonal residents as follows: ▪ confirm if the 2009 Public Attitude Research and telephone poll of 800 residents included permanent and seasonal residents, and if yes, confirm the proportion of the poll responses were made by seasonal residents; and ▪ clarify what proportion of the 2005 poll responses were made by seasonal residents in the Strategic Counsel telephone poll and provide the breakdown of response by resident type (i.e., seasonal vs. permanent) if available	Section 2.2 of the EIS Guidelines stresses how public participation is a central objective of the overall review process. It is unclear if and how seasonal resident views were taken into consideration. The Socio-Economic Environment TSD describes how Public Attitude Research was undertaken in 2009 that involved a telephone interview of 'residents in the local and regional study areas'. Appendix D2 of the EIS includes a summary of the survey findings. It is not clear if the survey included permanent and seasonal residents. The EIS also includes the findings of a community telephone poll of permanent residents of Kincardine that was conducted in January and February 2005 by an independent company called The Strategic Counsel. The EIS notes that seasonal residents were mailed a copy of the question and asked to respond by mail. The combined survey results (shown in Appendix D3 of the EIS) are not broken down by type of respondent/resident (i.e., permanent and seasonal). For the two above public engagement activities, it would be beneficial to know whether or not the seasonal residents anticipated greater/different changes in expectations, attitudes or behaviours (e.g. use and enjoyment of private property, use of beaches or boating, tolerance for disturbance resulting from the DGR, economic benefits) than permanent residents.
EIS 01-32	▪ EIS Guidelines: Section 16 Follow-Up Program	▪ *EIS*: Section 7.1 Underground Air Monitoring Program	Describe how the proponent plans to monitor waste degradation rates (gas consumption, generation) within the sections of the repository to be closed off during operations in order to verify the EIS predictions on this matter.	The EIS indicates that the general air quality of the underground DGR will be monitored under the Environmental Management Program to ensure that the health and safety of personnel within the DGR is not compromised during underground construction and operations. The preliminary safety report indicates that concrete closure walls will be placed in the access tunnels at several places within the repository in order to isolate sections of the panel. Specifically they are: "designed to limit release of tritiated air, natural and waste-generated methane, and other off-gases from waste packages (e.g., H_2 and CO_2), as well as potentially contaminated water. In the remote event that explosive gases build up behind the closure wall and an explosion occurs, the air blast from the explosion will be contained by the closure wall." Since the first access tunnel closure wall is expected to be built several years before decommissioning, they will provide the opportunity to monitor waste degradation rates (O_2 consumption and CO_2/CH_4 production). This monitoring is important for operational safety and for verification of gas

IR#	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
				model EIS predictions and therefore should be included in the EIS Follow-up Program.
EIS 01-33	▪ EIS Guidelines: Section 8.1 General Information and Design Description: 12th and 14th bullets	▪ *Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository*: Section 2 - Projected operational low and intermediate level waste inventory and characteristics; Section 3, Projected retube and steam generator refurbishment waste inventory and characteristics	Describe how the proponent plans to verify the waste inventories (radiological and hazardous) during the DGR operational period, including radionuclides levels in the refurbishment waste, in order to confirm predictions of the inventory at the repository closure in 2062.	The radionuclide and hazardous substance inventory that is forecast is part of the basis for the safety assessment of both the preclosure and postclosure phases of the DGR. The inventory predictions made in the EA need to be verified for both the current inventory and also once refurbishment waste is sent to the DGR. There is currently no indication of a follow-up program element to deal with this matter.

References:

Akata N, H. Kakiuchi, N. Shima, T. Iyogi, N. Momoshima and S.Hisamatsu, 2011. Tritium concentrations in the atmospheric environment at Rokkasho, Japan before the final testing of the spent nuclear fuel reprocessing plant. Journal of Environmental Radioactivity; 102(9):837-842.

Best W.T., 1986. Updating scaling factors for 10 CFR Part 61. Waste Management 86, 3:311.

Best W.T. and A.D. Miller, 1987. Updating scaling factors in low level Radwaste. EPRI report NP-5077.

Bracke, G., W. Muller and K. Kugel. 2004. Derivation of Gas Generation Rates for the Morsleben Radioactive Waste Repository. Proceeding of the DisTec Conference, April 26-28, Berlin, Germany.

Canada Mortgage and Housing Corporation (CMHC) 2011. Rental Market Report, Ontario Highlights 2011.

CNSC 2004. Regulatory Policy P-290, *Managing Radioactive Waste*; http://www.nuclearsafety.gc.ca/eng/lawsregs/regulatorydocuments/published/index.cfm

CNSC 2006. Regulatory Guide G-320, *Assessing the Long Term Safety of Radioactive Waste Management*; http://www.nuclearsafety.gc.ca/eng/lawsregs/regulatorydocuments/published/index.cfm.

CSA Standard N288.1-08, *Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities.*

Deltete C.P., 1987. 10 CFR 61 International Atomic Energy Agency 2009. Determination and use of scaling factors for waste characterisation in Nuclear Power Plants. No.NW-T-1.18.

Humphreys, P.N., West, J.M. and R. Metcalfe. 2010. Microbial effects on repository performance. Quintessa Report QRS-1378Q-1.

Husain, A. and D. Jain. 2003. Chemical, Radiochemical and Microbiological Characterisation of the Contents of Resin Liners Sampled at the Western Waste Management Facility in 2002, Kinectrics Report No. 9820-090-RA-0001-R00, Toronto, Ontario.

IAEA 2009. Determination and Use of Scaling Factors for Waste Characterisation in Nuclear Power Plants. IAEA Nuclear Energy Series No.NW-T-1.18.

IAEA 2011. Disposal of Radioactive Waste. IAEA Safety Standards Series No. SRR-5. (http://www-pub.iaea.org/MTCD/publications/PDF/Pub1449_web.pdf),

Lewis, C.F.M., P.F. Karrow, S.M. Blasko, F.M.G. McCarthy, J.W. King, T.C. Moore, and D.K. Rea, In Press. Evolution of Lakes in the Huron basin: deglaciation to present. Aquatic Ecosystem Health & Management, 11(2):127-136, 2008.

Lewis, C.F.M., P.F. Karrow, S.M. Blasko, F.M.G. McCarthy, J.W. King, T.C. Moore, and D.K. Rea, In Press. Evolution of Lakes in the Huron basin: deglaciation to present. Aquatic Ecosystem Health & Management, 11(2):127-136, 2008.

OPG 2003. Carbon 14 Waste Management at the Western Waste Management Facility 1998-2002 Summary Report, Ontario Power Generation, June 27, 2003.

OPG 2007. An Overview of Tritium Releases and Mitigation for the Western Waste Management Facility W-REP-00531-00005-R000, Ontario Power Generation, January 15, 2007.

SHS Consulting 2009. *Bruce County Census Update*. Report prepared for the Bruce County Housing Services Affordable Housing Division (February 17, 2009)

Small J., M. Nykyri, M. Helin, U. Hovi, T. Sarlin, and M. Itävaara, 2008. Experimental and modelling investigations of the biogeochemistry of gas production from low and intermediate level radioactive waste. Applied Geochemistry 23:1383-1418.

Stroess-Gascoyne S., and C.J. Hamon, 2008. “Preliminary Microbial Analysis of Limestone and Shale Rock Samples”, Nuclear Waste Management Organization Report, NWMO TR-2008-09, 2008.

Thierfeldt S. and A. Deckert, 1995. Radionuclides difficult to measure in waste packages: Final Report BS-Nr. 9203-6. Brenk Systemplanung.

