Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

UNPROTECTED/NON PROTÉGÉ

(ORIGINAL/ORIGINAL)

PMD: 13-P1.2

Date signed/Signé le : 23 JULY 2013

Reference PMDs / PMDs de référence : 13-P1.3, 13-P1.3A

A New Licence for

Site Preparation and Construction of the Ontario Power Generation Inc. (OPG) Deep Geologic Repository (DGR) Project for Low- and Intermediate-Level Waste (L&ILW)

Public Hearing

Scheduled for:

September 16, 2013 to
October 12, 2013

Un nouveau permis pour

Préparation du site et construction du dépôt en formations géologiques profondes (DFGP) de déchets radioactifs de faible et de moyenne activité (DRFMA) proposé par Ontario Power Generation Inc. (OPG)

Audience publique

Prévue pour :

16 septembre 2013 au
12 octobre 2013

e-Doc 3939168 (WORD)
e-Doc 4174318 (PDF)

Canada

Summary

PMD 13-P1.2 presents matters of regulatory interest for the Ontario Power Generation Inc. (OPG) Deep Geologic Repository (DGR) Project for Low- and Intermediate-Level Radioactive Wastes (L&ILW) as follows:

- CNSC staff's review, assessment and recommendations regarding OPG's application for a licence to prepare site and construct a Deep Geologic Repository for Low- and Intermediate- Level Radioactive Wastes in Kincardine, Ontario.

The following actions are requested of the Joint Review Panel:

- Review PMD 13-P1.3; and following consideration of the Minister of the Environment's decision on the EA,
- Decide on the issuance of a licence authorizing OPG to prepare a site and construct the DGR for L&ILW.

The following items are attached:

- A proposed site preparation and construction licence WFCL-W6-3900.00/2024; and
- A proposed Licence Conditions Handbook

Résumé

Le PMD 13-P1.2 présente les questions de réglementation suivantes qui concernent le Projet de dépôt en formations géologiques profondes (DFGP) de déchets radioactifs de faible et de moyenne activité (DRFMA) d'Ontario Power Generation Inc. (OPG)

- l'examen, l'évaluation et les recommandations du personnel de la CCSN au sujet de la demande de permis présentée par OPG pour la préparation du site et la construction du DFGP de DRFMA à Kincardine, en Ontario.

La Commission pourrait considérer prendre les mesures suivantes :

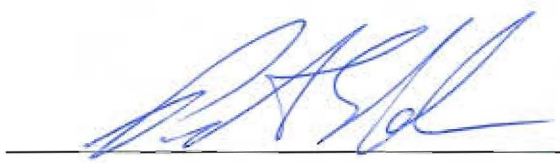
- examiner le PMD 13-P1.3; et après avoir examiné la décision du ministre de l'Environnement relative à l'EE
- prendre une décision quant à la délivrance d'un permis à OPG, qui l'autoriserait à préparer un site et à construire le DFGP de DRFMA

Les pièces suivantes sont jointes :

- le permis proposé pour la préparation du site et la construction du dépôt (WFCL-W6-3900.00/2024)
- le manuel des conditions de permis proposé

Signed/Signé le

23 July 2013



Peter Elder

Director General

Directorate of Nuclear Cycle and Facilities Regulation

Directeur général de la

Direction de la réglementation du cycle et des installations nucléaires

This page was intentionally left blank.

TABLE OF CONTENTS

This page was intentionally left blank.

EXECUTIVE SUMMARY

This Panel Member Document (PMD) describes the results of the Canadian Nuclear Safety Commission (CNSC) staff review and assessment of the Ontario Power Generation (OPG) application for a *Licence to Prepare Site and Construct* (LPSC) a Deep Geologic Repository (DGR) Facility for low - and intermediate-level radioactive waste (L&ILW). By letter dated April 14, 2011 [1], OPG submitted the application information for the LPSC pursuant to Section 24(2) of the *Nuclear Safety and Control Act*[1] (NSCA) and CNSC Regulations. This PMD presents information on the licence application's conformance with the applicable regulatory requirements under the NSCA and CNSC Regulations, and with CNSC policies, standards, regulatory documents and guidance and makes recommendations concerning a CNSC licence.

As required by the *Canadian Environmental Assessment Act*[2] (CEAA) 2012 (CEAA 2012), an environmental assessment (EA) for the project shall be completed before responsible federal authorities can take any action for the purpose of enabling the project to proceed in whole or in part. This is to ensure that the project, over its lifecycle, does not cause significant adverse environmental effects taking proposed mitigation measures into account. A decision on the EA must therefore be taken by the federal Minister of the Environment before the Panel, as temporary Commission Members, as the only responsible federal authority, may take a decision on issuing a licence for site preparation and construction of the DGR Facility. The results of CNSC staff's review and assessment of the Environmental Impact Statement (EIS) are presented in a separate PMD identified as 13-P1.3 [2]. The results of CNSC staff's review and assessment of the Long Term Safety of the DGR Facility are presented in a separate PMD identified as 13-P1.3A [3].

It is important to note that the EA covers the whole lifecycle of the DGR Project, while the licence application covers only site preparation and construction phases.

The DGR Facility for L&ILW has been proposed by OPG as the long-term management facility for the L&ILW produced by OPG-owned or operated nuclear generating stations (NGSs), including wastes presently stored at the Western Waste Management Facility (WWMF) or at OPG-owned or operated NGSs where produced. The DGR Facility is intended to provide for the safe management of the L&ILW in the very long term, covering the extended period of time that the radioactivity in the waste might pose a concern to the health and safety of persons and the environment.

The DGR Facility's proposed location is immediately adjacent to the WWMF. The intended purpose of the DGR is to provide for an emplaced volume of approximately 200,000 m^3 of packaged L&ILW within rooms excavated in argillaceous limestone at a depth of approximately 680 m below ground surface. The LPSC requested by OPG will permit the preparation of the ground surface, installation of temporary and permanent infrastructure and the construction of the DGR Facility.

[1] S.C. 1997, c. 9
[2] S.C. 1992, c. 37

The DGR Facility will consist of a waste package receiving and administration building, the associated headframes and hoisting systems for the repository's main and ventilation shafts, underground tunnels and emplacement rooms, and other supporting features. During the licensed period the licensee will be required to conduct additional investigation and testing of the rock formations as they become more fully exposed during the construction activities. These results will enhance the existing basis of information that supported the LPSC application, and permit the on-going verification and validation of the repository design and the site models and assessments of repository performance. The LPSC will not permit the possession of nuclear substances, pursuant to subsection 26(*a*) of the NSCA. Therefore emplacement of nuclear wastes in the DGR Facility cannot take place under the LPSC. Before nuclear wastes can be emplaced, OPG will require a CNSC waste facility operating licence that would be evaluated by the Commission under a separate, subsequent licence application process.

The DGR Project proposal is consistent with the federal government's Radioactive Waste Policy Framework [4] that states that radioactive waste producers are responsible for the funding, organization, management and operation of disposal facilities for their wastes. It is also consistent with CNSC's waste management policy [5] and guidance [6], and standards [7]. Further, the DGR is the technical option declared to be the preferred by a supportive host municipality, the Municipality of Kincardine.

CNSC staff conclude that the applicant has provided sufficient information on the site specific characteristics and external events to adequately demonstrate geological conditions at the site that are suitable for repository development and to support the technical basis for safety assessments, design, and construction activities. Site preparation and construction of the proposed repository requires activities, with their associated risks to workers, typical of conventional underground excavation associated with mining. The potential environmental impacts of site preparation and construction activities include dust, noise, seepage from the permanent waste rock pile and pumping of deep saline groundwater. These impacts are expected to be low and are typical of conventional underground excavation associated with mining and therefore are anticipated to be readily controlled under standard management practices. The remaining repository lifecycle is considered to be adequately defined and assessed, providing reasonable assurance that there would be a low overall risk to health, safety and the environment if the repository proceeds to operation and, in the long term, decommissioning.

CNSC staff are satisfied that the information presented addresses the regulatory requirements under the NSCA and CNSC Regulations and supports the issuance of a licence authorizing site preparation and construction of a repository for L&ILW. Based on their review of the information provided, CNSC staff have concluded that the applicant is qualified to carry on the activity authorized by the licence, and that the applicant will, in carrying out that activity, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security.

CNSC staff recommend that the Panel, as temporary Commission Members, accept CNSC staff's assessment and conclusions, approve an LPSC, and issue WFCL-W6-3900.00/2024, and accept the delegation of authority to staff as outlined in the Licence Conditions Handbook (LCH), provided in Part Two of this PMD. A summary of CNSC staff recommendations for proposed licence conditions for the LPSC is provided in section 6.0 of this PMD.

Following the issuance of the LPSC, OPG will be required to implement an approved EA Follow-Up Monitoring Program before engaging in site preparation and construction activities. To verify OPG's compliance with the LPSC, CNSC staff will also establish a compliance verification program based on the LCH that will include verification activities and any necessary enforcement.

PART ONE

This PMD is presented in two parts.

Part One includes:

1. An overview of the matter being presented;
2. Overall conclusions and overall recommendations;
3. Discussions pertaining to the evaluations of site suitability, design adequacy and construction activities;
4. Discussion pertaining to Safety and Control Areas (SCAs) that are relevant to the licence requested;
5. Discussion about other matters of regulatory interest; and
6. Addenda material that complements items 1 through 5.

Part Two provides all relevant information pertaining directly to the proposed licence.

7. The proposed licence; and
8. The accompanying Licence Conditions Handbook.

1 OVERVIEW

1.1 Background

In December 2005, Ontario Power Generation Inc. (OPG) provided a letter to the Canadian Nuclear Safety Commission (CNSC) communicating its intent to 'prepare a site' and 'to construct' a Deep Geologic Repository (DGR) for low- and intermediate-level radioactive waste (L&ILW). OPG also included a project description [8] which identified the purpose of the DGR as providing for the long-term management of the L&ILW produced from the operation and refurbishment of OPG-owned nuclear power reactors. This kind of facility for managing radioactive waste meets the definition of a Class IB nuclear facility under the *Class I Nuclear Facilities Regulations*[3] (CINFR).

In December 2006 the Commission recommended to the federal Minister of the Environment that the DGR Project be referred to a federal EA review panel. It was subsequently agreed, by the federal Minister of the Environment and the President of the CNSC, that the EA and licence application would be heard concurrently by a Joint Review Panel (JRP).

The final EIS Guidelines [10] and the JRP Agreement were issued concurrently on January 26, 2009. The JRP is therefore both a review panel pursuant to sections 40, 41 and 42 of CEAA 2012 for the purposes of carrying out an EA of the project; and a panel of the Commission, created pursuant to section 22 of the *Nuclear Safety Control Act*[4] (NSCA), for the purposes of the review of the licence application under section 24 of the NSCA. The EIS and the licence application submitted by OPG essentially becomes a combined submission, and the information was considered by the public and government agencies through a single process**.**

In August 2007, an application requesting a licence to prepare the site and construct the DGR was submitted by OPG to CNSC [11]. By letter dated April 14, 2011 [1], OPG submitted the application information for the LPSC.

The three-person JRP was appointed on January 24, 2012. The JRP commenced the public review period on February 3, 2012 for OPG's EIS and licence application. The JRP concluded the public review period on May 24, 2013**.** On June 18, 2013, the JRP determined it had sufficient information to proceed to public hearings. The public hearing, announced to begin on September 16, 2013, will provide participants the opportunity to hear about the project and to provide their views to the Panel. The JRP requested written submissions from certain federal departments and agencies, including the CNSC, by July 23, 2013. The results of the CNSC staff review of the OPG's licence application are presented in this PMD.

[3] SOR/2000-204
[4] *Supra*, note 1

The results of CNSC staff's review and assessment of the EIS are presented in a separate PMD identified as 13-P1.3 [2]. The results of CNSC staff review and assessment of the Long Term Safety of the DGR Facility are presented in a separate PMD identified as 13-P1.3A [3].

Following the JRP hearing planned for September/October 2013 and the close of the public record, the JRP will prepare and submit a report on the EA of the project to the federal Minister of the Environment. The federal Minister of the Environment will make this report available to the public.

After considering this report, the federal Minister of the Environment will make a decision on the EA. If, taking into consideration the mitigation, the decision is that the DGR Project is not likely to cause significant adverse environmental effects, the Minister will issue an EA decision statement that will allow the Panel to proceed to a decision on the issuance of the licence. The EA decision statement will also include conditions with which the project applicant must comply. It will be made available to the public.

Subsequent to the EA decision statement of the federal Minister of the Environment, the JRP as temporary Commission Members will proceed with their decision on the issuance of the CNSC licence authorizing site preparation and construction (LPSC). If the decision is to issue the licence, the conditions issued by the federal Minister of the Environment in the EA decision statement that are applicable to the site preparation and construction phase will be included in the LPSC. The responsibilities of the JRP conclude with the issuance of the LPSC. CNSC staff will ensure that conditions in the EA decision statement that apply to the licensed activities are integrated as licence conditions in the applicable CNSC licence.

1.1.1 Introduction

The CNSC is mandated under the *Nuclear Safety Control Act*[5] (NSCA) to regulate the use of nuclear energy in Canada so "*there will no be unreasonable risk to the environment and the health and safety of person and to national security arising from the licensed activities*" [NSCA 9(*a*)]. In the context of the NSCA, this objective is considered achieved and a licence can be issued, if the licence applicant is determined:

1) to be qualified to carry on the activity that the licence will authorize [NSCA 24(4)(*a*)]; and in carrying on that activity

2) will make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed". [NSCA 24(4)(*b*)]

[5] *Supra*, note 1

This determination can be supported by the completion of the EA. The aim of the EA is to determine whether the project is likely to cause significant adverse environmental effects, taking into account mitigation measures that may be necessary. It does so by credibly defining the spatial and temporal limits of any potential environmental impact throughout the entire lifecycle of a project. Where a completed EA establishes there are no significant adverse environmental effects, it then provides the basis for claims that OPG will make adequate provision for the protection of the environment. These mitigation measures will be monitored for their implementation, accuracy and effectiveness with an EA Follow-up Monitoring Program [9].

OPG seeks authorization from the Panel, as temporary Commission Members, to prepare a site and to construct a DGR for L&ILW on lands retained by OPG within the Bruce nuclear site, in the Municipality of Kincardine. A request for an authorization to operate is not part of OPG's submitted application. An authorization from the Commission is required before OPG is authorized to operate the DGR. The licensing process will be done in accordance with CNSC rules of procedure.

OPG is identified in their application as the owner and operator of the proposed DGR. If an LPSC is issued, they will become a CNSC licensee for the DGR Facility and therefore responsible under the NSCA and CNSC Regulations. For the site preparation and construction phase, OPG has entered into a contract with an Engineering, Procurement, and Construction Management (EPCM) company who will manage the completion of the engineering design details, and the site preparation and the construction of the DGR Facility. This EPCM company is identified as the Nuclear Waste Management Organization (NWMO). Regardless of this contract, if a licence is issued OPG would be the licensee and would hold all regulatory responsibility for compliance with the licence.

This PMD presents CNSC staff review and assessment of the information submitted in support of the licence application. Information submitted by the applicant includes: the EIS [12]; the licensing submission [1]; update to these submissions [34]; OPG responses to JRP IRs [32]; and, information provided during JRP Technical Information Sessions held on July 18, 2012, October 11, 2012, and March 20, 2013 [35]. CNSC staff's assessed the application against requirements under the NSCA and CNSC Regulations and conformance with CNSC Regulatory Guide G-320 *Assessing the Long-term Safety of Radioactive Waste Management* (CNSC G-320) [6]. The application was reviewed in parallel with the EA.

The PMD has been prepared with the guidance of CNSC procedure *Prepare Commission Member Documents*, which establishes the CNSC's Safety and Control Area (SCA) framework. See Addendum D, *SCA Framework*, for further information about SCAs and how they relate to the DGR for the site preparation and construction phase.

1.1.2 General Applicant Information

The applicant, OPG, is an Ontario-based electricity generation company whose principal business is the generation and sale of electricity in Ontario. OPG was created under the *Business Corporations Act*[6] (Ontario), and is wholly owned by the Province of Ontario.

OPG has a variety of generating assets, including hydroelectric generating stations, fossil-fuelled generating stations, and NGSs. Its NGSs and associated nuclear waste management facilities are licensed by the CNSC. The business address for OPG is 700 University Avenue, Toronto, Ontario, M5G 1X6.

OPG has identified [13] Vice President, Nuclear Services, Laurie Swami, as having authority to act and make commitments of behalf of OPG with respect to the DGR Project.

In accordance with subsection 3(c) of the *Class I Nuclear Facilities Regulations* (CINFR), the applicant provided evidence that OPG is the owner and retains control of the DGR Project area. OPG submitted a copy of the Transfer/Deed of Land filed in the Land Registry Office for the Province of Ontario showing OPG-Huron Common Facilities Inc. as site owner [14]. OPG-Huron Common Facilities Inc. is a wholly-owned subsidiary of OPG.