Wiborgh, M., L.O. Höglund and K. Pers. 1986. Gas Formation in a L/ILW Repository and Gas Transport in the Host Rock. Nagra Technical Report 85-17. Baden, Switzerland.

Attachment 2
Deep Geological Repository Project
Joint Review Panel LPSC Information Requests
Package 1 – March 7, 2012

IR#	NSCA Regulations Section #	Section # in OPG's LPSC Application	Information Request	Context
LPSC 01-01	▪ Class 1 Nuclear Facilities Regulations (C1NFR),5(a) and (d)	▪ Preliminary Safety Report (PSR) 6.1.2, Applicable Regulations, Standards and Codes, Table 6-1, [Ref. 1] ▪ Project Requirements DGR-PDR-00120-0001 [Ref. 2] ▪ 19.2 Buildings and Structures	For surface structures, provide clarification on the required application of the current edition (2010) of the National Building Code of Canada (NBCC) to all surface building and structures, including those surface buildings and structures that relate to mining activities.	Table 6-1, in PSR 6.1.2 Applicable Regulatory Standards and Codes, identifies the application of the National Building Code of Canada (NBCC). The Project Requirements, section 19.2 titled Buildings and Structures, states that *"(a) Surface facilities (except "mine-specific") - NBCC (2005)* *(a) Surface facilities - Ontario Regulation 213/91, Construction Projects (applicable to construction work to a nominal depth of 50 m below ground surface)* *(b) Surface facilities and underground waste handling - Ontario Regulation 851/90, Industrial Establishments* *(c) Underground facilities - Ontario Regulation 854/90, Mines and Mining Plants."* While the text identifies NBCC (2005) for surface facilities excepting mine-specific, CNSC staff notes that all surface facilities, including those that relate to mining activities and are described in the document as 'mine-specific', are required to comply with the current editions (2010) of the National Building Code of Canada. Assurance is needed on the application of the current editions of the NBCC to all surface structures, including those that relate to mining activities.
LPSC 01-02	▪ C1NFR, 5(d) and (e)	▪ PSR 6.1.2, Applicable Regulations, Standards and Codes, Table 6-1, [Ref. 1]	For fire protection, provide clarification on the application of the current edition (2010) of the National Fire Code of Canada(NFCC) to the fire protection systems of all surface facilities, including those described as mine specific; and the application of the current edition (2010) of the NFCC to below ground areas. Also confirm the correction to reference the current edition of the NBCC which is 2010.	Table 6-1 of PSR 6.1.2 identifies the application of the National Fire Code of Canada (NFCC). The Project Requirements, section 19.3 titled Fire Protection System, states that: *"(a) Surface facilities (except "mine-specific") - NBCC (2005)* *(b) Underground mine-specific (e.g., head frames, hoist rooms) facilities –*

IR#	NSCA Regulations Section #	Section # in OPG's LPSC Application	Information Request	Context
		▪ Project Requirements DGR-PDR-00120-0001 [Ref. 2] ▪ 19.3 Fire Protection System		*Ontario Regulation 854/90, Mines and Mining Plants* *(c) Surface facilities – National Fire Code (2005)* The text indicates 'underground' facilities as complying with O. Reg. 854/90 for the fire protection system. It is CNSC staff's opinion that the National Fire Code of Canada requirements are applicable to the underground portion of the facility also. This is to ensure that the appropriate inspection, testing and maintenance of the fire protection features are implemented. All surface facilities, including those that relate to mining activities and are described in the document as 'mine-specific', are required to comply with the current edition (2010) of the NBCC. Further, the current edition (2010) of the NFCC also applies to fire protection systems of the surface facilities. For the fire protection system, assurance is needed as to the codes to be applied to the surface and below ground facilities.
LPSC 01-03	▪ C1NFR, 5(d)	▪ PSR 6.1.2, Applicable Regulations, Standards and Codes, Table 6-1, [Ref. 1] ▪ PSR 4.5.2 Geologic Disturbances ▪ Project Requirements, DGR-PDR-00120-0001, [Ref.2] ▪ 6.0 Seismic and Anthropogenic Vibration Requirements	With respect to seismic hazards, provide information clarifying the edition of the NBCC that will be used in design the DGR surface buildings and structures to withstand earthquakes and identify the peak ground acceleration that will used for the design and include information on the basis for its use.	PSR 6.1.2 specifies that the DGR design will comply with the National Building Code of Canada (NBCC). Table 4-10 of PSR 4.5.2.2 provides peak ground acceleration from a seismic hazard assessment that refers to the 2005 edition of the NBCC. The Project Requirements, section 6.1, states that *'the occurrence of a seismic ground motion event, as specified in the NBC (2005) shall not lead to a structural failure in DGR surface facilities …'*. CNSC staff can not confirm the application of appropriate seismic accelerations to the detailed DGR design.
LPSC 01-04	▪ C1NFR, 5(e)	▪ PSR 6.1.2 Applicable Regulations,	With respect to pressure retaining systems, provide information clarifying the application of Canadian Safety Association, General Requirements for Pressure Retaining Systems and Components for Candu Nuclear	OPG indicates in PSR 6.1.2, Table 4-10, and in section 19.4 of Project Requirements, their application of Canadian Safety Association, General Requirements for Pressure Retaining Systems and Components for

IR#	NSCA Regulations Section #	Section # in OPG's LPSC Application	Information Request	Context
		Standards and Codes, Table 6-1, [Ref. 1] ▪ Project Requirements DGR-PDR-00120-0001, [Ref. 2] ▪ 19.4 Pressurized Systems	Reactors (CSA 285-08) and its updates, to the design effective date, in the DGR Project Requirements and PSR.	Candu Nuclear Reactors CSA N285-08 to pressurized systems in the DGR. CNSC staff note that Update No. 2 to this standard has been issued. Assurance is needed that CSA N285-08 and associated updates will be applied to pressurized systems and components in the DGR facility design.
LPSC 01-05	▪ C1NFR, 5(a)	▪ PSR 6.1.2, Applicable Regulations, Standards and Codes, Table 6-1, [Ref. 1] ▪ Project Requirements DGR-PDR-00120-0001, [Ref. 2] ▪ 19.9 Concrete and Steel	Provide information on the design standard that will be used for concrete structures.	Table 6-1 in the PSR identifies CSA A23.1 and A23.2 (titled Concrete materials and methods of concrete construction/Test methods and standard practices for concrete, respectively) but did not reference a standard for the design of concrete structures. CSA A23.3, Design of Concrete Structures, is standard that is considered by CNSC staff to be acceptable for the detailed engineering of the concrete structures. Confirmation is needed that appropriate standards are applied to the design of concrete structures for the DGR facility
LPSC 01-06	▪ C1NFR 5(d)	▪ PSR 6.2, Surface Buildings and Infrastructure ▪ Project Requirements DGR-PDR-00120-0001, [Ref. 2] ▪ 19.2 Buildings and Structures	Provide a description of the foundations for the surface structures, including information addressing their suitability for the general ground conditions.	The general design of the surface structures is provided in PSR 6.2, but no description of the foundations for the surface structures is included. Descriptions of the foundations for the surface structures are needed to complete the description of the general design of the DGR facility.
LPSC 01-07	▪ C1NFR, 5(d) and	▪ PSR 6.1.2, Applicable	Provide information demonstrating that the regulatory equivalent dose limits for Nuclear Energy Workers (NEWs), non-news and members of the	Sections 15.2.2 and 3 of the Project Requirements, referenced in PSR 6.1.2, identify occupational dose limits and dose constraints in terms of