On April 14, 2011, OPG submitted information supporting the licence application, including an EIS for the DGR Project. The applicant has requested a licence term of 10 years [15] for the site preparation and construction phase of the DGR Facility. CNSC staff concur with OPG's request, as a 10-year period allows for sufficient time for all proposed activities associated with the site preparation and construction of the DGR Facility.

Information provided support of the licence application included the following documents:

- Preliminary Safety Report (PSR) [16]
- Reference L&ILW Inventory [17]
- Project Requirements (NWMO DGR-PDR-00120-0001) [18]
- DGR Project Management System (Charter) [19]
- Design & Construction Management System [20]
- Preliminary Decommissioning Plan (PDP) [21]
- Preliminary Conventional Safety Assessment [22]

[6] R.S.O. 1990, CHAPTER B.16

- Preliminary ALARA Assessment [23]
- Postclosure Safety Assessment [24]
- Maximum Flood Hazard Assessment [25]
- Radon Assessment [26]
- Geosynthesis Report [27]
- Descriptive Geosphere Site Model [28]
- Geoscientific Verification Plan [29]

1.1.3 General Site Description

The DGR is to provide for an emplaced volume of approximately 200,000 m^3 of packaged waste within rooms excavated in argillaceous limestone, a sedimentary rock, at a depth of approximately 680 m below ground level.

The DGR Project site is on the Bruce nuclear site, in the Municipality of Kincardine. The Bruce nuclear site is located about mid-way between the town of Kincardine and the village of Port Elgin, part of the neighbouring Municipality of Saugeen Shores, at a longitude of 81°30’ west and latitude 44°20’ north, on the eastern shore of Lake Huron. Figure 1 (below) identifies the general location and features of the proposed DGR Facility on the Bruce nuclear site, in the Municipality of Kincardine.

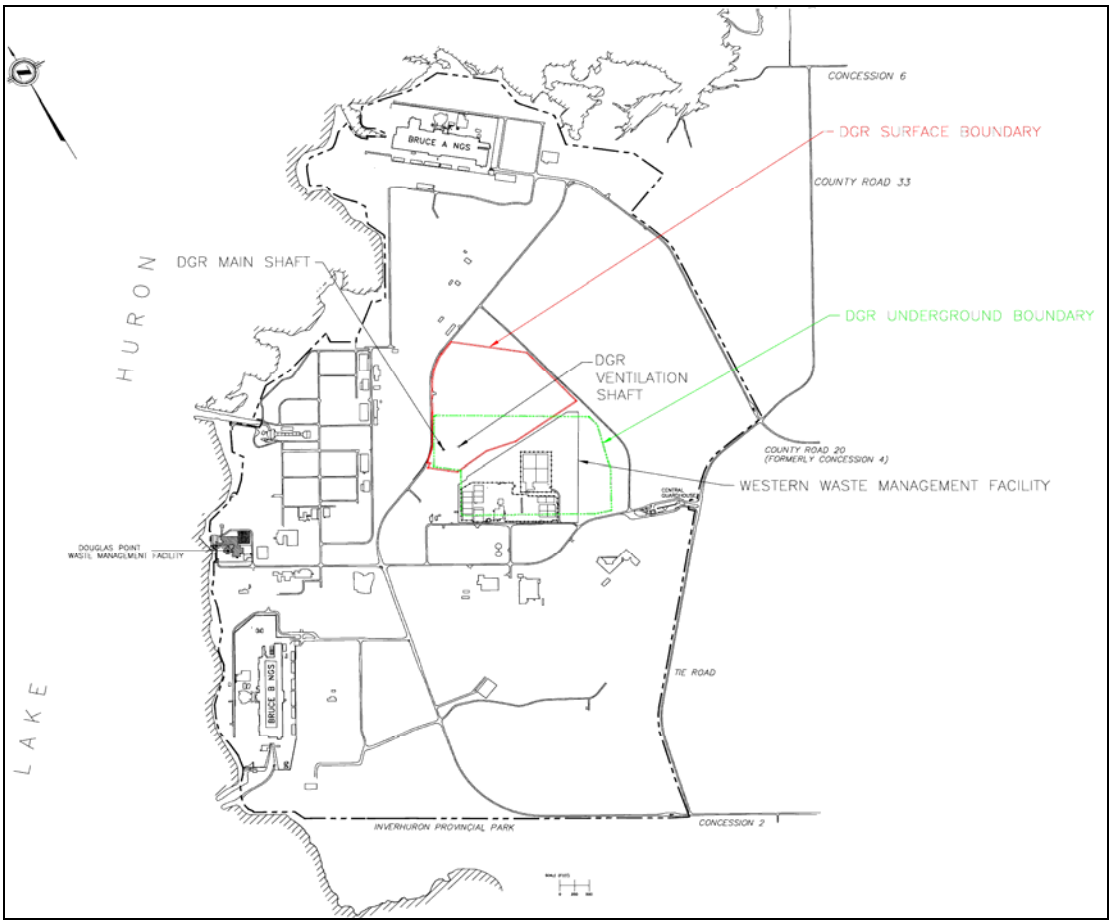
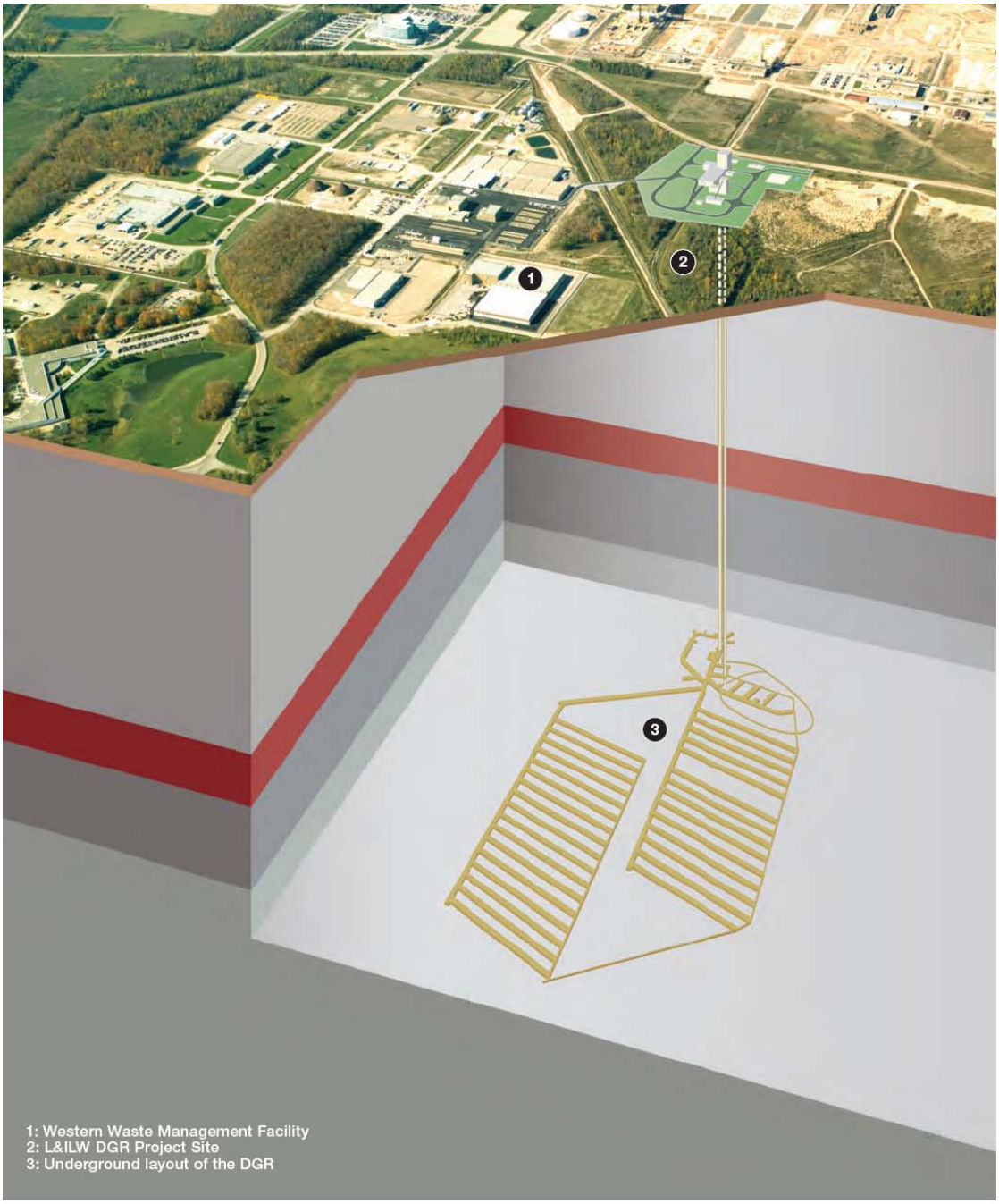


Figure 1.1.3-1. General Arrangement of DGR Site and Surrounding Area (Source: OPG Drawing # 00216-DRAW-00120-10001).

The Bruce nuclear site is on what is known as the Douglas Point promontory. The promontory is a feature of relatively low relief jutting 2.5 to 3.0 km into the lake. It has a lateral extent of approximately 5 km between Inverhuron Bay to the southwest and Baie du Doré to the northeast.

Most of the Bruce nuclear site has been leased to Bruce Power. The DGR Facility will be situated on lands retained by OPG within the Bruce nuclear site. The DGR surface and underground facilities are to be situated about 1 km inland from the Lake Huron at its nearest point, about 2 km from Bruce NGS A and 1.6 km from Bruce NGS B. There are no major rivers or small lakes in the immediate vicinity of the site. Access to all of Bruce nuclear site is security-controlled, ensuring restricted access to the DGR.

On its south side, the DGR's surface facilities will neighbour the existing WWMF. The DGR's underground facilities, founded approximately 680 m below ground surface, will impinge under the footprint of WWMF. Figure 2, below, identifies surface and underground portions of the proposed DGR Facility relative to the WWMF.



The DGR Project: aerial view of the existing Western Waste Management Facility and the surface and underground layout of the DGR.

Figure 1.1.3-2. Surface and underground portions of the proposed DGR Facility relative to the WWMF (Source: OPG website)

1.1.4 Project (Site Preparation and Construction) Application Evaluation

The NSCA and CNSC Regulations specify requirements with which activities associated with nuclear energy must comply. This includes the provision of information required by the CNSC to enable a determination on a licence applicant's qualification and the adequacy of their environmental, health and safety, and security provisions to issue the licence permitting the applicant to carry on those activities. CNSC regulatory documents describe the CNSC's expectations for meeting the regulatory requirements. CNSC guidance documents describe some of the means whereby an applicant may demonstrate they meet those requirements within the framework of CNSC regulatory policies.

OPG's LPSC application includes site evaluation studies which assessed the suitability of the proposed site for the construction of DGR in accordance with the regulatory requirements of section 3 and 4, Licence to Prepare Site, of the CINFR. The LPSC application also includes a description of the proposed DGR design and other required information in accordance with the requirements of section 5, Licence to Construct, of the CINFR.

OPG's DGR Project fits within the CNSC's policy for Managing Radioactive Waste, P-290 (CNSC P-290) [5]. The applicant's assessment of long-term repository performance follows CNSC guidance in CNSC G-320 [6].

CNSC G-320 [6] represents the CNSC's expectations for safety when managing radioactive waste in the long term. CNSC G-320 [6], which was published in December 2006, is based on international discussions of long term repository performance. CNSC G-320 [6] guidance remains consistent with the completed and recently published International Atomic Energy Agency (IAEA) Specific Safety Guide 23, *Safety Case and Safety Assessment for the Disposal of Radioactive Waste* (IAEA SSG-23) [30]. Details of CNSC staff's review and assessment of the long term safety case for the DGR Project for L&ILW are presented in a separate PMD, identified as PMD 13-P1.3A [3].

1.2 Special Concerns or Information

1.2.1 Evaluation of Site Preparation and Construction Application

OPG's DGR meets the definition of a nuclear facility under the CINFR. These regulations identify five phases in the lifecycle of nuclear facilities. These are licences to prepare site, construct, operate, decommission and abandon.

Following OPG's 2005 submission of the project description it was determined that a combined site preparation and construction licence application would be submitted that would address site preparation and construction application requirements of section 3 of the *General Nuclear Safety and Control Regulations*[7] (GNSCR) and sections 3, 4 and 5 of the CINFR.

[7] SOR/2000-202

The DGR is not a uranium mine and does not have the radiation hazards and volumes of mineralized waste rock associated with uranium mines. As such, it is similar to conventional mines, and will be developed using known technologies, codes and standards of both conventional mining as well as industrial construction.

For a licence to prepare a site the applicant is expected to provide, amongst other information, detailed evaluations to demonstrate the conditions and characteristics of the site are adequately defined and supportive of repository development in the near and long term. The applicant's evaluation is to ensure that the characteristics which may have an impact on the health and safety of persons and the environment have been adequately identified. Aspects considered in the evaluations of site include:

- the potential effects of natural external events (such as seismic, flooding, tornadoes), including the evolution of the site over time, and human induced external events;
- the surface and subsurface characteristics of the site and the environment that could influence the transfer of any releases of radioactive or hazardous materials to persons and the environment; and
- the characteristics of the area as they may affect the evaluation of the risks to persons and the environment.

As OPG is also applying to construct, the evaluation of the site must be sufficient to support a design and the associated safety assessments required for a construction licence. However, it is recognized that engineering details are not required with this licence application. The baseline conditions pertaining to construction must also be re-measured so that any additional needs can be identified during construction, ensuring the results of the EIS [12] can be confirmed.

For a licence to construct, the applicant is required to provide information on the repository design, the supporting preliminary safety assessments demonstrating the ability of the repository design to meet requirements for its safe construction. operation, and closure, including performance under accident conditions. Much of this information is also common to that expected in support of the EA for the project, as described in CNSC staff document PMD 13-P1.3 [2].

The proposed activities requested by OPG can be described as the following: site access control measures; clearing and grubbing of vegetation; installation of permanent and temporary services and utilities; grading; establishment of the waste rock management area (WRMA) and the surface and groundwater management system; ground stabilization work; shaft sinking; hoist and head frame construction for main and ventilation shafts; ventilation building and system construction; commissioning of hoist and ventilation systems; underground development; and waste package receiving building construction.

Further development of engineering design details as well as excavation and construction methods will occur during the proposed licensing period since these must reflect actual conditions.

1.2.2 Activities Authorized under Other Regulatory Approvals

The issuance of a licence by the CNSC does not eliminate the need for additional regulatory approvals from other regulatory agencies, as appropriate, during the site preparation and construction phase. OPG as the owner and operator may not be the holder of all the required approvals as some may be held by contractors; this will be determined in accordance with the requirements of the applicable legislation. However, OPG will be responsible for meeting all CNSC regulatory requirements and is accountable and responsible to ensure the health, safety and security of persons and the environment are protected.

Other federal, provincial or municipal permits or authorizations required during the site preparation and construction phase may include, but are not necessarily limited to:

- approval under paragraph 7(1)(*c*) of the *Explosives Act*[8] from Natural Resources Canada (NRCan) for the temporary storage of explosives;
- approval under subsection 142.(1) of the *Explosives Act* from NRCan for the possession of explosives;
- Environmental Compliance Approvals (ECA) under the *Ontario Water Resources Act*[9] and the *Environmental Protection Act*[10] from the Ontario Ministry of Environment (MOE);
- Permit to Take Water (PTTW) under the *Ontario Water Resources Act*, subsection 34(1), and Ontario Regulation 387/04 from MOE;
- Generator Registration Document for a waste generation facility under the *Environmental Protection Act*, General Waste Management Regulation[11], O. Reg. 347 from the MOE;
- requirements of the MOE under the following:
  - Ontario Regulation 153/04 Records of Site Conditions, Part XV.1 of the *Environmental Protection Act*;
  - Soil, Ground Water and Sediment Standards for use under Part XV.1 of the *Environmental Protection Act;*
- authorizations under the *Technical Standards and Safety Act*[12] from Ontario Technical Standards and Safety Authority (TSSA);

[8] R.S.C., 1985, c. E-17
9 R.S.O. 1990, CHAPTER O.40
10 R.S.O. 1990, CHAPTER E.19
11 R.R.O. 1990, REGULATION 347
[12] S.O. 2000, CHAPTER 16

- requirements of the SVCA; and
- other approvals as required under the Bruce County By-Laws, and building permits and additional approvals under the Municipality of Kincardine By-Laws.

1.2.3 CNSC Compliance Verification

The DGR Facility is designated as a Class IB nuclear facility. However, this phase of the DGR Project does not involve nuclear materials. The risks associated with DGR Facility construction are similar to those encountered in conventional mining projects in Canada and will be developed using known mining technologies, codes and standards. However, long term safety has also been considered in the design and construction of the proposed DGR Facility. This is an important consideration in the CNSC's planned compliance approach for the DGR Facility.

Based on a review of the information in support of the licence application, CNSC staff's conclusions are that OPG will make adequate provisions for the health and safety of persons and the public and to protect the environment during the conduct of its site preparation and construction activities, and that OPG has considered future provisions to protect workers, the public and the environment during subsequent licensing phases and long into the future. DGR Facility construction will follow recognized standards for underground development and OPG's information in support of the licence application demonstrates there will be adequate control so that construction conforms with the key aspects of the long term safety case.

CNSC staff find that OPG and their EPCM company, NWMO, have management systems that meet the required standards, and have provisions for the protection of the health and safety of persons, and of the environment. CNSC staff have also verified that there is sufficient information known for this stage of construction planning and a clear path forward to address the engineering design details to follow. As is normal with large construction and mining projects, CNSC staff recognize that further effort will be required by OPG to complete the programs and procedures to manage site preparation and construction activities. The documented management system provides assurance that the engineering details and the programs and procedures will be completed appropriately to the required standards.

CNSC staff recommend a licensing hold point requiring OPG to demonstrate to the CNSC that the required details are in place prior to continuing with the project. If the licence is granted, CNSC staff will conduct verification activities to ensure that licence conditions are met, quality is maintained and persons and the environment are protected.

A Licence Conditions Handbook (LCH) has been developed to articulate CNSC staff's expectations for compliance with the NSCA and CNSC Regulations as well as OPG's application for the LPSC. The LCH follows a consistent format used for CNSC regulated facilities. It also identifies the delegation of authority for possible changes to the DGR design or the safety and control measures described in the submissions that support the licence application provided the changes are demonstrated to remain within the objectives of the licensing basis when the licence was issued. This authority is requested to be delegated to the incumbents in the following positions:

- Director, Wastes and Decommissioning Division
- Director General, Directorate of Nuclear Cycle and Facilities Regulation
- Executive Vice-President and Chief Regulatory Operations Officer, Regulatory Operations Branch

CNSC staff activities are planned to verify regulatory compliance, promote nuclear safety culture, ensure transparency with local communities and Aboriginal groups, and foster a co-operative working relationship with other regulators. CNSC staff are committed to consult and cooperate with other regulatory bodies to harmonize regulatory oversight and minimize duplicative or conflicting regulatory requirements.

1.3 Overall Conclusions

CNSC staff conclude that the applicant has provided the information required under the NSCA and CNSC Regulations for an LPSC.

The information provided by the applicant in support of the combined EIS and licensing submission, the information presented in the public JRP Technical Information Sessions (TIS) and the responses to JRP information requests (IRs) was considered sufficient by CNSC staff to evaluate the suitability of the site and DGR design. The information presented by OPG and the results of CNSC staff evaluation demonstrate that the proposed design can meet regulatory requirements for the protection of workers, the public and the environment during construction, operation and in the postclosure period, over the very long term. The information evaluated by CNSC staff regarding the applicant's plans for managing site preparation and construction activities are sufficient to meet the requirements of the NSCA and CNSC Regulations.

The EA concluded, and CNSC staff concur, that the DGR Project for L&ILW will not likely cause significant adverse environmental effects provided the mitigation measures proposed and commitments made by OPG are implemented, as outlined in section 2.0 of PMD 13-P1.3 [2].

On this basis, CNSC staff conclude with respect to paragraphs 24(4)(*a*) and (*b*) of the NSCA that the applicant:

1) is qualified to carry on the activity authorized by the licence; and

2) will, in carrying out that activity, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

1.4 Overall Recommendations

CNSC staff recommend that the Panel, as temporary Commission Members:

- accept CNSC staff conclusions as summarized in subsection 1.3 above;

Should an EA decision by the federal Minister of the Environment permit the Commission to proceed with its authority to take a decision under the section 24 of the NSCA, CNSC staff also recommend that the Panel, as temporary Commission Members:

- approve the issuance of the Licence to Prepare Site and Construct (LPSC), WFCL-W6-3900.00/2024, for a term of ten (10) years;
- accept the proposed financial guarantee for decommissioning; and,
- confirm the delegation of authority summarized in 1.2.3 and outlined in the LCH.

A summary of CNSC staff recommendations for the proposed LPSC is provided in section 6.0 of this PMD.

2 MATTERS FOR CONSIDERATION

2.1 Project Evaluation

This section will examine whether:

- the characteristics of the site are such that the environment and persons can be adequately protected during the various phases of the project;
- the repository design as described can adequately protect the environment and persons during operation, decommissioning, and in the long term; and whether
- the described site preparation and construction activities can adequately protect the environment, workers and the public.

The evaluation recognizes that the engineering details of the design and construction methods are to be updated or finalized during the licensed period of site preparation and construction.

2.2 Relevant Safety and Control Areas

The functional areas of any licensed facility/activity consist of a standard set of Safety and Control Areas (SCAs). Each SCA comprises "specific areas" of regulatory interest; however, the specific areas associated with each SCA vary between facility and activity types. See Addendum D, *SCA Framework*, for further information about SCAs and how they relate to the DGR for the site preparation and construction phase.

Information in this section presents CNSC staff's evaluation that is the basis for CNSC staff recommendations to the Commission including the proposed licence and draft LCH so that the Commission may take a decision on the issuance of an LPSC for the DGR Facility

The CNSC applies a risk-informed regulatory approach in the regulatory management and control of nuclear facilities/activities. Risk ranking identifies the general probability and consequence of adverse incidents associated with an SCA for the facility/activity type. The ranking is used to identify the CNSC's regulatory management and monitoring approach for the ranking level. With the regulatory management and monitoring level identified, the CNSC will establish their compliance verification plan accordingly. Risk rankings are not static, and may change due to such things as: experience; activities; organization; and performance.

The assigned ranking for DGR SCAs represents CNSC staff's assessment of the 'present' overall risk associated with the SCA recognizing: there is no existing licence; development is taking place at a site that is not overly complex or hazardous; worker safety during site preparation and construction activities is conventional in nature; nuclear material is absent from this phase of licensing.

In the following table:

1. The relevance of each SCA to this PMD is indicated.

2. The risk-ranking column indicates the 'present' overall level of risk associated with each SCA. As it is prior to the issuance of a licence, the ranking relates to the application for a site preparation and construction of the DGR (refer to Addendum A, "Risk Ranking" for further information).

3. The rating level for each relevant SCA indicates the overall compliance with regulatory requirements for the SCA (refer to Addendum B, "Rating Levels", for further information).

4. For the DGR Facility, the term SA (Satisfactory) indicates the licence application and its supporting information, including commitments made by OPG, meet the requirements of the NSCA and CNSC Regulations and expectations of CNSC staff.

Table 2.2-1. Safety and Control Areas (SCAs) Relevant to the DGR Facility LPSC.

Functional Area	SCAs	Relevant	Risk Ranking	Rating Level
Management	Management System	Yes	M	SA
	Human Performance Management	Yes	M	SA
	Operational Performance	Yes	M	SA
Facility and Equipment	Safety Analysis	Yes	M	SA
	Physical Design	Yes	M	SA
	Fitness for Service	Yes	L	SA
Core Control Processes	Radiation Protection	No	-	-
	Conventional Health and Safety	Yes	M	SA
	Environmental Protection	Yes	M	SA
	Emergency Management and Fire Protection	Yes	M	SA
	Waste Management	Yes	L	SA
	Security	Yes	L	SA
	Safeguards	No	-	-
	Packaging and Transport	No	-	-

2.3 Other Matters of Regulatory Interest

The following table identifies other matters that are relevant to this PMD.

Table 2.3-1. Other Matters of Regulatory Interest Relevant to the DGR Facility LPSC.

Area	Relevant
Environmental Assessment	Yes
Aboriginal Consultation	Yes
Other Consultation	No
Cost Recovery	Yes
Financial Guarantees	Yes
Improvement Plans and Significant Future Activities	Yes
Licensee's Public Information Program	Yes
Nuclear Liability Insurance	No

The relevant "other matters" of regulatory interest are discussed in section 5 of this PMD.

2.4 Regulatory and Technical Bases

The regulatory and technical bases for the matters discussed in this PMD are provided in Addendum C to this PMD. The regulatory basis for the matters that are relevant to this PMD are provided in Addendum C.1. For this licence application, the key regulatory requirements come directly from the *General Nuclear Safety and Control Regulations*[13] (GNSCR) and the *Class I Nuclear Facilities Regulations*[14] (CINFR). While the *Uranium Mines and Mills Regulations*[15] do not apply directly to the DGR, they provide guidance. The technical basis for the matters that are relevant to this PMD include Standards and codes as well as regulatory documents as listed in Addendum C.2.

OPG's licence application submission [1] provided a mapping of the sections of the NSCA and CNSC Regulations to the applicable sections of the licence application. This mapping table was reviewed by CNSC staff and found to have adequately referenced where, in the licensing submissions, information related to the application requirements from the regulations are addressed.

[13] SOR/2000-202
[14] SOR/2000-204
[15] SOR/2000-206

Published IAEA guidance documents that are also considered by CNSC staff in the review of the application include IAEA SSG-14, *Geological Disposal Facilities for Radioactive Waste* [31] and IAEA SSG-23 [30].

The requirements with respect to the proposed LPSC, include those regulations, codes and standards associated with the DGR design and the on-site activities of site preparation and construction. These are numerous and will expand with the development of the engineering details for the proposed DGR design and construction activities which is to occur once the LPSC is issued by the Commission.

As part of the information submitted in support of the licence application, OPG provided a list of applicable codes and standards in the document Project Requirements (NWMO DGR-PDR-00120-0001) [18]. The DGR Facility is required to comply with federal and provincial regulations in its construction and operation. For example, surface buildings and structures will comply with the National Building Code of Canada, the National Fire Code of Canada, Ontario Regulation 213/91 – Construction Projects, and Ontario Regulation 851/90 Industrial Establishments. Underground structures must comply, where relevant, with Ontario Regulation 854, *Mines and Mining Plants.*

3 PROJECT EVALUATION

The purpose of the project evaluation section is to provide CNSC staff's assessment of the technical acceptability of the DGR Project based on the information submitted in support of the licence application.

3.1 Site Evaluation

This section will examine whether the characteristics of the site are such that the environment and persons can be adequately protected during the various phases of the project.

3.1.1 Introduction

CNSC staff reviewed OPG's assessment of the proposed site for use as a repository. This review included an examination of the general site characteristics of the surface and subsurface, the natural hazards, existing land uses and how this information is used for the proposed DGR design and its predicted long term repository performance. Information on the conduct of the site characterization work and the need for additional site related data before and during construction is discussed. This work, and additional site related data is required to permit confirmation of the assessed effects, to complete the engineering details, to confirm the design, to support construction related activities, and to confirm and verify long term performance in support of later licences.

Applicable Regulatory Requirements under the NSCA

The CINFR stipulates the requirements for licence applications. With respect to the site and its evaluation, a licence application to prepare site and to construct must include:

- a description of the site evaluation process and of the investigations and preparatory work that have been done and will be done on the site and in the surrounding area (subsection 4a);
- a description of the site's susceptibility to human activity and natural phenomena, including seismic events, tornadoes and floods (subsection 4b);
- the proposed program to determine the environmental baseline characteristics of the site and the surrounding area (subsection 4c); and
- a description of the environmental baseline characteristics of the site and the surrounding area (subsection 5b).

In addition, paragraph 3(1)(*i*) of the GNSCR stipulates that an application for a licence must include "a description of the results of any test, analysis or calculation performed to substantiate the information included in the application".

The CNSC's technical expectations with respect to evaluations of the site as it relates to its development as a repository for radioactive waste are documented in CNSC G-320 [6]. Other related technical guidance considered during the review includes IAEA SSG-14 [31], and IAEA SSG-23 [30].

Information Presented in the Application – General

OPG conducted a number of site evaluation studies which assessed the suitability of the proposed site in accordance with the regulatory requirements of the CINFR. Information summarizing the completed site evaluations can be found in the Preliminary Safety Report (PSR) [16]. The following detailed reports and site evaluation studies were also provided:

- Postclosure Safety Assessment [24]
- Descriptive Geosphere Site Model [28]
- Geosynthesis [27]
- Radon Assessment [26]
- Maximum Flood Hazard Assessment [25]
- Geoscientific Verification Plan [29]

The PSR [16] summarizes the characteristics of the DGR Project site in terms of its geosphere characteristics (geography, hydrology, seismology, meteorology, geology, geotechnical, hydrogeology and hydrogeochemistry) and the evolution of the site over the extended period of time that will form the life-cycle of the repository. It also describes the biosphere at the site and the naturally occurring hazards or events. The PSR [16] description of the geosphere is elaborated in detail in the Geosynthesis Report [27], Descriptive Geosphere Site Model [28], and Postclosure Safety Assessment [24]. These documents reference further reports providing an even greater layer of detail. The description of the biosphere is further supported by details in the EIS and related Technical Support Documents (TSDs). Under the joint review process, the material provided for the EA of the DGR Project is also considered to support licensing.

CNSC Staff Assessment – General

Prior to the April 2011 submission of the EIS [12] and licensing application documents [1], OPG characterized the site geosphere to collect site specific data for the design and assessment of the DGR facility. Results were used as input to the DGR design, safety assessments, and safety case. This information is part of OPG's licence application submission in order to satisfy the requirements of CEAA 2012, the NSCA and its CNSC Regulations.

During this site characterization phase by OPG, CNSC staff assessed the documented quality management programs used by OPG and OPG's EPCM company against the Canadian Standards Association (CSA) standard N286-05, *Management System Requirements for Nuclear Power Plants* (CSA N286-05) [33] (refer to section 4.1 of this PMD for more detail on this standard). The programs meet CNSC staff expectations regarding documented processes for preparation of assessments, monitoring of measurements, organization, work control, documentation control, control of records, control of suppliers' activities and their performance. OPG oversight of their EPCM company was also established during this site characterization phase. These quality assurance programs support the development, the acquisition and analysis of site characterization data, the DGR design and safety case, and the EIS and other information submitted in support of the licence application.

CNSC staff reviewed and commented on OPG geoscientific site characterization plans (Phases 1 and 2) and their preliminary geoscientific reports assessing the Bruce nuclear site [2]. Staff of the Geological Survey of Canada also provided comments on these preliminary geosphere reports. JRP IR EIS 01-18 [32] requested further evidence of OPG's use of independent technical reviews of geoscientific activities during site characterization. Information on the independent review of these activities was provided in OPG's response to the first package of JRP IRs [32].

CNSC Staff Conclusion

OPG's staged approach to site assessment and their use of independent technical review follows the guidance provided in CNSC G-320 [6] and in IAEA SSR-5, *Disposal of Radioactive Waste*. OPG's geoscientific activities were determined to clearly indicate a staged approach in obtaining information and assessing the geosphere. OPG was also observed to respond to the developing site data, and to target data gaps and uncertainties.

OPG has a well-demonstrated corporate management system under which their nuclear operational activities (e.g., procurement, operations, maintenance, design, and engineering) are conducted. OPG's management system is also applied to planning, project management, human resources and finance. This corporate management system was applied to the DGR Project in the evaluation to the site and the development of the EIS [12] and licence application submission [1].

CNSC staff conclude that the applicant had an acceptable management system in place during the assessment of the site and development of the EIS [12] and licence application submissions [1] to provide a well-supported and documented licence application.

3.1.2 Biosphere/Near Surface Characteristics and DGR Project Interactions

Information Presented in the Application

In section 2 of the PSR [16] the applicant provided information on the characteristics of the DGR Project site, including information on the location and general site description and the natural surface environment (atmospheric, aquatic, terrestrial). More details are provided in the EIS and TSDs supporting the EIS.

The natural surface environment of the Bruce nuclear site has been extensively studied over many years by OPG and Bruce Power. Additional environmental information was obtained specific to the DGR Project submission during the 2007 and 2009 period under the documented quality assurance programs of OPG.

No surface characteristics were identified by the applicant that would render the proposed DGR Project site unsuitable for the construction and subsequent operation of a DGR for L&ILW. A brief summary of the surface characteristics provided in information submitted by the applicant follows.

CNSC Staff Assessment

Location and Topography

The applicant provided the following information on site location and topography. The long established Bruce nuclear site encompasses 932 hectares and is located on the shore of Lake Huron at latitude 44^0 19' N, longitude 81^0 34'. The DGR Project area, of approximately 96 hectares, is located with respect to the prominent features of the Bruce nuclear site as presented in Figure 1 in section 1.1.3 of this PMD.