IR#	NSCA Regulations Section #	Section # in OPG's LPSC Application	Information Request	Context
	(4) ▪ Radiation Protection Regulations (RPR) 4	Regulations, Standards and Codes, 7.1.2.1 Radiological Protection, [Ref. 1] ▪ Project Requirements DGR-PDR-00120-0001, [Ref. 2] ▪ 15.2 Occupational Safety Requirements ▪ Preliminary ALARA Assessment, NWMO DGR-TR-2011-36 [Ref. 3]	public are part of the radiation protection requirements for DGR design and operation, and that they will be adhered to and kept as low as reasonably achievable (ALARA)	'effective' dose and the requirement that the DGR be designed, constructed, operated, and decommissioned in keeping with ALARA. Section 7.1.2.1 of the PSR and the Preliminary ALARA Assessment report present dose limits and targets in terms of effective dose. No acknowledgement or demonstration was made of the 'equivalent' dose limits as part of the radiation protection requirements for DGR design and of the adherence to these limits, or to keeping these doses ALARA.
LPSC 01-08	▪ C1NFR, 5(d) ▪ RPR 4(a) and 5	▪ PSR 6.2.1.2, Waste Package Receiving Building, [Ref. 1] ▪ Preliminary ALARA Assessment, NWMO DGR-TR-2011-36, [Ref. 3]	For the Waste Package Receiving Building (WPRB) provide information clarifying: ▪ how ALARA is accounted for in the design of the WPRB (for NEWs and Non-NEWs); ▪ the maximum number of intermediate level waste packages that the intermediate level waste staging area is expected to support in an 8 hour shift ▪ the maximum dose rate from the low and intermediate level waste packages in the staging areas; ▪ the location and general layout of adjacent control room and offices; and ▪ the application of ALARA in the design for those working in the office/control room. .	PSR 6.2.1.2 Waste Package Receiving Building provides a general description of the number (24) of low level waste packages but not the number of intermediate level package that the staging area may support during an 8 hour shift. PSR 6.2.1.2 states that "*localized shielding is incorporated into the WPRB wall design adjacent to the staging area, as required to protect workers … in accordance with OPG radiation protection requirements*" and that the detailed engineering will ensure "*the external dose rate outside the WPRB is below the OPG 25 μSv/hr building exterior radiation protection requirement and that dose rates in the office/control room are below the dose target of the 10 mSv/year.*" (see PSR 7.7.1). Further, PSR 10.1.1 Keeping Doses ALARA, affirms that radiation exposure is, amongst other things, managed by "*establishing facility design optimized on the basis of ALARA considerations*". CNSC staff expects that the structures are designed to ensure regulatory dose limits are respected and radiation exposures to individuals are ALARA. An examination of the Preliminary ALARA Assessment did not provide an account for workers in the office/control room area. Given the

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				design targets, 25 μSv/hr at the building exterior and < 10 mSv/yr for the Zone 1 office/control room, it is not apparent whether the regulatory dose limits and ALARA have been taken into account for non-NEW workers in the design of the WPRB. No information is provided on the maximum dose rate from the low and intermediate level packages that will be used for the detailed engineering of the shielded wall, and figure 6-4 of the PSR does not clearly illustrate the location of the adjacent rooms and offices.
LPSC 01-09	▪ C1NFR, 5(e)	▪ PSR 6.2.1.4, Compressor Building, [Ref. 1]	Provide information clarifying both the need and availability of a back-up air supply in tanks or bottles to maintenance areas and refuge stations, and of the need for instrument air. Include supporting information when addressing need.	In the description provided in PSR 6.2.1.4 on the compressor building used to provide air to maintenance areas (surface and underground) and to refuge stations (underground). It was unclear whether back-up air in tanks or bottles is also being provided in case of a complete loss of compressed air. It is also unclear whether there is any requirement for instrument air.
LPSC 01-10	▪ C1NFR, 5(e)	▪ PSR 6.2.4 Shared Services – 6.2.4.1 Electrical Supply and Emergency Power [Ref. 1] ▪ Project Requirements DGR-PDR-00120-0001 [Ref. 2] ▪ 19.5 Electrical	Provide additional information on the electrical systems, including the induction motor(s) that are its largest load, and the emergency power system. Include information on the basis for the identified emergency power loading and period of operation, and address NBCC emergency power requirements for the fire alarm system. Also address such things as: the kinds of analyses used to assess voltage and current at bus bars and to avoid common mode power failure; the use of batteries in the emergency generator, and in emergency lighting and communication; and the hazards that will be considered for the locations of distribution and control panels.	While general information is provided in PSR 6.2.4 on the induction motor, electrical supply and emergency power, information related to design and operational safety were missing such as: ▪ the standard for the induction motor(s) (National Electrical Manufacturers Association) (NEMA MG1); ▪ if the DGR will use the odd/even separation concept to avoid common mode power failure; ▪ if electrical transient assessment program analysis will be used to assess voltage and current at various bus bars; ▪ if the fire alarm system is on the emergency power supply; ▪ the analysis for the basis of the 1750 kW emergency power presented in the PSR, taking into account the maximum capacity of individual loads; ▪ if batteries will also be used to support emergency lighting and communication, and the basis for their sizing; ▪ the basis for the 48 hour operation of the emergency diesel generator presented in the PSR, the standard for the generator, whether there is a need for provisions to hook-up a portable diesel generators, battery size for minimum five starts, the maximum black-out time for the facility; and the ▪ locations of electrical system distribution/control panels relative to natural event hazards (floods, etc); and of secondary controls to address access emergencies to the main control room.

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				▪ The additional information will enable a clearer understanding of the design of the electrical system and emergency power supply.
LPSC 01-11	▪ C1NFR 5(d)	▪ PSR 6.2.1 Main Shaft Area, [Ref. 1] ▪ 6.2.1.4 WPRB ▪ 6.2.1.4 Offices, Main Control Room and Amenities Building ▪ Project Requirements DGR-PDR-00120-0001, [Ref. 2] ▪ 19.2 Buildings and Structures	Provide information on the Human Factors (HF) design standard, criteria, and/or guidelines that has been and will be used in the detailed design. Identify the areas, both above and below ground, where Human Factors are being applied to the design. Provide additional information on the activities in the main control room and design features in other safety-significant areas.	PSR 6.2.1.4 and 6.2.1.4 provide descriptions of the design of the Waste Package Receiving Building (WPRB) and the Main Control Room. Project Requirements, section 19, does not identify the Human Factors design standard, criteria or guidelines that will apply to these areas and others, such as maintenance areas, refuge stations, where Human Factors considerations should be applied in design for safety.
LPSC 01-12	▪ C1NFR 5 (d)(e)	▪ PSR 6.2.4 Shared Services, [Ref.1] ▪ 6.2.4.8 Stormwater Management System	Clarification is requested on the volumes of process water and underground seepage expected during the construction period and how it has been considered in the sizing of the stormwater management pond.	PSR 6.2.4.8 provides a description of the stormwater management system which is to serve during both DGR construction and operation. Information provided discusses the sizing of the stormwater management pond based on catchment size and rainfall events. This information does not indicate consideration in the sizing of excavation effluents during the period of underground construction (process water and underground seepage).
LPSC 01-13	▪ C1NFR 5 (d)(e)	▪ PSR 6.2.4 Shared Services, [Ref. 1] ▪ 6.2.4.8 Stormwater Management System ▪ 9.3.2 Stormwater Management	Provide additional information on the stormwater management pond including the liner(s), point of influent and discharge control. The additional descriptions need to be supported with geotechnical information on the subsurface conditions at the site of the management pond.	PSR 6.2.4 and 9.3.2 describes the design (drawing H333000-WP404-10-042-0001) of the stormwater management pond as relying on natural or composite liner. No supporting geotechnical information has been provided on subsurface conditions at the site of the stormwater management pond. There is little description of the liner, point of influent, and discharge control. Additional information is needed for a complete a description of the design stormwater management pond.
LPSC 01-14	▪ C1NFR 5(e)	▪ PSR - 6.3.8.1 Ventilation System and Operation, [Ref.	Provide additional information on the ventilation on the ventilation system and its operation in the area of the underground facility. This information should address things as: size of ventilation tunnels, exhaust filtration	As described in the PSR and stated in 4.4 of the Preliminary Conventional Safety Assessment *"The repository's underground ventilation system has been designed so that fresh air flows from the main shaft through the*

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		1] ▪ 6.3.8.2 Ventilation System Capacity; 6.3.8.3 Operations Ventilation; 6.3.8.5 Exhaust Fans, 6.8.4 Emergency Ventilation Controls ▪ Preliminary Conventional Safety Assessment, NWMO DGR-TR-2011-37 [Ref.4] ▪ 4.4 Operations Activities	requirements; plenum description; control of contaminated condensation from ventilation; ventilation logic for normal operation; and location of underground fans.	*emplacement rooms to the return air drifts and then exhausts through the ventilation shaft to the surface … . Therefore, under normal conditions, workers are on the fresh air side of each workplace, with potentially contaminated air being exhausted from the workplace."* While a description of the ventilation system design and operation is provided, additional information is needed in areas such as the: ▪ size of the return air tunnels that are also used for egress; ▪ ventilation system exhaust filtration requirements; ▪ plenum description; ▪ control of contaminated water discharge from condensate associated with the ventilation shaft plenum; ▪ the ventilation logic for normal operations, including service areas and tunnels, in both the day and night time periods, and the ▪ general location of the underground fan(s) The additional information is needed for a clearer understanding of the ventilation system, including the logic for its operation.
LPSC 01-15	▪ C1NFR, 5(e)	PSR - 6.3.8.1 Ventilation System and Operation; [Ref. 1] 6.3.8.3 Operations Ventilation; 6.3.8.5 Exhaust Fans, 6.8.3.2 Underground 6.8.4 Emergency Ventilation Controls Preliminary Conventional Safety Assessment, NWMO DGR-TR-2011-37, [Ref. 4]	Additional information is required concerning: ▪ the ventilation logic for fire events and its relation to the egress strategy and the fire suppression strategy; ▪ the use of fire doors and temporary walls, their construction, and their function in the underground fire suppression scheme; and ▪ the ventilation logic in the event of an incident involving the release from a non-fire event, of significant quantities of volatile radionuclides or volatile hazardous substances.	Further to underground ventilation: PSR 6.8.3.2 states "*To fight a fire in a waste-filled emplacement room, fire doors or temporary barrier walls will be places across the entire cross-section of the access and return air drifts to isolate … .*": PSR 6.8.4 states "*Ventilation fans and regulators underground are controlled remotely from surface … or manually … . For safety reasons, no alteration or disruption to the ventilation system will occur until all underground workers are accounted for and the mine rescue team has assessed the situation*"; and the Preliminary Conventional Safety Assessment states *"The underground layout of the DGR … . … provides secondary egress via the return air drifts."* It is unclear how the ventilation will be operated in the event of a fire given the use of the return air drifts as secondary egress and the identification of the use of fire doors (fixed structure location) and/or temporary barrier walls as a fire suppression scheme (construction, possible locations and timing of implementation). There was also no discussion of ventilation control in the event of an incident involving significant quantities of volatile radionuclides or volatile hazardous substances.

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				The use of inflatable fire barriers to starve a fire of oxygen is not common, and may not be feasible from a pragmatic implementation perspective. CNSC staff has concerns with this method of fire suppression. The applicant will be required to demonstrate that the system is appropriately tested and qualified by an accredited testing laboratory (such as ULC), be shown to be feasible through testing and case studies and be supported by appropriate training and testing for the life of the facility. Additional information is needed for a clearer understanding of the ventilation system logic and its relation to the fire suppression scheme during abnormal events, such as fire. Information is also needed on how the ventilation will work in the event of a significant release of volatile radioactive or hazardous substance.
LPSC 01-16	▪ General Nuclear Safety and Control Regulations (GNSCR) 3(1)(i)	▪ PSR 6.8.3.2 Underground, [Ref. 1]	Additional information is requested justifying the statement made concerning the installation of fire suppression equipment in emplacement rooms.	It is stated that "*Installing fire suppression equipment in the emplacement rooms would be ineffective due to the size of the rooms and the storage arrangement of packages.*" It is not clear why the installation of fire suppression systems would be ineffective where fire suppression systems are currently installed in the Low Level Storage Buildings of the Western Waste Management Facility (WWMF). Clarification is needed.
LPSC 01-17	▪ C1NFR, 5(d)	▪ PSR 6.3 Underground Facilities, [Ref. 1] ▪ 6.3.1.2 (Main) Shaft Liner ▪ 6.3.2.2 (Ventilation) Shaft Liner ▪ 9.4.5.4 Final Liner Construction	Provide clarification on how the design of the shaft liners is expected to vary to address changeable rock conditions along the shaft length, and the method expected for the liner construction.	PSR 6.3.1.2 states *"The main shaft contains a concrete liner designed for the varying conditions from the shaft collar to the shaft bottom. The liner is a key component to the support of the shafts, as well as, controlling water inflow into the shaft."* PSR 6.3.2.2 indicates that the ventilation shaft liner performs the same functions. No information is provided on how the design is expected to change to address variability in ground conditions (e.g. seepage, rock strength) along the shaft length. The design of the liners is not discussed. PSR 9.4.5.4, Final Liner Construction, does not describe the expected method for the liner construction. Additional information is needed to understand how the shaft liner design is expected to address variable rock conditions.
LPSC 01-18	▪ C1NFR, 5(d)	▪ PSR 6.3 Underground Facilities, [Ref. 1] ▪ 6.3.4 Underground Shaft and Services	Additional information on the dimensions and configuration of the underground facilities in the service area, the ramp to shaft bottom, ventilation tunnel, and loading pocket is requested. Also include information on the expected ground support needs in these areas.	The opening sizes of some tunnels and the emplacement rooms are provided (see PSR 6.3.4 and 6.3.5 - figures 6-15, 6-16, 6-17, and 6-18). But similar information is not provided for the underground services area, the ramp to shaft bottom, the ventilation tunnel, and loading pocket. The text in 6.3.8.3, and subsequently 6.8.3.2, references ground support but