The topography of the Bruce nuclear site is flat to gently sloping with a gradual rise in the easterly, inland, direction. The elevation of this site varies from the level of Lake Huron, which is 176 meters above sea level (mASL), to the area just above an old shore line called the Nipissing Bluff, which is 195 mASL. The DGR Project site is located 1 km inland of the lake, and has an elevation of 181 m on its northern side, rising to 187 m on its south. OPG provided two topographic maps. The first, a map with 50 centimetre (cm) contours of the Bruce nuclear site [CEAR 715] was provided in response to an undertaking arising from the JRP Technical Information Session held on July 18, 2012 [35]. The second, a map of the DGR Project site [CEAR 953] was provided in response to JRP IR EIS 09-471 [24].

The layout for the proposed DGR Facility at ground surface is presented in figure 4.4.1-2 of volume 1 of the EIS [12]. This includes the location of the main and ventilation shafts, the amenities office, waste package receiving building, WRMA and stormwater management system. The proposed underground layout is presented in the updated schematic, figure 6.6, presented to the JRP in February of 2012 [34] and includes emplacement room layout, service area, shaft locations and loading pocket.

Staff Assessment of Location and Topography

Information on the location and topography of the Bruce nuclear site and DGR Project site is acceptable for use in the EIS and in support of the licence application for the DGR. Site wide topographical information permits the assessment of the flooding hazards and provides information to support the DGR design.

Atmospheric Environment

Meteorology

The applicant presented meteorological information (precipitation, temperature, wind, humidity, atmospheric pressure, atmospheric stability, etc.) for the period 2005 to 2009 from Environment Canada stations as well as Bruce on-site and near-site meteorological tower locations in both the PSR [16] and the EIS. The primary purpose of this information was to facilitate dispersion modelling and the assessment of project effects. The assessment of the effects of the DGR Project on the atmospheric environment is detailed in the EIS and the Atmospheric Environment TSD. Additional information to clarify and support the meteorological information in the EIS was requested in IRs EIS 01-10 and 11, EIS 04-131, 132, 133, and 143, and EIS 08-326 [32].

The on- and near-site data measurements show both the large scale effects of circulating air masses and of the Great Lakes and the smaller scale effects of the Bruce nuclear site terrain, topography and diurnal variation. The on- and near-site locations reflect weather within 10 km of the Bruce nuclear site and are considered pertinent to effects assessment for the DGR. The applicant also provided information from climate stations at Paisley and Wiarton, Ontario for data not available on- and near-site locations.

Briefly, the Bruce nuclear site is characterized by warm summers, with July/August monthly means of 19.3 ^{o}C/19.4 ^{o}C, respectively. Winter is considered cold with a February monthly mean of -4.5 ^{o}C. Low speed winds at the site are fairly evenly distributed through all directions. Higher speed winds during the fall, winter, and spring come from the south through the west-northwest. It is also during the fall and winter that the strongest winds occur. The spring and summer experience more frequent winds from the northeast relative to the fall and winter.

Diurnal effects occur as well, often reflecting the influence of the lake. The night prevalence is for land breezes, with weaker winds from the east-southeast. In the daytime the stronger lake breezes from the south through the west occur. During the warmer months when land is warmer next to the colder lake, an upward flow of heat can occasionally result in a thermal inversion boundary layer.

Severe Weather

Severe weather in the region includes thunderstorms, lightening, extreme precipitation events, freezing precipitation events, windstorms, and fog. The Bruce area experiences about 28 thunderstorms per year with 2 to 3 lightening flashes per km^2, and an average of 9 days with freezing precipitation in the form of freezing rain and ice pellets.

Severe wind (tornado) and extreme rain events are associated with tropical and extra-tropical cyclones (low-pressure centres). While the Bruce nuclear site is north of the main corridor for them, one or two tornadoes can be expected per year, per 10,000 km^2, in the southwestern region of Ontario. Heavy precipitation events in southern Ontario, such as 250 mm over 9 hours in Peterborough and 450 mm over 30 hours in Harrow, are the main causes of flooding.

Air Quality

Air quality information for southwestern Ontario, with some particulate measurements at the Bruce nuclear site and immediate environs has been provided in the EIS, the supporting Atmospheric Environment TSD, and in the PSR [16]. Much of the monitoring data is from the Ontario MOE for London, Kitchener, Sarnia, and Tiverton. Regional monitoring results of NO_2, SO_2, CO, O_3, and particulate (regional and local) were provided.

Existing Bruce nuclear site operations release small amounts of radiological and non-radiological substances to the air. These releases are associated with on-site operations such as the NGSs, the steam plant, the waste incinerator, on-site traffic, and other site project activity (construction, demolition, refurbishment, etc). On-site releases of non-radiological pollutants are subject to provincial requirements and regulated through ECAs from the MOE. Additional clarifications of the existing air quality information was provided by the applicant in their responses to IR EIS 03-91, 04-131 and 141, 06-250 and 251, and 08-322 [32].

Monitoring of particulates during recent on-site demolition work established that dustfall from the Bruce nuclear site is well below provincial criteria. Further, dispersion modelling results presented by the applicant in section 6.7.5 of the EIS [12] demonstrate that concentrations of pollutants at the Bruce nuclear site are below provincial criteria and have no significant effect in the local area.

Noise

Information provided in the EIS, Atmospheric TSD, and PSR [16] described the existing noise environment for the area adjacent to the Bruce nuclear site. This was based on results from several extended periods of monitoring at the nearest noise receptors, including the night hours. These areas were confirmed to experience noise levels typical of a rural environment and the noise was characterized and dominated by the sounds of nature, such as rustling of leaves and lake shore waves. Road traffic noise from near-by roads and, barely audible, sounds from the Bruce nuclear site can be identified at a receptor site to the north. The applicant provided clarifications on the existing sources of noise, including natural sound in responses to IR EIS 06-254 and 09-450 [32].

Climate Change

Climate change over this century is projected to increase the frequency and intensity of precipitation events, as well as the frequency of more severe weather. Temperatures are expected to rise and lake levels lower.

CNSC Staff Assessment of Atmospheric Environment

The information provided by the applicant on the existing atmospheric environment (meteorology, severe weather, air quality, noise, climate change) was considered sufficient for use in the EA of the environmental effects of the DGR Project. Section 2.14 of PMD 13-P1.3 [2] provides more detailed information on CNSC staff's assessment of the atmospheric environment with respect to the effects of the project.

The atmospheric environment was also determined to be adequately described, with sufficient information on temperatures, winds and precipitation events for use in the DGR design presented in the licence application. No additional baseline measurements related to atmospheric conditions at the site are considered necessary to verify the results of the EA or to support completion of the engineering details of the design.

The possibility of increased frequency and intensity of precipitation over the period of time the DGR may be operated can affect the assessed maximum flood level and surface water runoff volumes. This could necessitate adjustments when the final engineering design details are developed, such as the shaft collar height and the capacities of storm water management pond, ditches, and culverts. In their response to JRP IR EIS 04-143 [24] OPG stated their process for completing the final engineering design details included commitments to further assessment of the 100 year return period storm event used in establishing the engineering design details and an update to the flood hazard assessment as part of finalizing the site grading plan to ensure an adequate shaft collar height.

CNSC staff note that while the meteorological data identified by the applicant is sufficient to support the licence application, it does not fully address Ontario Ministry of the Environment (MOE) meteorological data requirements in support of an application for an Environmental Compliance Approval (ECA). Should a CNSC licence be issued, OPG will be required to comply with provincial requirements to obtain the requisite ECAs. To address this project requirement CNSC staff recommend a licence condition 9.2 which requires OPG to provide confirmation to the Commission that it has complied with MOE's ECA requirements.

Terrestrial Environment

Information in section 2.7 of the PSR [16] provides a description of the terrestrial environment for the wider Bruce nuclear site, which encompasses the DGR, addressing such things as vegetation communities and species, wildlife habitat, wildlife communities and species, natural heritage systems, and significant species. Additional details are included in the EIS and Terrestrial TSD. The applicant provided further information and clarification on the terrestrial environment in responses to IR EIS 01-15, EIS 03-85, EIS 05-168, EIS 05-169, EIS 05-170, EIS 07-305, EIS 08-370, EIS 10-490 and EIS 10-498 [32].

Vegetation Communities and Species

A large portion of the DGR Project area is under current industrial use or has undergone disturbance (grading, filling, clean fill storage or use as a construction laydown area) due to various activities on the Bruce nuclear site.

The DGR Project area includes fragmented sections of young woodland forest, dominated by Eastern white cedar. Most of the DGR Project site is barren ground with sparse and scattered colonizing species of plants and scattered trees. To the east of the DGR Project site are some small areas of marsh and swamp. None of the vegetation surveys identified species listed under Schedule 1 of the federal *Species at Risk Act*[16] (SARA) or listed provincially as threatened or endangered under the *Endangered Species Act* in the DGR site area. No designated or significant natural areas are located within or immediately adjacent the DGR Project site.

[16] S.C. 2002, c. 29

Wildlife Habitat

Fragmented woodland units in the DGR Project area have limited function as forest interior habitat for wildlife because of their limited size, lack of continuity between fragments, and their disturbed nature. The open areas of the DGR Project site have been extensively modified by previous industrial activities which have limited the availability of topsoil. The limited and stony nature of these soils has impacted vegetative growth and reduced the quality of these areas as wildlife habitat.

Small networks of naturalized ditches are only intermittently wet, and provide corridors for wildlife movement on the project area. The railway ditches are the largest of these naturalized corridors. These areas, and other wetlands such as the marsh located in the northern portion of the DGR Project area provide habitat for amphibians during various lifestages, as well as other herpetofauna and wildlife species. There is a one small area of marsh immediately adjacent to the site and another area marsh farther to the east and on either side of the abandoned railway. Adjacent this marsh, along the south side of the railway ditch is an area of wetland.

Wildlife Communities and Species

The wildlife communities at the DGR Project site and adjacent land tend to be subcomponents of the populations and communities on the larger Bruce nuclear site and in the local and regional study areas.

Amphibians and Reptiles - Field surveys were conducted to identify amphibian and reptile species within the site study area. Several amphibian species were identified, including Spring Peeper, Green Frog, Grey Treefrog, American Toad, and Northern Leopard Frog. One amphibian species at risk, the Western Chorus Frog, was identified for the first time on the Bruce nuclear site during surveys in 2009, well removed from the DGR Project area. Amphibian breeding occurs within wetland communities throughout the Bruce nuclear site, including the DGR Project area.

The DGR Project is not expected to result in a significant adverse effect to amphibians and reptiles as site preparation activities will not produce a measurable change to the overall available habitat within the Bruce nuclear site.

Two species of turtle, Midland Painted Turtle, and Common Snapping Turtle (a species at risk), were identified during surveys completed at the site study area in 2009. The preferred basking area was a small pond located at the southern portion of the site study area. Common snapping turtle have also been observed utilizing habitat within the project area.

Snake species have not specifically been identified using habitat within the DGR Project site, however there is a potential for certain species that have been observed within the site study area to be present. This includes two species at risk, the Eastern Ribbonsnake (a species-at-risk) and Eastern Milksnake, As discussed in IR EIS 01-15 and IR EIS 10-490, exclusionary fencing will be erected around the DGR

Project site to prevent entrance by reptiles. OPG will also develop a plan to address at-risk reptiles found within the construction site.

Burrowing Crayfish – Species of the terrestrial burrowing crayfish occur on the Bruce nuclear site in association with wetlands, roadside ditches, and creek banks with moist, clayey soils. They have been observed in the ditches and wetland areas of OPG retained lands on the Bruce nuclear site. Burrowing crayfish are considered part of the aquatic environment, and are discussed further under that heading, below.

Mammals – Surveys of the Bruce nuclear site have identified 15 mammal species typical of southern Ontario. These mammals, such as beaver, rabbit, hare, skunk, squirrel, weasel, and deer, are mostly associated with the wooded, southeastern area of the Bruce nuclear site. In the more industrial, barren areas of OPG retained land, deer and skunk have been noted, as have shrews and mice.

Avian Species – Breeding bird surveys identified 83 species of birds potentially breeding within the Bruce nuclear site. Approximately 40 species were identified within the DGR Project area. These include forest species such as red-eyed vireo, blue jay, and black-capped chickadee; and open habitat species such as red-winged blackbird and tree swallow. Flocks of wild turkey are also present on the Bruce nuclear site however surveys did not identify roosting areas within the DGR Project area. Two avian species-at-risk, the Canada Warbler and Eastern Meadowlark, were identified on the Bruce nuclear site during surveys completed in 2009. IR EIS 07-305 [32] provides additional details of the assessment for these species. The DGR Project is not expected to result in a significant adverse effect to these species as the open and forested habitat to be cleared does not provide preferred habitat for these species. Barn Swallow and Bobolink, also species-at-risk, have been observed on the Bruce nuclear site in the past, but were not identified during the 2009 surveys. Nest surveys will be completed prior to site-clearing to ensure nests for these, and other migratory birds are not disturbed.

Staff Assessment of the Terrestrial Environment

The information provided by the applicant on the existing terrestrial environment is sufficient for the EA of the DGR Project. Section 2.10 of PMD 13-P1.3 [2] provides more detailed information on CNSC staff's assessment of the terrestrial environment with respect to the effects of the project.

The terrestrial environment is adequately described, with sufficient information available with respect to habitat, flora, and fauna, to permit consideration of the terrestrial environment in the DGR design and site preparation and construction activities described in the application. The use of the existing disturbed nature of a large part of the DGR Project site, which includes graded and filled areas, reduces the impact of the DGR Project.

The most affected vegetation in the fragmented and small stature mixed forest community that covers the remainder of the DGR Project site, is eastern white cedar. As habitat, the area does support some use by breeding birds, and use by common smaller mammals. The loss of this terrestrial habitat area is not considered to be significant since the effect is limited spatially and the species are common in the surrounding local study area. The location of the DGR Project site avoids the most significant marsh and wetland areas on the Bruce nuclear site. Sufficient information on the smaller marsh locations nearer the DGR Project site was provided so that mitigation to protect wildlife and wildlife habitat areas can be implemented.

The characterization of the baseline terrestrial environment provides an adequate assessment of the on-site biodiversity and supports the assessment of potential DGR Project effects and determination of mitigation measures where appropriate.

Aquatic Environment

Information in section 2.6 of the PSR [16] provides a description of the aquatic environment for the Bruce nuclear site addressing such things as Lake Huron, surface water on the Bruce nuclear site, and aquatic habitat and biota. Additional details are included in the EIS and the Aquatic Environment TSD. The applicant provided further information and clarification in response to questions on the aquatic environment in IRs EIS 01- 14, 15, and EIS 05-196, 197, 198, plus several other supplemental responses to EIS 01-13 and 15 [32].

General Description

Lake Huron, which includes the embayments of Baie du Doré, Macpherson Bay, and Holmes Bay, lies immediately adjacent the promontory that is the Bruce nuclear site. The lake is used locally for sport and commercial fishing, as well as recreational swimming and boating.

The lake water varies between 6 m to 20 m deep in the nearshore zone of the lake, with the exceptions of Macpherson Bay which is less than 3 m deep and Baie du Doré which is less than 5 m. The Bruce nuclear site either drains directly into the Lake via small creeks or ditches on the site, or into ditches or creeks flowing into Stream ‘C’. Stream C is itself a diverted stream that was redirected to flow into Baie du Doré at the time the Bruce nuclear site was first developed for the production of nuclear power.

The proposed location of DGR surface buildings is approximately 1 km inland of Lake Huron’s nearest point, Macpherson Bay. These buildings will be located adjacent to the WWMF, where more than half of the L&ILW proposed for the repository is currently stored. Most of the surface water from the proposed DGR Project site currently drains through a ditch to Lake Huron via Macpherson Bay. The small area of the DGR Project site that lies adjacent to the ditch on the north

side of the abandoned railway embankment currently drains to the east and into Stream C and subsequently into Baie du Doré.

Near Site Aquatic Habitat and Biota

The on-site ditches of the north and south railway embankment have naturalized over time, with cattails dominating over most their length. Stream C, into which the railway ditches ultimately flow, is a designated coldwater fish habitat that supports both warm and cold species including brook, rainbow, and brown trout, sucker and cyprinid.

Warm water baitfish communities, like bluntnose and fathead minnow, have been indicated in several years of surveys of the south railway ditch. These communities are common and widespread in warm water creeks and wetlands in south and central Ontario. Other life, like snails, leeches and crayfish have been noted in the south railway ditch. The north railway ditch does not support fish habitat within the DGR Project Area due to insufficient periods of water flow in the ditch. The Saugeen Valley Conservation Authority (SVCA) classifies the south railway ditch as fish habitat as some areas of open water can remain in low/dry conditions, but not the north railway ditch.

CNSC Staff Assessment

CNSC staff's assessment of the aquatic habitat and biota is provided in detail in section 2.11 of PMD 13-P1.3 [2]. Staff determined that there was sufficient information on aquatic habitat and biota for the EA. The information is enough to identify aquatic areas of importance, such as the Baie du Doré and Stream C.