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		Area, 6.3.5 Emplacement Rooms		does not provide a description of the methods expected to be used. This information will provide a better understanding of the facility design.
LPSC 01-19	▪ C1NFR 5(e)	▪ PSR 6.3.10.4 Underground Dewatering, [Ref. 1]	Provide clarification of the dewatering system, including sump/pump locations, pump sizes, and effluent release description and location, with a simplified flow diagram(s).	PSR 6.3.19.4 provides the description and operation of a number of sumps and plans for the dewatering of the underground facility. Some of the sumps are interconnected and others are not, but this description is not clear. No diagram is provided indicating the location of the various sumps, nor is a diagram(s) provided illustrating their interconnections. There is no description of the point of release for effluent from the dewatering sump at the surface. This information is important understanding the facility design
LPSC 01-20	▪ C1NFR 5(e)	▪ PSR 6.8.2 Fire Suppression, [Ref. 1] ▪ 6.8.3.1 Surface Facilities	Provide additional information on the fire water supply to the DGR site. The information needs to include an assessment of the sufficiency of the single point supply including the possibility and effect of a fire water impairment, the safety considerations and the planned response in such an event during the construction and operational periods.	PSR 6.8.3.1 states that *"The fire water main is connected to the existing Bruce Power fire water system. Water for all water based fire suppression systems will be supplied by the fire water main".* The fire water main as is understood to exist to the centre of the Bruce site is via a single point. A single point connection leads to a greater potential for an impairment of the system to the centre of site and therefore to the DGR. The applicant should consider the benefit of multiple supplies to the Bruce Power fire water system to minimize the potential for an impairment of the fire water system and the operational restrictions in such an event." Additional information is needed to establish the adequacy of the fire water supply.
LPSC 01-21	▪ C1NFR 5(e)	▪ PSR 6.8.3 Fire Suppression, [Ref. 1] ▪ 6.8.3.2 Underground	Provide clarification of the statement "if required" in respect to a dry standpipe at the main shaft is requested.	It is stated that *"A dry standpipe and hose will be available at the main shaft station, if required."* It is CNSC staff's opinion that at a minimum, a dry standpipe to supply water for fire fighting will be required in the underground portion of the facility. Clarification is required, given the opinion of CNSC staff concerning the need for the availability of fire water in the underground facility.
LPSC 01-22	▪ C1NFR 5(e)	▪ PSR 6.8.3 Fire Suppression, [Ref. 1] 6.8.3.2 Underground ▪ EIS Main Report	Provide clarification of the fire suppression methods that will be used (fixed and portable), along with requirements for the systems.	The PSR and EIS Main Report identify a reliance on chemical-based fire suppression systems. The EIS Main Report states "handheld foam-based extinguishers located … in high traffic areas (i.e. *diesel fuel bay, maintenance shop) as well as mobile equipments …* and *… a mobile foam generator … based underground for use in open emplacement rooms*,". The PSR states "*a foam based suppression system for the maintenance*

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		Vol.1 [5] ▪ 4.17.2 Fire Protection Systems		*shop and diesel fuel bay … (single fixed pipe foam system) …installed to provide coverage to both rooms* and *a portable skid mounted dry chemical system is provided to aid mine rescue teams* …" It is unclear what will be used and where, if both a mobile foam generator and a mobile dry chemical system are to be used, and if a fixed foam system is being employed. There is little information indicating the intended size and type of fires the various systems are intended to address. It is also unclear what the water source for the foam units will be.
LPSC 01-23	▪ C1NFR 5(e) ▪ RPR 4(a)(b), and 5(2)	▪ PSR 6.11 Radiation Monitoring, [Ref. 1] ▪ 10.4.1 Radiological Monitoring Program ▪ DGR EA Follow-up Monitoring Program, NWMO DGR-TR-2011-10 [Ref. 6]	Provide clarification on radiation monitoring of air and water in the underground facility addressing such things as: the radionuclides monitored; sampling locations; types of monitoring equipment; measurement monitoring/control locations; emergency power; and notification/alarms.	PSR 6.11 provides a brief description of the radiation monitoring of air in underground areas (i.e. service area, active emplacement rooms) and water underground but does not identify what radionuclides will be monitored or the locations to be monitored. PSR 10.4.1 indicates that tritium, C-14 and gross-beta monitoring will be conducted at appropriate points as part of the environmental management system, but is not definitive "*potentially including vent exhaust, surface water and groundwater*". An examination of the DGR EA Follow-up Monitoring Program, Table 5b, indicates monitoring of vent and WPRB exhaust for radon, tritium, particulate, and carbon-14 as part of the environmental management plan during operations, but it does not include any details of radiation monitored underground for worker health and safety. The description of the radiation monitoring was not sufficiently clear for CNSC staff to assess the adequacy of the radiation monitoring to protect workers and the environment.
LPSC 01-24	▪ C1NFR 5(e)	▪ PSR 6.12 Underground Air Quality Monitoring, [Ref. 1] ▪ 10.4.3 Underground Air Quality Monitoring ▪ DGR EA Follow-up Monitoring Program, NWMO DGR-TR-2011-10,	Clarification is requested on the air quality monitoring system for the underground facility, addressing such things as sampling and air flow measurement/control locations, type of equipment, emergency power, and notification/alarms. Discussion of the need for future air quality monitoring of the closed panel should be included.	PSR 6.12 and 10.4.1.3 provides a general description of the monitoring of air quality and air flow underground, including the non-radioactive hazardous substances to be monitored. PSR 6.2.4.3, Control and Monitoring Systems, states that air quality is monitored but not controlled at surface in the main control room. The DGR EA Follow-Up Monitoring Program, Table 3b, 4b identifies air quality as controlled at surface. The description of the air quality monitoring appears contradictory and not sufficient to assess the air quality monitoring system to protect workers in the DGR underground facility. It is also uncertain if there will be need in the future for air quality monitoring within the panel projected for closure within the first ten years of operation.

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		[Ref. 6]		Clarification is needed for CNSC staff to assess the adequacy of air quality monitoring to protect workers and the environment during the operational period.
LPSC 01-25	▪ C1NFR 5(c)	▪ PSR 9.1.2 Construction Program and Schedule, [Ref. 1] ▪ DGR Project Schedule [Ref. 7]	Provide clarification and additional information on the project schedule, including completion of engineering details and construction tasks.	PSR 9.1.2 provides a site preparation and construction schedule (Figure 9-1). The schedule of tasks in Figure 9-1and the tasks as indicated by the text headings in PSR 9.1.2 do not align. Further, the schedule does not include information on the timeline for the completion of design details. Also not included is information identifying when construction plans (ground improvement, excavation plans and techniques, ground support, construction ventilation and dewatering) are expected to be complete. Additional information is needed on the schedule for completion of detailed engineering and construction plans so that CNSC compliance verification activities associated with the details and construction plans can be identified and integrated to assure regulatory oversight and licensee compliance.
LPSC 01-26	▪ GNSCR 3(1)(b)	▪ PSR 9.3.1 Installation of Construction Services, [Ref. 1]	Additional information is requested describing the temporary concrete batch plant and the site services.	PSR 9.3.1 identifies the services that will be provided by the project for use by contractors on site and refers to figure 9-2 for the layout of the construction area. No description has been provided of the temporary concrete batch plant that will serve the construction of the DGR facility. Figure 9-2 does not identify the "*service and fire water connection points*" or the "*communications connection point*" which are common for all construction users. Additional information is needed for a more complete description of temporary construction services.
LPSC 01-27	▪ C1NFR 5(d)	▪ PSR 9.3.2 Stormwater Management, [Ref. 1] ▪ EIS Main Report Vol.1 [Ref. 5], .4.1.5 Stormwater Management System, 4.7.5.4 Water Management	Provide additional information on the water treatment system and plant, such as location, the basis for the design, description of the point of release to the stormwater management system, and the expected operation.	PSR 9.3.2 states "*Water pumped to the surface from the underground via the shafts during construction will be treated in a temporary water treatment plant prior to discharging in to the site stormwater management system. Contaminants such a nitrogen, ammonia and saline groundwater will be treated as necessary, in the stormwater management pond.*" The EIS (4.4.1.5) indicates "*The stormwater management pond is sized to provide a retention area for settling particles … . Additionally, water treatment will be employed in the drainage system upstream of the stormwater management pond for the duration of the site preparation and construction phase, and possibly the first two years of operation*