Of somewhat more marginal condition, supporting burrowing crayfish and benthic invertebrates, is the marsh area adjacent the DGR Project site, and the north railway ditch. The understanding of the aquatic environment is sufficient to ensure aquatic habitat can be protected, and supports the licence application with its plan to avoid releases of surface water from the DGR Project site to the aquatic habitat of Stream C and Baie du Doré. OPG has identified that baseline information on the water level in the neighbouring marsh area is required to establish typical marsh conditions and ensure they are maintained if necessary. No other baseline monitoring requirements are identified for the aquatic environment.

<u>Hydrology, Surface Water and Sediment Quality</u>

Also considered in evaluating the site is the hydrology, surface water and sediment quality that has influences on both the terrestrial and aquatic environments. Details on the hydrology, surface water and sediment quality are included in the EIS and the Hydrology and Surface Water Quality TSD. The applicant provided further information and clarification in response to questions on the hydrology and surface water and sediment quality in IRs EIS 01-14, EIS 03-45, EIS 03-66, EIS 03-79, EIS 03-83, EIS 03-86, EIS 04-146, EIS 05-180, EIS 05-185, EIS 05-188, EIS 05-189, EIS 05-227, EIS 07-295, EIS 07-298, EIS 07-299, and EIS 08-387 [32].

Hydrology

As indicated above, most of the DGR Project site currently drains via an unnamed ditch to Macpherson Bay. Only a small portion currently drains into the north railway ditch toward Stream C and into Baie du Doré. The present creeks, streams and ditches are not expected to flood the DGR Project site under conditions of the probable maximum precipitation (PMP), but the site itself can delay drainage and the potential for surface structure flooding requires consideration as part of the overall water management system. This issue was discussed in the Atmospheric Environment subsection above and is to be addressed during the development of the engineering details of the design as discussed in JRP IR EIS 04-143 [32]. The grading and the size of the storm water management system, including the ditches and pond, will need to be further assessed and adjusted where required to ensure adequate control as part of the overall water management system.

Surface Water Quality

Surface water characterization conducted in field studies in 2007 and 2009 focused primarily on Lake Huron, including nearshore Macpherson Bay and offshore, Stream C, north and south railway ditches, and the unnamed ditch from the DGR Project site to Macpherson Bay. The nearshore surface water quality results in Macpherson Bay were similar to historic offshore samples for dissolved solids, pH, conductivity, total suspended solids, hardness and non-ionized ammonia. Higher nearshore concentrations were recorded for iron, calcium, sodium, and potassium.

The ditches and streams in the DGR Project site and project areas were sampled for total suspended solids, nutrients, metals, organic contaminants and temperature. In these shallow systems, the total suspended solids varied considerably due to weather conditions during sampling. Most of the concentrations of metal were below the Ontario Provincial Water Quality Objectives (PWQO) and organic contaminants such as PCBs, oil, grease and volatile organic compounds were generally below detection. Total phosphorus in the south railway ditch exceeded the PWQO.

Sediment Quality

Sediment samples were collected in 2009 at six locations and tested for a variety of metals. Three samples had copper and zinc above the Canadian Council of the Minister of the Environment (CCME) sediment criteria. Arsenic, cadmium and nickel exceeded the CCME criteria in one other. Results were consistent with samples taken between 1997 and 2001.

CNSC Staff Assessment

CNSC staff's assessment of the hydrology, surface water and sediment quality is provided in detail in section 2.9 of PMD 13-P1.3 [2]. The information submitted by the applicant is considered sufficient for the EA. The information is also sufficient to support the licence application and the plan to divert a small quantity of surface water flow from the north railway ditch and Stream C, and redirect it to Macpherson Bay.

Some uncertainties remain with respect to baseline water quality and flow rates, and with baseline sediment quality that will require additional monitoring and assessment as part of the development of the engineering details of the design. OPG indicates in the submitted EA Follow-Up Monitoring Program [9] that baseline monitoring of surface water quality and flow rates will be conducted. As a result of CNSC staff review of OPG's EIS, several related recommendations were made in PMD 13-P1.3 [2] including additional baseline sediment quality sampling at the unnamed ditch and Macpherson Bay (PMD 13-P1.3 [2] recommendations # 7 and 13); and verification of flow rates in the north railway ditch and Stream C (PMD 13-P1.3 [2] recommendation #8).

CNSC Consolidated Assessment of the Biosphere

In summary, the information on the biosphere presented in the EIS and related documents have been sufficient to permit assessment the effects of the project. OPG's evaluation of the biosphere is sufficient to support the submitted licence application which includes the proposed DGR location, general design and plans for mitigation.

CNSC staff concur with OPG's EA monitoring plans for additional baseline monitoring of: the water level in the marsh adjacent to the DGR Project site; flow in the unnamed drainage ditch and in the north railway ditch; surface water samples in the unnamed ditch and in Macpherson Bay; and radioactivity in stormwater. CNSC staff also support the completion of: an assimilative capacity study and a receiving water assessment of Macpherson Bay; and channel characterization and capacity study of the unnamed drainage ditch. OPG has also committed to update the flood hazard assessment based on a revised PMP that considers the projected operating period of the DGR and climate change influences. This updated assessment will be used in completing the engineering details of DGR design and will influence such things as the elevations of the shaft collars, key equipment like air intake and exhaust and other safety systems, and sizing for the Stormwater Management Pond (SWMP) and ditches.

CNSC Staff Conclusion

CNSC staff conclude that OPG's evaluation of the biosphere has been sufficiently detailed to ensure adequate DGR design and construction mitigations and programs will be in place to protect the environment.

3.1.3 Geosphere/Subsurface Characteristics and DGR Project Interactions

This section focuses on: potential near-term interactions between the overburden and bedrock at shallow and intermediate depths, the biosphere, and the DGR; and, the characteristics of the deep bedrock and its suitability to isolate and contain the proposed DGR for a very long time.

Information Presented in the Application

Section 3 of the PSR [16] provided a summary of the process used to characterize the geosphere at the DGR Project site. In section 4 of the PSR [16] the applicant provided summary information on the geosphere on the regional, local and site specific scale, addressing the overburden geology, bedrock geology, hydrogeology, hydrogeochemistry, and geochemistry. This information is supported by details provided in other licensing documents such as the Descriptive Geosphere Site Model [28], the Seismic Hazard Assessment report [36], the Geosynthesis Report [27], the EIS [12], the Geology TSD supporting the EIS [12], the 3D Geological Framework Model and OPG's responses to JRP IRs. Many other documents are also referenced in the Descriptive Geosphere Site Model [28] and the Geosynthesis Report [27] as support for the application.

The applicant conducted a review of regional geological data and carried out a Geoscientific Site Characterization Program (GSCP). Initiated in 2006, this program was developed to evaluate the attributes of the geosphere necessary to evaluate the site suitability, which provided an additional, complementary line of reasoning to those presented in the safety assessment. The GSCP was carried out under quality assurance programs designed by OPG and OPG's EPCM company, as previously discussed.

The GSCP characterized the subsurface (from the surface) through drilling, testing and seismic reflection surveys. Information from six deep boreholes were used in the EIS and in support of the licence application; three shallow boreholes provided additional information on the upper 200m. Testing included: geophysical logging of 6276 m of borehole; hydraulic testing of 2425 m of borehole; geomechanical testing of 707 core samples; geological, petrophysical and hydrogeochemical testing of 1214 samples; and a two-dimensional seismic reflection survey across 19.7 kilometres, on site. Subsequent to the initial submission, further information on:

- regional and structural geology was provided in the responses to JRP IRs EIS 05-165, 05-167, 08-314, 08-315, 08-319, 09-415, 09-416, 09-428 and 10-484 [32];

- geomechanical and other rock properties was provided in the responses to JRP IRs EIS 03-68, 03-72, 03-73, 08-372, 08-373, 08-374, 08-375, 08-376, and 08-377 [32];

- geochronology (age dating information) was provided in the responses to JRP IRs EIS 02-38, 09-415, 09-428 and 10-484 [32];

- geochemistry and hydrogeochemistry was provided in the responses to JRP IRs EIS 09-424, 09-435 and 09-442 [32];

- economic geology was provided in the responses to JRP IR EIS 01-24, 01-24 supplementary, 02-39, and 05-162 [32];

- overburden geology was provided in the response to JRP IR EIS 01-01 [32];
- hydrogeology was provided in the responses to JRP IRs EIS 02-35, 04-125, and 09-425 [32], and TIS 9 (CEAR 692) associated with the JRP Technical Information Session held on July 18, 2012 [35]; and,
- Undertaking TIS 6 (CEAR 692) associated with the JRP Technical Information Session held on July 18, 2012 [35].

Information regarding two additional boreholes at the planned site of the main and ventilation shafts was developed following the submission of the EIS [12] and the licence application submission [1]. This borehole information was provided during the public review period in the responses to JRP IR EIS 08-314, the supplementary information to EIS 08-314, the supplementary information to EIS 08-373 [32], and in undertaking TIS 15 (CEAR # 697, 699, and 700) arising from the Technical Information Session held on July 18, 2012 [35].

The shallow subsurface environment, within 180 m or so of ground level, has been explored by OPG at a number of locations on OPG retained lands, in many earlier activities of site investigation activities and with groundwater monitoring. Additional overburden and shallow bedrock investigations have been completed and this information has been included in responses to:

JRP IRs EIS 03-54, 03-57, 05-229 and associated supplementary information, 08-352, 08-383, 08-386, 08-394, and 08-399 [32]; undertakings TIS 4, TIS 11, and TIS 13 (CEAR 692, 695, and 715 respectively) associated with the JRP Technical Information Session held on July 18, 2012 [35]; and, supplementary information to JRP IR EIS 08-383 and 08-394 [32].

General Geosphere

The Bruce area is located on the eastern side of the Michigan Basin, and north of the Algonquin Arch. Nearly flat-lying Paleozoic sedimentary rocks overlie Precambrian basement, which formed during the Grenville Orogeny between around 1250 and 980 million years. Uplift, erosion, and sedimentation occurred during a major gap in the stratigraphic record. Periods of Paleozoic sedimentation (from around 500 until around 300 million years ago) within the Michigan basin occurred within a very broad shelf and platform setting; sedimentary formations are regionally extensive and traceable over a vast area. The last active tectonic process to have affected the DGR Project site occurred about 250 million years ago.

During the Pleistocene, glacial erosion removed a minor but variable thickness of Paleozoic sedimentary rock (and basement, where exposed). The last glacial advance began about 125,000 years ago, and as it melted (beginning about 25,000 years ago), deposited unconsolidated surficial sedimentary deposits (overburden). The bedrock and deeper hydrostratigraphic regime at the Bruce nuclear site has resisted glacial perturbation from an estimated 9-10 glacial cycles, over the last million years.

Further support for the stability of the project area comes from the probabilistic seismic hazard assessment, which shows the DGR would be built in a seismically quiet location. No faults were identified at the Bruce nuclear site during geoscientific characterization activities.

Overburden Geology and Groundwater

Overburden in the DGR Project area consists of weathered and unweathered stony and sandy beach materials underlain by sandy silt and silty till layers that are glacial in origin. There are thin shoreline-parallel bands of sand and gravel beach deposits and minor gravel-dominated glaciofluvial outwash. A large portion of the shoreline exposes the underlying dolostone bedrock (mid Devonian Lucas Formation). Overburden thickness varies from 0 to 20 m, at the DGR Project area the overburden is about 15 m thick. The underlying bedrock surface generally slopes east-northeast beneath the project area. The overburden is sometimes overlain by a thin veneer of topsoil and humus. Soil quality is variable, and at some locations reflects past industrial activities. A middle sand layer present at the WWMF is generally absent from the DGR site area.

Due to the relatively dense and impervious nature of the till much of the surface water is expected to flow directly into ditches and streams. Surface waters in marshes and swamps are within and adjacent to the DGR Project area. Groundwater measurements indicate some of these wet areas reflect locally perched groundwater conditions in thin sand/gravel layers in the till. Groundwater flow is both downward through the overburden to the underlying bedrock and toward Lake Huron to the northwest.

Stratigraphy (Bedrock Geology) and Hydrogeology

The hydrogeological regime that characterizes the site depends directly on the stratigraphy of the bedrock in the project area. OPG's Postclosure Safety Assessment Report [24], Figure 4.13, identifies this stratigraphic column. A copy of this figure is presented below followed by a brief description of the stratigraphy.

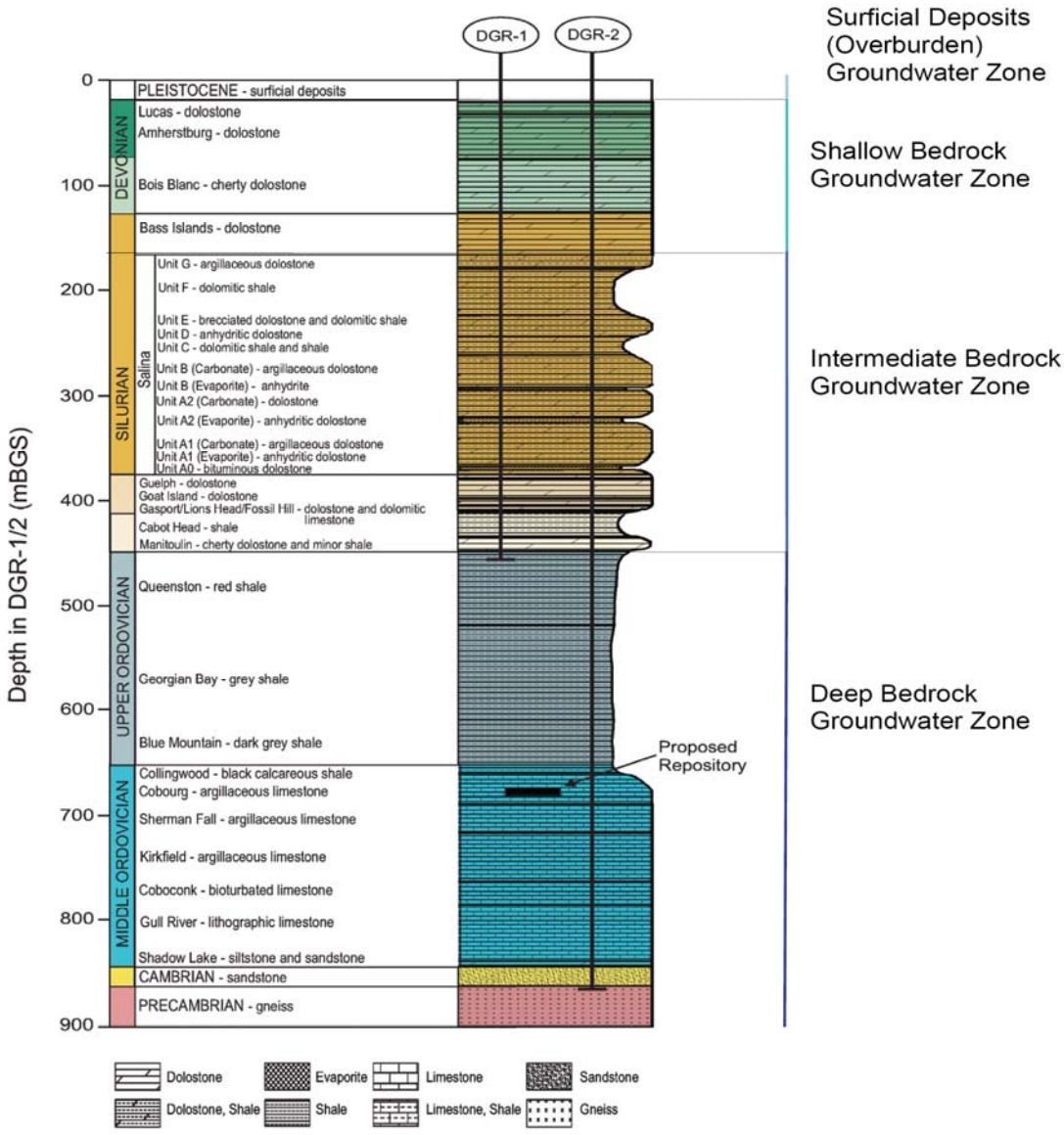


Figure 3.1.3-1. Stratigraphy of the bedrock in the vicinity of the proposed DGR Facility [24].

Cambrian sandstones (around 500 million years) at the base of the stratigraphic column in Figure 3, above, unconformably overlie the Precambrian basement. They are in turn unconformably overlain by the Middle Ordovician units that are predominantly limestones; the repository is proposed to lie within the Cobourg formation, near the top of the Middle Ordovician units. These units are mainly gradational with overlying Upper Ordovician units, that are mainly described as shales with interbeds of limestone. Overlying Silurian units are siliciclastics, dolostones with gypsum and salt, and evaporates. The youngest bedrock unit is Devonian in age, and comprised of limestones, dolostones, and shales. Devonian dolostones are exposed along the shoreline of Lake Huron near the project site.

Hydraulic conductivities within the rocks proposed to host the DGR and overlying units are very low (10^{-14} m/s). This indicates that the movement of contaminants will be slow and controlled by diffusion in Ordovician limestones and shales. Several units in the Silurian Formations have horizontal permeabilities, meaning that permeability in the vertical direction is lower than in the horizontal direction.

Shallow and Intermediate Bedrock Geology and Hydrogeology

Below the overburden to a depth of approximately 170 m, Devonian and Upper Silurian dolostones and argillaceous dolostone is moderately to highly fractured. The ground and pore waters in this shallow groundwater regime transition from fresh compositions in the overburden and upper bedrock layers, to brackish at the base. Horizontal hydraulic conductivities range from 8×10^{-8} m/s to 1×10^{-4} m/s. Solute migration in this permeable shallow regime is driven principally by advection.

The rock units in the shallow regime are fed by rainfall in areas of recharge that are generally located east of the Bruce nuclear site, and the groundwater flow is westward to the point of near shore discharge at Lake Huron. The overburden and upper part of the shallow rock east of the Bruce nuclear site may serve as potable water sources. The shallow water system is isolated from the underlying intermediate ground water system by low rock permeabilities at that depth.

Below the Upper Silurian Bass Island formation, the intermediate bedrock and groundwater zone extends from a depth of around 170 m to 448 m through the Upper Silurian age Salina G formation, through the Middle Silurian (including the Guelph formation) and Lower Silurian units. The bedrock consists of layered evaporite, dolostone and shale. At these depths, the rock is sparsely fractured and characterized by low permeabilities with horizontal hydraulic conductivities ranging from 5×10^{-14} m/s to 3×10^{-10} m/s. Groundwater in two, three-meter thick layers, the Salina A1 and the Guelph, are more permeable with horizontal hydraulic conductivities ranging from 5×10^{-9} m/s to 2×10^{-8} m/s and saline water compositions. These layers are apparently recharged where they outcrop or subcrop east of the Bruce nuclear site along the Niagara Escarpment, and they discharge into Lake Huron at several locations tens of kilometers from the Bruce nuclear site. Where groundwater information is available, it is found to be slow moving in the lateral direction, because the vertical transport mechanism is diffusion dominated due to the laterally continuous, near horizontal layers of low-permeability rock. Both groundwater and porewater are saline near the top of the intermediate zone; salinity increases with depth, where it is a brine. Water in the intermediate zone is not potable.

Deeper Bedrock Geology and Hydrogeology

The deeper hydrogeological zone extends from a depth of 448 m to the top the Precambrian crystalline basement, consisting of around 410 m of sedimentary rock. At the top of this package, Upper Ordovician units (210 m thick) are sparsely fractured shales and limestones, of moderate strength. The underlying Middle Ordovician argillaceous limestones (180 m thick, consisting of the Trenton and Black River groups are also sparsely fractured. The Cobourg formation within the Trenton group Ordovician limestone, is the proposed host for the DGR at approximately 680 m below ground surface. Assessment of the Cobourg indicates its high strength and good quality rock. Below the Middle Ordovician, around 20 m of Cambrian sandstone overlies the Precambrian basement.

The Ordovician shales and Trenton group limestones have exceptionally low permeabilties. The horizontal hydraulic conductivities range from $4x10^{-15}$ m/s to $1x10^{-13}$ m/s. These rock units are also significantly underpressured. Porewaters are brines with much higher salinity that the seawaters that were present at the time of deposition. It is likely that the high salinity is due to subsequent evaporation of the seawaters. These and other properties, including the modelling and geochemistry of porewater and mineral infill associated with paleo-karstic features, suggest that rock units at depth have isolated porewater from the surface for hundreds of millions of years. The information establishes the long term presence of diffusion dominated transport mechanisms.

The deeper Black River Group and the Cambrian sandstone are overpressured, exhibiting increasing hydraulic conductivity with depth relative to the Trenton limestone. The porewater and groundwater in the Cambrian formation is slightly less saline, reflecting groundwater mixing with those in the underlying Precambrian basement.

CNSC Staff Assessment

Section 2.8 of PMD 13-P1.3 [2] provides CNSC staff's assessment of the geosphere and its influences in assessing the DGR Project effects. Section 2.20 of PMD 13-P1.3 [2] includes CNSC staff's assessment of the geosphere and its relation to DGR design and long term safety and the protection of the environment. Further details can be found in PMD 13-P1.3A [3]. The following summarizes the technical conclusions of these documents.

Overburden and Shallow Bedrock

CNSC staff are in agreement with OPG's assessment of the overburden, shallow bedrock and groundwater conditions. Information addressing geotechnical properties of the overburden and rock strength and behaviour has also been provided.

Though OPG indicated that 7 shallow bedrock wells (4 DGR and 3 US series wells) were currently being monitored for quality and hydraulic head measurements (see Table 2 – Baseline Monitoring program, EA Follow-Up Monitoring Program [9]), existing baseline groundwater data was found by CNSC staff to be incomplete. In response to IR EIS 08-383, OPG confirmed the installation and sampling of new subsurface groundwater monitoring wells (also identified on Table 2) and provided results for August and November 2012, and February 2013, in a supplementary submission to 08-383 (CEAR # 1065).

The locations of these newly installed wells are all north of the railway embankment, and mostly down-gradient of the DGR footprint. None of the monitoring wells that are part of current groundwater sampling in the area of the neighbouring WWMF have been identified to support the baseline for the DGR. OPG has indicated (section 10.4.1.1 of the PSR [16]) that a network of sampling holes will be established for the DGR. This will enable existing operations, such as the WWMF and other Bruce nuclear site activities, to be distinguished from the DGR Facility once in operation.

OPG modeled the effect of drawdown from pre-shaft excavation and shaft sinking activities on the groundwater at the DGR Project site and at neighbouring areas. OPG determined that these activities would have drawdown effects within the identified zone of influence of 54 m around the planned main and ventilation shafts and assessed these effects as temporary in duration and not significant. Further, OPG modeling established that hydraulic head distributions in the bedrock below the existing storage buildings at the WWMF should not be influenced.

OPG also submitted information that modeled the effect of the WRMA and the Stormwater Management Pond (SWMP) on the surface and groundwater. OPG established, and CNSC staff agree, that the WRMA and SWMP are not likely to cause significant adverse impact on the groundwater system. CNSC staff have noted however that the salinity associated with the runoff and groundwater seepage is predicted to be quite high. OPG has proposed monitoring for runoff and seepage water from the WRMA.

On the basis of the baseline well locations and the modeling of drawdown effects, CNSC staff have determined that additional monitoring wells up-gradient of the DGR Project footprint are necessary to establish the follow-up groundwater monitoring network for the DGR Project. This may include existing and/or new wells to permit the detection of any migration of the existing tritium plume at the WWMF. The additional wells, along with those currently identified for DGR Project groundwater monitoring, are necessary to confirm the groundwater modeling results for both drawdown and the WRMA and SWMP influences. Confirmation of the EA results also includes refinement of the modeling exercise for WRMA and SWMP as more data becomes available, and verification of assessment results through the groundwater and shaft discharge monitoring programs.

CNSC staff recommendations related to this work can be found in PMD 13-P1.3 [2]. These include a waste rock monitoring program (PMD 13-P1.3 [2] recommendation #6); groundwater and shaft discharge monitoring programs to verify assessment results (PMD 13-P1.3 recommendation #5); and additional monitoring wells up-gradient of the DGR Project footprint (PMD 13-P1.3 [2] recommendation #3). Each of these is a component of the larger EA Follow-up Monitoring Program [9], which is part of the proposed licence (see licence condition 13.2).

This program, in combination with the proposed groundwater and surface water quality programs identified in the EA Follow-up Monitoring Program [9] is acceptable to CNSC staff and can confirm the performance of the proposed mitigation to prevent any impacts for the WRMA.

Deep Bedrock – Cap and Host Rock

CNSC staff are in agreement with OPG's characterization and assessment of the intermediate and deep bedrock attributes that would serve to isolate and contain radioactive waste for a very long time within a DGR constructed at a depth of 680m at this site. OPG's assessment of the area and region is supportive of statements regarding the following: geologic stability; stratigraphic thickness, predictability and lateral extent; low permeability rocks providing containment; diffusion dominated contaminant transport geomechanical stability; seismic quiescence; isolation of shallow groundwater resources from groundwater at depth; and the low potential for natural resources.

Geologic Stability

OPG has acceptably established the geologic stability of the bedrock; confirming the last tectonic process to have affected the region occurred at the end of Appalachian mountain building, 250 million years ago; the deep groundwater regime has resisted perturbation from nine glacial cycles over the last million years. Paleohydrogeological evidence of the thermal-hydrological-mechanical-chemical (THMC) regimes, confirms that below 500 m the rock remains largely unaffected by past glacial cycles. Modelling performed independently through the CNSC's research program, confirmed the lack of glacial influence below this depth. Geologic stability is further supported by OPG's Seismic Hazard Assessment report [36] showing the location to be seismically quiet. Hydrogeochemical data from the deep groundwater regime reflects an ancient origin and a deep zone that has not mixed with shallower waters even during glacial events.

Predictable Geometry and Lateral Extent of Host Rock

OPG has provided regional and site specific information to show the stratigraphy to be generally predictable, exhibiting lateral continuity, with predictable formation depths and thicknesses. This information was used to create the three dimensional geological framework model and CNSC staff's review of this information is

discussed in PMD 13-P1.3A [3]. The uncertainties associated with the 3DGFM - with respect to the thickness of units, model and source data verification - that were addressed by OPG during their model development include: verification of their regional historic borehole data sources by screening for obvious errors (such as incorrect logging of contacts), the inclusion of reference wells and geophysical logs published by the Ontario Geological Survey, site specific drill core, the comparison of borehole geophysics from DGR boreholes and an historic borehole. The model was validated by OPG against boreholes that were used to make the model and with a statistical analysis experiment where 67% of the wells were isolated and used to generate a surface passing through the other 33%, which had been removed from the dataset. The high correlation factor verified that the model operated as planned, but does not verify the accuracy of predictions. A second test made predictions of depth to the top of DGR-4, which were made only after DGR-2 was incorporated into the model. This verifies the procedure used, but doesn't validate the accuracy of the model.

The stratigraphy documented from DGR-7 and 8 boreholes, which were drilled after the construction of the 3DGFM, is consistent with the model – providing additional information on model accuracy.

Plans for reducing the uncertainties associated with vertical faults are proposed in OPG's Geoscientific Verification Program, planned for the DGR construction phase. The Geoscientific Verification Program aims to confirm the sub-surface geology and geotechnical conditions through geological mapping, geophysical surveying, excavation damaged zone (EDZ) characterization, and characterization of host rock response to excavation. OPG's plans for reducing uncertainty associated with models have been found to be acceptable by CNSC staff.

Low Permeability

CNSC staff consider OPG to have provided sufficient evidence of the existence of multiple layers of low permeability rock above, below and at the proposed repository level. The data submitted establishes thickness, and redundancy in these barriers that exhibit low permeabilities that would restrict gas and groundwater movement.

Deep Groundwater is Diffusion Dominated and Isolated from Shallow Groundwater

OPG has provided multiple lines of evidence supportive of extremely slow, diffusion dominated groundwater flow in the cap and host rock. These conditions have been assessed to have existed for a very long time. Correspondingly, deep groundwater (at repository depth) have been isolated from the shallow groundwater regime for a similarly long time. Measured hydraulic conductivities, porosity and diffusion coefficients indicate movement would be very slow and controlled primarily by diffusion in the Ordovician shales and limestones. This is supported by the hydrochemical and isotopic characteristics of the groundwater in the Ordovician and adjacent rock, which reflect extremely long groundwater residence times of millions of years. Characterization of gases in groundwater and drill cores also supports the existence of a stagnant, diffusion dominant transport regime. CNSC staff concur with OPG's assessment that the low hydraulic conductivity, high-density stagnant groundwater/porewater, isotope profiles, diffusion measurements, and residence time calculations all indicate a diffusion-dominated system with no advective flow, unperturbed by past glacial loading and unloading and isolated from the upper groundwater regimes.

Geomechanical Stability

OPG has provided data establishing the strength and behavioural properties of the host rock and rock layers above and below the repository level. The rock property data provided are sufficient to permit the assessment of the geomechanical stability of underground openings to be made in these materials. Some uncertainties remain with respect to in-situ stress magnitudes and orientations and some more time-dependent mechanical properties of the host and cap rock formations. These uncertainties would more appropriately be resolved during construction of the DGR. OPG's plans for confirming these properties via verification programs planned for this phase has been found to be acceptable by CNSC staff.

Low Potential for Natural Resources

OPG has qualitatively assessed hydrocarbon potential at the Bruce nuclear site that might encourage exploration and possible intrusion. OPG has stated that based on the current state of knowledge, there exists no commercial hydrocarbon accumulation at the Bruce nuclear site and that currently available data does not allow for a statistically meaningful evaluation of resource potential. A quantitative evaluation of hydrocarbon resource potential would contribute to an assessment of the probability of inadvertent intrusion by future generations, after repository closure. International guidance on this issue propose that this uncertainty need not be resolved, so long as the applicant can demonstrate that the consequences of future intrusion are acceptable. Over time however, the value of resources and the technologies to obtain them can be expected to change. It is the DGR Facility Safety Case (as discussed in section 4.4) that would track this aspect in order to provide continued confidence that the risk of intrusion remains acceptably low.

Protection of Lake Huron

OPG evaluated scientific investigations, analyses and studies conducted in support of the EA to assess potential impact on Lake Huron [63]. OPG concluded, and CNSC staff concur after their evaluation of the submitted information, that the DGR is not likely to result in any significant adverse effects to Lake Huron. Evidence provided by OPG in support of this conclusion include the following. The DGR site, is approximately 1 km inland from the shore of Lake Huron, in an area of low seismic activity. Waste will be emplaced 680 metres below ground surface in low permeability limestone rock beneath a 200-metre-thick layer of low permeability shale. These rock formations provide multiple natural barriers to isolate and contain the waste. The deepest point of Lake Huron in the area is about 180 metres, such that the laterally extensive multiple natural rock barriers isolate the DGR from Lake Huron. OPG's evaluation considered migration of radionuclides and predicated that the maximum calculated dose under a wide range of plausible scenarios is essentially negligible. During operation of the DGR Facility, OPG will be required to have in place a monitoring program that will be able to detect any interaction of L&ILW with the environment (geosphere and biosphere) well before it reaches including Lake Huron.

CNSC Staff Conclusion

CNSC staff conclude that OPG's evaluation of the geosphere has been sufficiently detailed to support the DGR design and construction described in the licence application, and the assessment of the environmental impacts of the DGR Project. While a large amount of geosphere data was obtained during site characterization activities and additional geosphere information, obtained after the submission of the EIS [12] and the licence application submission [1] has been provided to the JRP in response to information requests, and in commitments by OPG including but not limited OPG's verification programs as detailed in PMD 13-P1.3A [3].

3.1.4 Natural External Events and DGR Project Interactions

This section addresses the evaluation of external hazards or events whose effects on the DGR Facility are considered in ascertaining the suitability of the site to host it. This includes consideration of changes to these hazards or events over time. Hazards or events evaluated include meteorological, flooding, seismic, geotechnical, and other naturally occurring hazards.

Information Presented in the Application

OPG has provided information in PSR [16] assessing natural external events that might affect the DGR Project site, such as storms, tornadoes, wind, rain, snow, hail (section 2.5.3.8) and related flooding; geologic disturbances like earthquakes, faulting and volcanoes (sections 4.5.2); and long term climate change effects like glaciation (section 4.5.1). Further details were provided in supporting documents

such as the Maximum Flood Hazard Assessment [25] and the Geosynthesis Report [27], which included information from referenced reports addressing long-term climate change, assessment of glacial erosion, and assessment of seismic hazard. Related information is also presented in the EIS in discussions of the effect of the environment on the project (EIS [12] section 7.13) and the effects of the future environment on the project (EIS [12] section 7.14.2). The Atmospheric TSD and the Geology TSD are two detailed document that support the information summarized within the EIS [12].

OPG responded to information requests from the JRP with additional information in areas such as:

- Seismic events in JRP IRs EIS 03-75, EIS 06-270, and EIS 08-398 and JRP IR LPSC 01-17 [32];
- Meteor impacts in JRP IRs EIS 01-03 and EIS 06-270 [32];
- Flood events in JRP IR EIS 06-270 [24];
- Severe rain/storm events in EIS 04-113, 04-143, 05-222, and 07-283 [32];
- Lightning in EIS 06-270 [32];
- Severe wind (tornado) events in EIS 01-03, 05-222, and 06-270 [24];
- Climate change effect in EIS 01-16, 04-143 and 04-144 [32], and undertaking TIS 7 (CEAR 692) associated with the JRP Technical Information Session held on July 18, 2012 [35]; and
- Glacial events in EIS 10-486 [32].