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				depending on monitoring results." and (4.7.5.4) *"the temporary treatment plant would be used, as required, to remove excess oil, grease and grit before discharge to the drainage network. It, however, will not be used to treat water in the stormwater management pond … ."* The description of the water treatment system for surface and underground water is unclear from the descriptions provided in the PSR and EIS. The temporary plant location, the basis for the design, a description of the point of effluent control, and the general operation of the plant is not described. Further, as part of the water treatment during construction it is indicated that nitrogen, ammonia, and salinity will be treated (as necessary) in the stormwater management pond, but the process is not described. Additional information is needed to clearly understand the function and operation of the treatment system during the construction period which includes the plant and activities in the stormwater management pond.
LPSC 01-28	▪ GNSCR 3(1)(b)	▪ PSR 9.3.3 Waste Rock Handling, [Ref. 1] ▪ 6.2.3 WRMA	Provide information describing the construction of the waste rock management area (WRMA).	While PSR 6.2.3 and drawing H333000-WP404-10-042-0003, provides some description of the WRMA, PSR 9.3.3 is very brief on the development of the area during the construction phase (stages, lifts, end-dump, etc). Additional information describing the construction of the waste rock management area is needed to assess construction activities.
LPSC 01-29	▪ GNSCR 3(1)(j)	▪ PSR 9.3.4 Conventional and Hazardous Materials Management, [Ref. 1]	Provide information on the estimated range of annual output of grey water and clarification on the range of waste rock produced per year.	PSR 9.3.4, states "*during construction, sanitary services will be supplied and managed by the contractor, with disposal off-site. This will include sanitary and mine dry facilities …* ." Table 9-1 identifies the sanitary waste volumes, but it is not clear on the volume of grey water. Further, the waste rock in the table is the total volume expected, and not a range per year during the period of excavation. Information on the quantity of grey water produced during construction is needed. Clarification is also needed on the approximate volume of waste rock expected to be produced annually during the period of excavation.
LPSC 01-30	▪ GNSCR 3(1)(b)	▪ PSR 9.4 Construction, [Ref. 1] ▪ 6.3.8.1 Ventilation	Provide information on the construction of the plenums as part of shaft pre-sinking activities.	While PSR 6.3.8.1 identifies the intake and exhaust plenums, the description of shaft pre-sinking activities does not include the construction of the main and ventilation shaft plenums. To better assess construction plans, a description of the construction of

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		System and Operation		the plenums is needed for a more complete description of shaft pre-sink activities.
LPSC 01-31	▪ GNSCR 3(1)(b)	▪ PSR 9.4 Construction, [Ref. 1] ▪ 9.4.1 Ground Improvement	Provide additional information on the ground improvement planned for the upper 180 metres of bedrock, including the relative advantages of the proposed methods and estimates for the change in groundwater flow (before and after).	PSR 9.4.1 describes several ground improvement approaches for rock excavation that may be used for pre-sink (shaft collar) activities and shaft sinking activities. The description indicates ground water concerns primarily in the upper 180 metres of bedrock but is unclear what ground improvement approach will actually be used, and on the ground water flow estimates before and after ground improvement. Additional information on ground improvement plans and groundwater control will enable a better understanding of construction issues during shaft sinking.
LPSC 01-32	▪ GNSCR 3(1)(b)	▪ PSR 9.4 Construction, [Ref. 1] ▪ 9.4.2 Preparation of Shaft Collars ▪ 9.4.5. Shaft Sinking	Provide information on the kinds of controlled drill and blast techniques that may be used to minimize the excavation damage zone (EDZ) associated with the shaft excavation. Also provide information discussing the kind of ground support expected for use during excavation of the shafts.	PSR 9.4.2 provides a brief description of rock excavation for the shaft collar in the upper 20 metres of bedrock with temporary equipment for drilling. PSR 9.4.5 briefly described the sinking of the main and ventilation shaft using "controlled drill and blast techniques". No information is provided on what controlled drill and blast techniques may be used to minimize the EDZ. The EDZ is important to long term performance. Ground support is also not described. Additional information on the kinds of drill and blast and ground support techniques is needed for a more complete description of the construction of the DGR facility.
LPSC 01-33	▪ GNSCR 3(1)(b)	▪ PSR 9.4 Construction, [Ref. 1] ▪ 9.4.3 Erection of Main Shaft and Ventilation Shaft Headframe	Provide additional information on the waste rock dumping facility and the muck bay (with sump description, dust control, etc) associated with the main and ventilation shafts.	PSR 9.4.3 briefly describes a temporary waste rock dumping facility and muck bay beside the main headframe for shaft sinking, and similar facilities for waste rock from underground development associated with the ventilation shaft (PSR 6.2.2.1). Additional information on the temporary and permanent muck bays and dumping areas (nominal size, dust control, etc.) provides a more complete understanding of waste rock handling.

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LPSC 01-34	▪ GNSCR 3(1)(b)	▪ PSR 9.4.7 Construction of Underground Facilities, [Ref. 1] ▪ 9.4.7.1 Excavation Methods and Installation of Rock Support	For underground development provide additional information on the excavation cycle, the use of partial-face excavation, and the ground support methods and their expected locations for installation.	PSR 9.4.7.1 provides a brief, but incomplete, description of the drill and blast excavation cycle. It is not clear what support is expected for the typical profiles of the excavated openings, and whether steel mesh is part of the initial ground support. It is also unclear what partial-face excavation may be conducted to reduce risk of rock falls and where it may be expected to be used. Additional information is needed to complete the excavation plans for the underground development.
LPSC 01-35	▪ GNSCR 3(1)(b)	▪ PSR 9.4 Construction, [Ref. 1] ▪ 9.4.7.2 Development Sequence ▪ 9.4.7.3 Ventilation During Lateral Development ▪ 6.3.8.2 Ventilation System Capacity ▪ Radon Assessment, NWMO DGR-TR-2011-34 [Ref. 8]	Provide additional information on the lateral development and the ventilation schemes for the development sequences to allow confirmation of the ventilation system capacity. Provide description of the ventilation system during underground development (e.g. temporary or permanent rigid metal ducting?).	PSR 9.4.7.2, 9.4.7.3 and Figures 9-4 to 9-8 provides only a brief description on the development sequence and the associated ventilation. No information is provided about the development and ventilation of the shaft bottom ramp, and information is lacking on the other lateral development sequences. This limits determining the adequacy of the capacity of ventilation system. The lateral development schedule suggests a minimum of 6 development headings indicating, based on Figure 2.3, Radon Assessment, a requirement for 180 m3/sec maximum air flow. This is different from PSR 6.3.8.2, which indicates 130 m/sec maximum air flow during construction. Figure 9-12 shows a push (40 kw) - pull (80 kw) system for a single heading, but this is uncertain. Additional information is needed so that ventilation requirements for the construction period can be confirmed by CNSC staff.
LPSC 01-36	▪ GNSCR 3(1)(b)	▪ PSR 9.4 Construction, [Ref. 1] ▪ 9.4.9 Occupational Safety ▪ Preliminary Conventional Safety Assessment, NWMO DGR-TR-2011-37 [Ref. 4]	Clarification is needed on the application of fire safety/protection requirements of Part 8 of the National Building Code and Ontario Regulation 213/91 Construction Projects during the site preparation and construction phase. Additional information is needed addressing fire and fire protection during construction, including a fire hazard analysis and the development of a fire protection program for the site preparation and construction phase of the DGR project.	There is no apparent discussion in PSR 9.4.9, Occupational Safety, on fire protection during the site preparation and construction phase. PSR 9.4.9 does refer to the Ontario Occupational Health and Safety Act and the Preliminary Conventional Safety Assessment Report which identifies the *Mines and Mining Plants Regulations*, RRO 1990 Reg.854. This regulation includes fire protection. But no references are made to the application of Part 8 of the National Building Code of Canada (NBCC), "Safety Measures at Construction and Demolition Sites" (and by citation the National Fire Code of Canada) for the construction phase of the DGR project. Nor is reference made directly to Ontario Regulation 213/91 Construction Projects. Both Part 8 of NBCC and Ontario Regulation