Geologic Disturbances

The Bruce region is in the tectonically stable interior of the continent and experiences sparse seismic activity. An assessment of the seismic hazard for the DGR site considered return time periods of 100,000 to 1 million years, to be commensurate with the facility type. The site responses to seismic events are established with site specific dynamic properties and ground motion time histories for consideration in the repository design and investigation of events on deep caverns. The information assessing the host rock indicated it is competent. Faulting at site and volcanoes were determined to be non-credible events given the conditions of the Michigan basin within the continental interior.

Severe Weather

The kinds of severe weather events in the Bruce area were identified and include: thunderstorms, lightening, hail, tornadoes, ice storms, and hurricanes. All these events were identified and discussed in OPG's assessment of natural events. Occurrences such as tornadoes and hurricanes are identified as having a low probability of occurring at the Bruce nuclear site. High intensity rainfall from a hurricane was considered, along with other high intensity rainfall events in assessing the PMP for the Bruce area. The possible revision of the PMP and its affect on the flood hazard assessment was identified.

Shoreline Flooding

OPG has identified possible events affecting shoreline flooding by Lake Huron. These included a rise in lake level, storm surge, tsunami, seiche (atmospheric), wind wave and wave uprush. Predictions of the 500 year maximum level for Lake Huron are 178.6 m International Great Lakes Datum (IGD) which is about 0.8 m above the maximum observed level from 80 years of record. The maximum predicated storm surge from a severe storm event is 1.3 m, and wave setup and uprush estimates for MacPherson Bay are as high as 0.48 and 1.6 m respectively.

The extreme weather predication is assessed to therefore result in shoreline flooding to 181.8 m, which is about 500 to 550 m inland, and well removed from the DGR Project site and its currently planned operational elevation of 186 m.

Surface Flooding

OPG has assessed surface flooding, based on the on-site streams and creeks (riverine) and from direct rainfall on the DGR Project site. Riverine flooding was determined to not pose a concern for site elevations of 186 meters above sea level (mASL). Surface flooding has been identified as the flooding event that will affect final design elevation. The assessment of maximum flood elevation will be affected by revisions to the PMP.

Climate Change

OPG considered climate change over the life of the DGR Project by examining past and future temperature and precipitation trends to identify how climate in regions were changing and to project changes over the life of the Project. The largest shifts in climate were identified over the next epoch, and predominantly associated with glacial effects such as permafrost, erosion, and glacial loading effects, including hydraulic pressure.

In the nearer time period (i.e. this century), there is increased possibility of storm events of greater frequency and intensity of precipitation that may impact the PMP. This may affect the nature of flooding events that can be considered in design and mitigation.

CNSC Staff Assessment

OPG's assessment of the natural events such as shoreline and surface flooding, and severe weather has been found adequate and acceptable. OPG has identified that the PMP and maximum flood will be reassessed as the final details of the DGR are developed. This is also discussed in section 2 of PMD 13-P1.3 [2].

OPG's confirmation in their response to JRP IR LPSC 01-17 [32] that seismic loading will be considered for all above and underground structures in association with the seismic event as per the 2010 National Building Codes is considered appropriate. OPG has further indicated that analysis of emplacement rooms and other openings for changes in rock stresses and rock support loading due to seismic racking deformation on excavation openings will also occur. CNSC staff are satisfied with the response.

The climate change effects on natural events presented by OPG are considered acceptable by CNSC staff. OPG's explanation of possible coastline migration in their response to EIS 01-16 is also considered adequate.

CNSC staff are satisfied with OPG's approach to faulting, volcanism, meteor impact, and tornadoes.

CNSC Staff Conclusion

OPG provided sufficient information on natural events over the lifecycle of the DGR Project to adequately assess the effects of the environment on the project as described in section 2.15 of PMD 13-P1.3 [2]. Further CNSC staff have also concluded that information on the natural events was sufficient to support the design of the DGR presented in OPG's application. OPG's commitments to updating the flood hazard assessment and completing seismic analysis and seismic loading as part of their completion of the details of the DGR design is appropriate and must be provided to the CNSC for a compliance review.

3.1.5 Land Use and Other Related External Events and DGR Project Interactions

This section relates to the assessment of neighbouring land uses, and possible events associated with those uses, necessary to evaluating the DGR Project site.

Information Presented in the Application

Section 2 in the PSR [16] provides information describing the use of the Bruce nuclear site and neighbouring areas. Additional detail is included within the EIS.

The Bruce nuclear site is an area of 932 hectares that has undergone continuous development for the production of nuclear power since 1960. The site includes Bruce A NGS, Bruce B NGS, Douglas Point (partially decommissioned research reactor), WWMF, Radioactive Waste Site 1, site of the decommissioned Heavy

Water Plant, Bruce Power Office Building, Bruce Landfill site, as well as other infrastructure for the power complex. The site is owned by OPG. OPG has leased most of the site to Bruce Power for their operation of Bruce A and Bruce B NGSs. The remaining area is retained by OPG for their on-site activities. This includes the interim radioactive waste storage area at the WWMF, and the area planned for the DGR.

The Bruce nuclear site is fully fenced and access to the site is controlled by Bruce Power. OPG has access and service arrangements with Bruce Power addressing their on-site requirements. The DGR Project site is located outside the exclusion zones of Bruce A and B.

Around the Bruce nuclear site is agricultural land, provincial park land, and wetland area. The neighbouring communities are Inverhuron and Tiverton

CNSC Staff Assessment

The information provided by OPG on the use of land at the Bruce nuclear site is considered acceptable by CNSC staff.

CNSC Staff Conclusion

CNSC staff conclude that sufficient information is available on the land uses at the Bruce nuclear site and in the local area to support the licence application.

3.1.6 Conclusions of Project Site Evaluation

CNSC staff conclude:

- There have been sufficient and acceptable programs for borehole characterization, testing, and for evaluation to permit an understanding of the site and its evolution over time, including natural events and processes;

- The results of the programs have adequately demonstrated the existence of geological conditions at the site that provide isolation and containment and can support repository performance in the very long term;

- Sufficient test and borehole data and other results have been developed to support the technical basis for the safety assessments, the proposed repository design and construction activities, and the assessments provided in the EIS and other information submitted in support of the licence application; and

- Further geological and geotechnical verification and monitoring activities are planned during construction to confirm design and constructions safety and permit verification of long term performance assessments. These activities can be obtained under the control of the CNSC licence and CNSC compliance verification activities.

CNSC staff conclude that the site is acceptable for repository development. Conditions are adequately defined to permit appropriate design and mitigations and thereby ensure environmental protection and safety over the lifecycle of the DGR Project.

3.2 DGR Design Evaluation

CNSC staff's evaluation of the proposed facility design, in both the near and long term, is presented here.

3.2.1 Introduction

The assessment as to whether the facility, as described, can be safely constructed, operated, and decommissioned and whether the environment will be protected in the near term is summarized in this section. Also included is CNSC staff's review of the expected performance of the repository containing the low and intermediate level waste in the long term. Finally, CNSC staff plans for the verification of developing engineering details are discussed.

Applicable Regulatory Requirements under the NSCA

The CINFR stipulate the requirements for licence applications. With respect to a licence application to prepare a site and to construct a Class I nuclear facility, the following information directed at the facility design is to be provided:

- ss.4 (d) the proposed quality assurance program for the design of the nuclear facility;
- ss.5 (a) a description of the proposed design of the nuclear facility, including the manner in which the physical and environmental characteristics of the site are taken into account in the design;
- ss.5 (d) a description of the structures proposed to be built as part of the nuclear facility, including their design and their design characteristics;
- ss.5 (e) a description of the systems and equipment proposed to be installed at the nuclear facility, including their design and their design operating conditions;
- ss.5 (f) a preliminary safety analysis report demonstrating the adequacy of the design of the nuclear facility; and
- ss.5 (i) the effects on the environment and the health and safety of persons that may result from the construction, operation and decommissioning of the nuclear facility, and the measures that will be taken to prevent and mitigate those effects;

CNSC Technical Expectations

Section 2.4 of this PMD provides information on the regulatory and technical bases used in considering the DGR application. Many of these relate specifically to the facility design and its performance. In particular, the DGR Facility must be able to meet the CNSC regulatory requirements for the protection of the public, workers and the environment. For a repository this means demonstrating it can meet requirements not just during its operational period, but can with reasonable assurance demonstrate that in the very long term these same requirements can be met in accordance with the CNSC's policy on managing radioactive waste. CNSC document CNSC G-320 [6] discusses the demonstration of long term performance expectations and the establishment of acceptance criteria for waste management facilities.

The DGR Facility is also required to comply with federal and provincial regulations in its construction and operation. Surface buildings and structures shall comply with the National Building Code of Canada, the National Fire Code of Canada, Ontario Regulation 213/91 – Construction Projects, Ontario Regulations 851/90 Industrial Establishments, and underground underground structures shall comply where relevant with Ontario Regulations 854, Mines and Mining Plants, to identify just a few.

Information Presented in the Application

To address the CNSC's regulatory requirements and technical expectations the applicant provided information summarizing the DGR Facility design description within the PSR [16]. Along with the PSR [16], the application information included more detailed reports related to DGR design as follows:

- Project Requirements (NWMO DGR-PDR-00120-0001) [18]
- Preliminary ALARA Assessment [23]
- Preliminary Conventional Safety Assessment [22]
- Preliminary Decommissioning Plan (PDP)
- Postclosure Safety Assessment [24]
- Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository [17]

The PSR [16] described the proposed DGR Facility in term of such things as its general requirements and quality assurance, surface buildings and infrastructure, underground facilities, waste package inventory, transfer equipment and emplacement operations, package retrieval, fire and life safety, emergency response, operations and safety, events and accidents, decommissioning and closure safety. In their letter dated February 10, 2012 [34] OPG provided an update to the DGR facility description originally provided in section 6 of the PSR [16].

CNSC Staff Assessment – General

Prior to the April 2011 submission of the EIS [12] and the licence application submission [1], OPG engaged in the phased development of the DGR facility design based on information obtained during site characterization activities. In accordance with CNSC G-320 [6], OPG also proposed acceptance criteria for radiological and non radiological contaminants for the performance of the DGR repository during the postclosure period. These acceptance criteria were found acceptable to CNSC staff (CEAR#257).

CSNC staff reviewed and commented on preliminary DGR design information during the period of site characterization and OPG responded to CNSC comments (CEAR#211). The JRP requested evidence of independent technical review of OPG's DGR design for that same period. Information about these design reviews by expert parties was provided to the JRP in OPG's response to JRP IR EIS 01-18 [32] (CEAR # 363).

As discussed in section 3.1 of this PMD CNSC staff conducted reviews of quality assurance plans for the site characterization period, which included quality assurance for the development of the DGR facility design. CNSC staff reviews confirmed that quality assurance programs were in place to support the development of quality product, in this case the DGR design and the site characterization data used in the design and safety case that is presented in the EIS [12] and other information submitted in support of the licence application.

CNSC Staff Conclusion – General

CNSC staff conclude that OPG developed their DGR design in a staged approach, with the use of independent technical reviews that fits with guidance from the CNSC and the IAEA. OPG had an acceptable corporate management system that was applied to the DGR Project, including the development of the DGR facility design considering acceptable criteria for its long term performance, that is described and assessed in OPG's EIS and other information submitted in support of the licence application.

3.2.2 Evaluation of Facility Design – Design and Operation

Information Presented in the Application

Section 6 of the PSR [16] describes the proposed DGR facility design and its operation. Section 7 of the PSR [16] provides an assessment of safety in this period. In a February 10, 2012 submission to the JRP [34] OPG provided an updates to the DGR design and changes to the environmental impact statement and safety assessment arising from the design updates. OPG plans to complete the engineering details of the design during the site preparation and construction period.

During the public review period OPG's responses to JRP IRs as well as information provided at the JRP Technical Information Session held on July 18, 2012 [1EE provided further clarification and information related to the DGR facility design and its operation. This clarification and information addressed the following aspects of the DGR Facility:

- Main shaft area buildings and structures in responses to JRP IRs LPSC 01-06, LPSC 01-08, and LPSC 01-09 [32];
- Ventilation shaft area buildings and structures in response to JRP IRs LPSC 01-03 and LPSC 03-60 [32];
- WRMA in response to JRP IRs EIS 05-192, EIS 05-200, and EIS 05-229 [32], and undertaking TIS 12 (CEAR 715) associated with the JRP Technical Information Session held on July 18, 2012 [35];
- DGR facility services in JRP IRs LPSC 01-10, LPSC 03-59, and JRP IR EIS 05-217 [32];
- Storm water management system in JRP IRs [32] LPSC 01-12, LPSC 01-13, LPSC 04-63, EIS 03-56, EIS 05-192, EIS 05-229, EIS 07-285, EIS 09-472, and undertakings TIS10 (CEAR 692), and TIS 12, 14 and 17 (CEAR 715) associated with the JRP Technical Information Session held on July 18, 2012 [35];
- Underground facility main and ventilation shaft and systems in JRP IRs LPSC 01-05, LPSC 01-17, LPSC 02-55, LPSC 03-60, and EIS 03-53 [32];
- Underground services area, pocket and emplacement rooms in JRP IRs LPSC 03-60 and LPSC 05-187 [32];
- Underground ventilation in JRP IRs LPSC 01-09, LPSC 01-14, LPSC 01-35, EIS 04-134, EIS 04-154, EIS 05- 207 and EIS 09-409 [32];
- Monitoring of underground in JRP IR EIS 08-381 [24];
- Dewatering in JRP IRs LPSC 01-019, LPSC 04-63, EIS 04-151 [32] and undertaking TIS 11 (CEAR 692) associated with the JRP Technical Information Session held on July 18, 2012 [35];
- Transfer equipment and emplacement operation in JRP IRs LPSC 01-16, EIS 04-102, EIS 03-61, EIS 07-280, and EIS 10-496 [32];
- Wastes, packages, and acceptance criteria in JRP IRs EIS 03-50, 03-58, 03-59, 04-99, 04-102, 04-147 , 08-342, 08-343, 08-347, 08-348, 08-350, 08-378 and 10-488 [32];

- Fire, life safety and emergency response was provided in JRP IRs LPSC 01-09, 01-15, 01-16, 01-21, 01-22, 01-43 [32] with supplementary information for 01-15, 16, 21, and 22 in a July 10, 2012 letter (CEAR 606); LPSC 03-61, EIS 03-60, 03-61 EIS 05-186, 05-186 and 06-269 [32];

- Operational monitoring, preclosure safety and accident assessments in JRP IRs LPSC 01-07, 01-23, 01-24, 01-40, 01-41; JRP EIS IRs 01-26, 03-62, 04-102, 04-112, 04-150, 05-207, 06-243, 06-245, 07-281, 08-351, 09-402, 09-430, 09-460 and 09-463 [32].

The above list is not considered exhaustive.

Design Description

Surface buildings and main associated infrastructure are located in four main areas (the following is a summary of the above-noted information sources):

- Main Shaft Area – provides intake ventilation and primary access to the underground repository; includes a waste package receiving building for receipt and transfer of waste packages, personnel, equipment and materials; provides the hoisting systems for packages to the development area; and a control room for, amongst other things, hoist control, communications, alarms and instrument monitoring.

- Ventilation Shaft Area – provides the location where waste rock from the development of the repository is brought to surface; it will support hoist requirements and act as a second egress; lastly the shaft will convey the air discharged from the repository to the surface.

- Waste Rock Management Area (WRMA) – the location where the rock excavated during underground construction of the DGR, approximately 1,000,000 m3, will be stored on the DGR site in segregated piles based on general rock type to allow some of these materials to be reused on the Bruce nuclear site.

- Surface Water Management Pond – the location where all surface water from the DGR site (WRMA, main and ventilation shaft areas), including ground water and treated process water arising from construction, will be collected for monitoring and release into an unnamed ditch and subsequently to Macpherson Bay.

Access and subsurface infrastructure are located at the repository level (depth of 680m in the Cobourg formation of argillaceous limestone) sized for a total emplaced volume of approximately 200,000 m3 of packaged L&ILW, and with the following key configuration details listed below (the following is a summary of the above-noted information sources):

- Shafts - The main shaft is nominally 720 m deep with an inside diameter of approximately 6.5 m. The ventilation shaft is nominally 745 m deep with an inside diameter of approximately 5.0 m. Shafts will be lined with a concrete liner to address groundwater conditions through the length of the shafts, primarily of importance in the upper layers of bedrock.

- Services Area: An underground services area is constructed nearer the ventilation shaft and contains such services as maintenance shop, diesel fuel bay, wash bay, etc. Electrical, sanitary facilities, instrumentation services, lunch room, geotechnical area and stores will also be included. The services area also contains a refuge station to ensure personnel safety in the event of any underground incidents such as fire or spills.