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				213/91 are applicable during the development of the DGR facility, and through Part 8 of the NBCC there is an expectation for a fire protection program during this period. Table 5.3, Summary of Construction Conventional Safety Assessment, in the Preliminary Safety Assessment Report did not identify 'fire' as a hazardous condition and did not, therefore, indicate control and mitigation measures. Fire was addressed as a hazardous condition in Table 5.2 for site preparation. CNSC staff requires the development of the Fire Protection Program and a Fire Hazard Analysis (FHA) based on the consideration of National Fire Protection Association (NFPA) 122 and NFPA 801. Clarification and additional information is required to understand how fire and fire protection will be addressed during site preparation and construction of the DGR.
LPSC 01-37	▪ GNSCR 3(1)(b)	▪ PSR 9.4 Construction, [Ref. 1] ▪ 9.4.9 Occupational Safety ▪ Preliminary Conventional Safety Assessment, NWMO DGR-TR-2011-37 [Ref. 4]	Provide additional information clarifying, for the site preparation and construction phase, the conventional safety requirements. The information should include any additional controls and measures for conventional safety required by the applicable regulations under Ontario's Occupational Health and Safety Act and not currently identified in the Conventional Health Assessment, and how the controls and mitigations are to be provided.	PSR 9.4.9 discusses occupational safety and contingency planning, primarily referencing Ontario's Occupational Health and Safety Act, the NWMO's Health and Safety Management Plan, the Design and Construction Phase Management System (provided), and the Conventional Safety Assessment (provided). Tables 5-2 and 5-4 in the Conventional Safety Assessment, provides a summary of the hazards during site preparation and construction, and lists the controls and mitigation measures needed to address them. It is not apparent in the PSR and Construction Phase Management System document how the controls and mitigation are to be provided and what, if any, additional controls and measures may be required by the applicable regulations made under Ontario's Occupational Health and Safety Act. Additional information is needed on the controls and measures and their application in the period of site preparation and construction to assure CNSC staff of worker safety.

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LPSC 01-38	▪ GNSCR 3(1)(b)	▪ PSR 9.4 Construction, [Ref. 1] ▪ 9.4.11 Commissioning ▪ 9.4.11.1 Underground, ▪ 9.4.11.2 Surface ▪ Design and Construction Phase Management System, DGR-PD-EN-0001, [Ref. 9]	Provide additional information clarifying the commissioning of temporary installations, such as the water treatment plant, used during the site preparation and construction phase and permanent installations, such as the hoists, that are used in a construction configuration during the same period.	PSR 9.4.11 states "*Commissioning plans for the DGR project will be developed in accordance with the commissioning program referred to in the Design and Construction Phase Management system document. … Commissioning … will be staged, with initial commissioning of key equipment and facilities occurring early the construction program to support development of the repository*." PSR 9.4.11.1-2 describes commissioning for subsequent operation of the DGR facility but provides no details on the commissioning of temporary installations (such as the galloway, water treatment plant and the batch concrete plant) that support construction. The commissioning of permanent installations for use in during the construction phase (such as the hoists in the main and ventilation shafts, the stormwater management pond) also does not appear to be discussed. CNSC staff was unable to confirm if the commissioning as discussed in the Design and Construction Phase Management System document included the period of site preparation and construction. Additional information on the commissioning of temporary and permanent installations used in a construction configuration is needed to fully understand this activity during the construction phase.
LPSC 01-39	▪ C1NFR 5(f) ▪ RPR 4, and 5	▪ PSR 7.1.1 Context, [Ref. 1] ▪ Preliminary ALARA Assessment [Ref. 3] ▪ 6.1.2 Collective Dose Estimate	Provide information clarifying the purpose and use of the collective dose benchmark for the DGR. Also include information on the disposition of the recommendations put forth in the Preliminary ALARA Assessment.	PSR 7.1.1 states *"The WWMF operating experience over the past 40 years is also an important context for this DGR operational safety assessment. Many of the waste packages to be emplaced within the DGR are currently handled, transferred and stored in the WWMF."* The Preliminary ALARA Assessment identifies the collective dose benchmark for DGR workers as 55 person - mSv/year (based on the WWMF experience). However, the actual collective dose estimate for DGR workers (i.e. waste handling, maintenance and support workers) is 137 person – mSv/year, which is significantly higher that the collective dose benchmark. Given the differences between the collective dose estimate and the benchmark, the intent of the collective dose benchmark and the purpose it serves in the design and operations is unclear. As well, the suggested efforts presented in the Preliminary ALARA Assessment to reduce the collective and individual doses are recommendations, and it is not clear whether any will be accepted and implemented in the design and operation of the DGR.

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LPSC 01-40	▪ C1NFR 5(f)	▪ PSR 7.1.2 Criteria, [Ref. 1] ▪ 7.1.2.1 Radiation Protection ▪ 7.4.2.2 Dose Impact Model	Provide additional information to support statements on the applicability of the Derived Release Limits (DRLs) for the WWMF to the DGR site on preliminary basis. Include information on plans for the development of final DRLs for DGR operation.	The PSR refers to the use, on a preliminary basis, of DRLs prepared for the WWMF because of similar wastes, and location of release sources. These DRL calculations include air dilution factors developed for the WWMF. The PSR indicates that the estimated doses, which are based on the estimated release rate for the DGR compared to the DRLs, are considered conservative. While the similarity of waste is understood, there is no discussion of the similarities of location and release height to support the statements on applicability. Additional information is needed to confirm the general applicability of the WWMF DRLs to the DGR
LPSC 01-41	▪ C1NFR 5(f)	▪ PSR 7.5 Accident Assessment, [Ref. 1] ▪ 7.5.1.2 Initiating Events	Identify events on the Bruce site that could affect the DGR. Provide an assessment of how the DGR may be affected, including possible simultaneous events at both the Bruce Power facilities and the DGR. Information needs to include how these events influence the DGR facility design (if they do) and if, and how, such events need to be addressed in contingency plans (e.g.changes to the status of DGR and Bruce Power operations) and emergency planning (e.g. changes to emergency response assistance) for the construction and operational phases.	PSR 7.5.1.2 and Table 7-25, Initiating Events, identifies many external events that are assessed as to their potential to affect operations at the DGR facility. However, the list of potential external events does not include radiological and nuclear events and/or other events originating from other areas of the Bruce site. These events may have effects that might necessitate changes to the DGR design, to contingency planning and to emergency response plans for the construction and operational phases. The assessment of the effects of initiating events occurring elsewhere on Bruce site, including simultaneous events, needs to be included to demonstrate adequate consideration of all potential events affecting the DGR.
LPSC 01-42	▪ C1NFR 5(f)	▪ PSR 7.5 Accident Assessment, [Ref. 1]	Provide information on the process by which information from the analysis of initiating events and accidents is being carried into the detailed design process, training, and procedural development.	PSR 7.5 discusses initiating events involving human error in design, training, and procedures and assesses potential effects. These events can be minimized through appropriate mechanisms that ensuring information is provided to the correct processes. It is unclear what mechanisms will be used to ensure the minimization of human error in initiating events. This information will facilitate CNSC staff's assessment of the integration of human factors considerations in the project.

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LPSC 01-43	▪ GNSCR 3(1)(i)	▪ PSR 6.8.1 Fire Safety, [Ref. 1] ▪ 10.6 Fire Protection Program	For the operational period, provide additional information supporting either the application of the Nuclear Waste Management Division's existing fire protection program and hazard assessment or the development of a DGR specific fire protection program and fire hazard assessment.	It is stated in PSR 6.8.1 that *"The design and operation of the DGR Facility is such that the risk of a fire occurring is minimized. Features of the DGR that lower the risk of fires include:* *Independent third party review of the fire protection design;* *Implementation of the Nuclear Waste Management Division (NWMD) Fire Protection Program (refer to Chapter 10) and fire hazard analysis;"* CNSC staff requires the development of the Fire Protection Program and a Fire Hazard Analysis (FHA) based on the consideration of National Fire Protection Association (NFPA) 122 and NFPA 801. There is no information provided to indicate why the NWMD fire protection program developed for OPG's operating, surface based, waste management facilities would be applicable to an operating DGR facility as the DGR has both a surface and deep underground component. Therefore, additional information is required supporting the application of the existing program and hazard assessment or identifying the development of a DGR specific FHA and fire protection program for the operational period.
LPSC 01-44	▪ GNSCR 3(1)(e) ▪ RPR 4	▪ PSR 10.1 Radiation Protection, [Ref. 1]	With respect to the Radiation Protection Program, the proponent is requested to clarify how individual doses are also kept ALARA.	PSR section 10.1 states "The Radiation Protection Program will achieve and maintain high standards of radiation protection including the achievement of the objectives listed below. a) Control occupational and public exposure by: ▪ Keeping individual doses below regulatory limits; ▪ Avoiding unplanned exposures; ▪ Keeping individual risk from lifetime radiation exposure to an acceptable level; and ▪ Keeping collective doses ALARA, social and economic factors taken into account." There was no indication that individual doses will be kept ALARA once the DGR facility begins operation. Clarification is required to understand how this will be achieved.

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LPSC 01-45	▪ GNSCR 3(1)(b)	▪ PSR 9.4 Construction, [Ref. 1] ▪ 9.4.9 Occupational Safety ▪ 9.4.9.1 Conventional Safety ▪ PSR, 6.8 Fire and Life Safety ▪ Design and Construction Phase Management System, DGR-PD-EN-0001 [Ref. 9] ▪ Project Requirements, DGR-PDR-00120-0001 [Ref. 2]	Clarification is required on emergency response and preparedness arrangements for the construction phase. Information on the arrangement(s) should address: ▪ the scope of the services; ▪ the roles and responsibilities of each of the parties as it pertains to the planning, preparedness and response capabilities, including the use of drills and exercises to demonstrate how the response teams will work together under emergency conditions; ▪ the provision and maintenance of emergency response equipment at the DGR, emergency communications systems/equipment; ▪ how command and control will be maintained between organizations during emergencies.; and ▪ in the event of an emergency or simultaneous emergencies involving the DGR and Bruce facilities, the contingency plans, including the need to curtail activities at either the DGR and Bruce facilities. Information on any mutual aid arrangement with a back-up off-site mine rescue team(s) during the construction phase should also be provided.	The PSR (9.3.1) states, for the construction phase, that "*services provided by the project will include … emergency response and mine rescue (mine rescue supported by the contractor)*." Text elsewhere in the PSR, for example PSR 6.8, refers to arrangements with Bruce Power for emergency response during the operational period, but is silent on the construction phase. PSR 9.4.9.1 references the Health and Safety Management Plan which is described in the Design and Construction Phase Management System as including the site emergency plan but no detail is provided. It is unclear what emergency response services will be provided by Bruce Power in the construction phase and what will be provided by OPG/NWMO and other contractors. Mine rescue plans and the arrangement for additional response teams are not described in detail. Fire response plans refer to existing response arrangements with the Western Waste Management Facility but provides no description of that service. Additional information is needed to assess emergency response and preparedness planning emergency events during the period of site preparation and construction.
LPSC 01-46	▪ C1NFR 3(k)	▪ PSR 13.0 Preliminary Decommissioning Planning, [Ref. 1] ▪ 13.11 Decommissioning at the End of Construction ▪ Preliminary Decommissioning Plan, NWMO DGR-TR-2011-39, [Ref. 10]	Clarify whether table 8.1 of the preliminary decommissioning plan includes the hazardous materials that may be present in the DGR at the end of operations. If not, provide information on the type, quantity/volume and form of these other hazardous materials. Also clarify the application of the information in tables 8.1 and 8.2 to the decommissioning of the DGR after construction.	PSR 13.11 describes general differences in the decommissioning planning at the end of construction from the planning at the end of operation for the DGR. Appendix B in the Preliminary Decommissioning Plan (PDP), provides some additional detail and identifies waste sections 8.2 and 8.3 of the facility plan as describing the avenues for the disposal of decommissioning waste should decommissioning occur at the end of construction. Section 8.2 of the PDP states "at the time of shut down any surplus hazardous materials will be removed from the facility for disposal at a licensed hazardous waste management facility." It is not clear if the hazardous materials identified in table 8.1 of section 8.2 as "arising for the decommissioning" includes the surplus hazardous materials noted in the quote above (i.e. present in the DGR but not generated by decommissioning activities). The text in B.5 of Appendix B is also silent on whether tables 8.1 and 8.2 apply for decommissioning the DGR at the end of construction.

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LPSC 01-47	▪ C1NFR 3(k)	▪ PSR 13.0 Preliminary Decommissioning Planning, [Ref. 1] ▪ 13.11 Decommissioning at the End of Construction ▪ Preliminary Decommissioning Plan, NWMO DGR-TR-2011-39 [Ref. 10]	Provide clarification on the decommissioning activities associated with the decommissioning of the DGR following construction. Provide information on the conditions that may require mitigation if decommissioned after construction. Information should also be provided on what effect the possible mitigation (worst case scenarios) would have on the cost of decommissioning provided in the Preliminary Decommissioning Plan for the end of construction.	The PSR and Appendix B of the Preliminary Decommissioning Plan indicates that the decommissioning process will be similar to that proposed for the DGR at the end of operation, with the exception of the installation of the concrete monolith and shaft seal system.. It is not clear from the information presented if the shaft liners will be left in the shafts or what mitigation is needed to address issues of surface subsidence associated with the collapse of the open shafts and the possibility of saline groundwater from the Salina A1and Guelph formations impacting the potable groundwater. Worst case scenarios need to be identified as they require consideration when developing cost estimates for a reasonably conservative financial guarantee. It is uncertain whether the costs identified for decommissioning at the end of construction (Appendix B) reflect consideration of the worst case scenarios.

References:

[1] OPG's Deep Geological Repository for Low & Intermediate Level Waste, Preliminary Safety Report (PSR), 00216-SR-01320-00001, March 2011.

[2] OPG's Deep Geological Repository for Low & Intermediate Level Waste, Project Requirements, DGR-PDR-00120-0001, September 2010.

[3] Preliminary ALARA Assessment, NWMO DGR-TR-2011-36.

[4] Preliminary Conventional Safety Assessment, NWMO DGR-TR-2011-37.

[5] Environmental Impact Statement, Volume 1: Main Report.

[6] DGR EA Follow-up Monitoring Program, NWMO DGR-TR-2011-10.

[7] OPG's DGR for L&ILW – Reference Level 1 Project Lifecycle Schedule.

[8] Radon Assessment, NWMO DGR-TR-2011-34.

[9] Design and Construction Phase Management, DGR-PD-EN-0001.

[10] Preliminary Decommissioning Plan, NWMO DGR-TR-2011-39.