- Panels: Two panels of waste emplacement rooms located to the east of the main and ventilation shafts. Panel 1 has a proposed fourteen rooms and Panel 2 has seventeen. Panel access and exhaust ventilation tunnels run parallel to one another perpendicular to the emplacement rooms. The panels are connected by the ventilation exhaust tunnel providing flow-through ventilation to the ventilation shaft. There is provision for minor modification of the panels to permit a change to the number of rooms for the proposed operational wastes.

- Dewatering: Water intrusion into the underground infrastructure that is encountered would be collected in sumps prior to being pumped to a dewatering sump location below the repository level near the ventilation shaft. Water is then pumped to the surface via a positive displacement pump through the ventilation shaft discharge column. A back-up discharge column would be provided in the main shaft.

- Emplacement Rooms: Emplacement rooms are nominally 250 m in length with end walls or bulkheads constructed at the end of the emplacement rooms where they meet with the exhaust ventilation tunnel. These end walls allow for the installation of ventilation regulators and there are access doorways for egress when rooms are empty. Emplacement rooms are arranged parallel to the assumed direction of the major principal horizontal in-situ stress of east-northeast. However, as stress direction will not be confirmed following shaft sinking room orientation may require modification to suit confirmed in-situ stress conditions.

- Systems and Instrumentation: The underground area will have a communications system, fire detection and alarm system, annunciation system, air quality monitoring, and radiation monitoring that is connected to the main control room on surface near the main shaft. The fire protection system is currently proposed as a portable dry system supported by fire doors.

The DGR's underground development is being located within the Cobourg formation which is a strong, competent rock layer that has been assessed to be sufficiently strong and to remain stable and open for the planned tunnel and emplacement room sizes for the operational period. The direction of the layout of underground development is planned for optimal orientation with the principle stresses at development level. This will be with the emplacement rooms aligned with the major principle stresses. The exact orientation is to be confirmed, and the orientation of the tunnels and rooms adjusted if necessary, based on planned measurements of the stresses made at the repository level during the construction. Ground support in the form of rock bolts, wire mesh and shot Crete, is included for design safety. These measures will be used to address localized stresses at tunnel and room corners and the expected, isolated areas of lower strength layers of rock that may potentially delaminate.

Design and Operation

The facility design will use material and equipment, in configurations to permitting repair, replacement, and maintenance to support the possible operation of the facility over a 100 year period. The facility is also planned for a possible 24 hour operation that will permit the receipt and placement of 23 low level waste packages or 2 intermediate level waste packages in each 8 hour shift. The waste package receiving building located at the main shaft is sized and configured with shielding and space to allow for the short term shortage of waste packages pending their transfer underground. Waste packages will be secured to a rail car and moved onto the hoist platform for the controlled descent to the underground area. This building is designed to ensure the external dose rates remain safe for workers. All operations are to be monitored. At the development level in particular, this monitoring includes systems and equipment for radiation, air quality, and fire detection to protect workers. Releases from the ventilation system to atmosphere, water from the underground development, and releases from the SWMP, will also be monitored.

The L&ILW from OPG owned or operated nuclear reactors, including refurbishment wastes, will be received in their final package configuration and must meet established waste acceptance criteria that include such aspects as the maximum permissible radiation field from the surface of a package and no surface contamination. The packages (waste and container) are designed to: contain a waste volume and weight; provide shielding where required for radiation protection of workers; be stable at rest as well as easily and safely moved; support other packages in a stable storage configuration; and provide assurance of performing as a package in the dry conditions of the repository for many tens of years of operation.

At the development level, wastes will be moved by either forklift or rail car, in accordance with size and weight, to the assigned emplacement area. Where access is provided by rail car, a gantry crane is planned for the associated heavy packages. Panel 1 is planned for use first, beginning with the rooms located the greatest distance from the main tunnel. End walls separating a filled emplacement room from the access tunnel may be installed on some rooms in either panel to reduce

dose rates to workers in the tunnels as required. Once the first panel is full, reinforced walls are planned for installation to isolate the panel from the main access tunnel and ventilation tunnel. There are no plans for backfilling the emplacement room; facilitating package retrieval during the operating period if it is required and maintains repository performance in the longer term.

Panel 2 is to be in full operation following the first. Once full, a period of monitoring is planned. The length of this period is unspecified, but will be developed during the operational period and consider geoscientific monitoring results.

When operated, the most exposed workers at the proposed DGR facility are conservatively assessed to receive doses below 10 mSv per year from the radiation fields from the waste packages and possible exposure to tritium and carbon-14 in air.

These calculations are part of the Preliminary ALARA Assessment [23] of the proposed DGR Facility and its future operation. ALARA is defined as 'As Low As Reasonably Achievable', social and economic factors being taken into account. Doses to non-Nuclear Energy Workers from a DGR in operation were determined to remain less than 0.5 µSv per hour, OPG's compliance dose limit, and result in doses well below 1 mSv per year. For members of the public, doses from DGR operations are assess to be less than 1 µSv per year.

The possibility of natural radon from the bedrock has been assessed and determined not be pose a radiation hazard to workers in the repository.

Design and Natural External Events

Natural external events associated with flooding, storms, and earthquake are considered in the DGR facility design. The DGR surface structures and buildings are to conform to the requirements of the National Building Code. The building code specifies how such things as wind, snow and ice load, and seismic loads, amongst other things, are to be considered in the design. Lightening protection is also planned for the design. The seismic hazard assessment has also been completed, and assesses further the possible seismic hazard of the area.

The site has been determined to be subject to surface water flooding from a heavy rain event rather than from Lake Huron or river flood events. A maximum flood elevation for establishing elevations for critical systems has been assessed and used in the preliminary design of the collar height. The elevation for the collar height to prevent flooding will be reassessed during the development of the details of the design as part of finalizing the site grading plan and the latest estimates of the probable maximum precipitation.

The heavy rain event is also of importance to the design of the surface water management pond and the associated ditches. The PSR [16] has identified the design capacity of the storm water management system is to meet the maximum precipitation event and the 1:100 year storm event without overtopping embankments and erosion of the outlet system.

Design and Operational Accidents, Malfunctions and Events

The DGR facility design has included considerations to reduce possible operational accidents, malfunctions and events. The application of the required codes and standards in the design greatly reduces the likelihood of many accidents, malfunctions and events. Fire hazard considerations include reducing combustible materials used in the facility design, and appropriate provisions for egress, fire detection and fire suppression provisions, fire barriers, and refuge stations. Flood hazard considerations related to design include location of safety significant systems above high water elevations, collar elevation, dewatering pump capacity, site grading, and surface water ditch and SWMP capacity. Release of liquid effluent events are to be addressed via weir closure provisions at the SWMP. Storage for liquids both above and below ground will use containers appropriate to volume and type of liquid required. Other considerations included safe working and transfer conditions for personnel and packages for hoisting, tunnel and room surfaces, transfer equipment, and lighting. Electrical service considerations for safe location and backup power requirements are also part of the design.

In addition to considerations in design, the potential for accidents, malfunctions and events are further reduced by the application of both the labour code requirements and regulations and the establishment of appropriate training, programs, and procedures, and other management practices and controls.

Safety provisions are included in the DGR design and will be supported by appropriate practices, programs and procedures to be employed during licensed activities. Notwithstanding this, credible accidents, malfunctions and events were assessed and their possible effects identified and evaluated. These included fire, container breach, inadequate shielding, and ventilation system failure. Results indicated dose effects to the public over a 1-hour period, would be much less than 1 mSv, and non-radiological releases would remain below the U.S. Department of Energy (DOE) Protective Action Criteria. Doses and non-radiological contaminant concentrations (soil and water) to valued ecosystem components or VECs are below established criteria. The predicted radiological doses to workers for the 5 minute response time remain well below the annual dose limit of 50 mSv limit. And concentrations of non-radiological contaminants are less than ‘Immediately Dangerous Life’ criteria established by the U.S. National Institute for Occupational Safety and Health.

Conventional, credible operational accidents and events associated with this type of facility (e.g., fire, spill, and vehicle) were assessed and determined not to pose a risk with normal worker protection in place. This does recognize that such accidents and events have the risk of injury and potentially even death. There are no adverse effects to the off-site members of the public.

The radiological and non-radiological effects of malevolent acts for workers and the public are bounded by the assessments during operation.

CNSC Staff Assessment

The information provided by the applicant on the proposed DGR facility design was considered sufficient for use in the EA of the environmental effects of the DGR Project. In PMD 13-P1.3 [2], sections 2.5.2 and 2.5.3 include CNSC staff's assessment and conclusions of the DGR facility design; section 2.19 includes CNSC staff's assessment of the operational accidents, malfunctions and malevolent effects. And the possible effects of operating the DGR facility on the hydrology and surface water, the terrestrial environment, the aquatic environment, ambient radioactivity to non-human and human biota, and atmospheric environment are found in PMD 13-P1.3 [2] sections 2.9, 2.10, 2.11, 2.12-13, and 2.14, respectively.

Design Description

OPG confirmed in IR response LPSC 01-01 and 01-02 [32], that the preliminary DGR design presented in the PSR [16] was completed prior to the issuance of the 2010 editions of the National Building Code of Canada and National Fire Code of Canada. OPG confirmed the application to design of regulations, codes and standards for seismic hazards, pressurized systems, concrete, dose limits, steel structures, electrical systems, human factors, to identify a few, in IRs LPSC 01-03, 01-04, 01-05, 01-05a, 01-07, 01-10, and 01-11 [32] respectively. OPG's completion of the details of the proposed DGR design is committed to follow the most current versions of the applicable codes and standards as indicated in the document Project Requirements (NWMO DGR-PDR-00120-0001) [18]. OPG indicated in their response to JRP IR LPSC 01-25 [32], the planned development of design details to the 'issued for construction' drawings. OPG's Project Execution Plan [19] includes their overview of their management of this detailed design phase of the project.

The design of the DGR follows the requirements for the project developed by OPG for their L&ILW. OPG has proposed development of the repository in the Cobourg, a competent rock formation, at sufficient depth for isolation, and with characteristics that can support rock openings and suitable containment functions. OPG has confirmed the submission of a preliminary design. The approach to the development of this design has been shown to be iterative, with the input of a technical advisory group. OPG has confirmed the development of the design details should a CNSC licence be issued.

The codes and standards proposed in the submission are appropriate and sufficiently comprehensive to progress to completing details in accordance with the most up to date versions. OPG will complete the design details in accordance with an established management system and quality program and has plans for geoscientific and geotechnical investigations that complete the assessment of rock openings and rock support systems and ensure adequate design safety.

Design and Operation

OPG responded adequately to JRP IRs LPSC 01-23, 01-24, 01-26 01-27, EIS 06-243, 06-245, 08-351 [32], and others, requesting clarification of information on how workers and the public will be protected during operation. OPG confirmed plans to optimize such things as shielding associated with the waste package receiving building, transfer vehicles, and waste packages, further addressing ALARA requirements, during the development of design details. OPG provided information, summarized in their response to JRP IR LPSC 03-56 [32], addressing emplacement room design with no plans for backfill. Information has also included descriptions of the programs and procedures that will be in place for DGR operation to further support safety and protect the environment during facility operation.

OPG responded to JRP IR EIS 01-08 [32] regarding possible tritium species associated with underground air quality during DGR operation. The response was considered acceptable by CNSC staff for this phase of licensing and worker doses are adequately assessed. CNSC staff will expect to see information in OPG's application for an operating licence that provides verification of the tritium species and expected doses to workers in the DGR.

CNSC staff have reviewed the information provided on the normal operation of the preliminary design of the DGR facility. The proposed design under normal operating conditions draws on OPG's experience with the safe management of these L&ILW at the WWMF. OPG's plans to utilize existing waste container designs, with known performance, and over packing where required is acceptable to CNSC staff, and fits within the design requirements of the repository. CNSC staff concur with OPG's assessment that the proposed DGR design can meet regulatory requirements for the safety and protection of workers, the public, and the environment during the normal operation of the facility.

Design and Natural External Events

OPG has responded to JPR IRs EIS 04-143, EIS 05-222, EIS 07-282, 07-284, and 07-285 [32], and others, regarding the flood hazard and the maximum flood elevation. OPG has determined that site drainage requirements have raised the ground surface elevation for the surface facilities to 88 meters above sea level (mASL). OPG has also indicated that the detailed site design will be established following further consideration of the stormwater infrastructure and stormwater ditch crossings (e.g., Innovation Road and the unnamed drainage ditch)

OPG sized of the preliminary design of stormwater management system, including the pond, for the 100 year storm. Climate change has been identified as having a possible impact on size of the storm event, given the possibility of the facility operating in the long term. CNSC staff recommended in section 2.9 of PMD 13-P1.3 [2] that the SWMP be sized considering an updated PMP so as to reduce the possibility of overtopping the storm water management system over the possible period of operation.

OPG's submission included a seismic hazard assessment in the area of the DGR site, which is has provided information on ground motions that could occurring the service life of the DGR. The seismic assessment indicates a general consistency with information provided in the NBCC 2005. As per OPG's response to JRP IR LPSC 01-03 [32], OPG has indicated the development of the design details for the surface buildings based on the provided information from the NBCC 2010.

For the underground development, JRP IR response LPSC 01-05a [32] has confirmed the stability of the preliminary design of the shafts and emplacement rooms based on the information in the seismic assessment report. CNSC staff are satisfied with the responses, and the approach proposed for developing the design details for the shaft liner. OPG has further indicated that analysis is being conducted to assess any changes in rock stresses and rock support loading due to seismic racking deformation on the underground openings.

Design and Accidents, Malfunctions and Events

The DGR design provides for fire suppression, alarms and communications, emergency power, refuge stations, as well other attributes in the choice of equipment and systems to reduce and limit accidents and malfunctions that might be associated with the DGR facility. OPG has responded to several IRs addressing possible accidents or events regarding an abnormal inflow of water (JRP IR EIS 04-151 [32]), a shutoff of ventilation (JRP IR EIS 04-154 [32]), possible theft or threats (JRP IR EIS 05-195 [32]), malfunctions or malevolent acts (JRP IR EIS 06-248 [32]), among others. OPG has also committed to ensuring accident mitigation will continue through the development of the details of the DGR design. OPG has confirmed that the mitigation of possible accidents, malfunctions and events associated with the design will be supported by operational programs and procedures, and worker training. OPG has adequately demonstrated their abilities to safely handle and manage the waste and waste packages at the WWMF over many years of safe operation. CNSC staff are satisfied with OPG's approaches and agree with OPG's assessment that workers, the public and the environment will be adequately protected from radiological and conventional accidents and malfunctions during the operation of the DGR.

CNSC Staff Conclusion – Design and Operation

Information submitted by OPG on the DGR Facility design is adequate to support the CNSC staff recommendation to the Commission to issue an LPSC. Safety assessments presented by OPG, and evaluated by CNSC staff, demonstrate that the repository can meet regulatory requirements for the protection of workers, the public, and the environment during its operational period. Information provided by OPG on the plans and programs that will be in place to support the safe operation of the facility is also considered sufficient by CNSC staff.

OPG plans for the completion of the engineering details of the design during year one of the site preparation and construction period. As indicated in PMD 13-P1.3 [2] CNSC staff have identified areas of the detailed design for their technical review to confirm design compliance with regulatory requirements and performance assurances made in the EIS and other information submitted in support of the licence application. For the DGR design, these areas include:

- Design of the Surface Water Management System (to address PMD 13-P1.3 [2] recommendation # 13 regarding sizing and grading elevations);
- Design of the ground improvement (to address part of PMD 13-P1.3 [2] recommendation #1);
- Design of rock shaft initial and final supports (to address PMD 13-P1.3 [2] recommendation #1);
- Design of initial and final rock support for shaft service area (to address PMD 13-P1.3 [2] recommendation #1);
- Design of aboveground structures, with seismic analysis and seismic loading assessment (to address PMD 13-P1.3 [2] recommendation #15);
- Design of underground facilities, with seismic analysis and seismic loading assessment (to address PMD 13-P1.3 [2] recommendation #15);

CNSC staff are satisfied that the development of the details of the DGR facility design can proceed under the terms of a CNSC licence, and safety corroborated by CNSC compliance verification activities. Under the terms of the licence CNSC staff can be provided with the details of the design for their review and comment, prior to construction. This is discussed further within section 4.5 of this PMD (Physical Design).

3.2.3 Evaluation of the DGR Facility – Design and Decommissioning and Closure

Information Presented in the Application

Section 13 of the PSR [16] describes preliminary planning for decommissioning and closure of the DGR facility, section 5 describes the waste inventory of the repository at closure, and section 8 provides an assessment of the repository's postclosure safety. The general underground layout was modified and the effects of the modifications presented in CEAR-336. Corrections to the text in the PSR [16], Postclosure Safety Assessment [24], and Reference L&ILW Inventory Report [17] were provided in CEAR-335.

During the public review period OPG's responses to JRP IRs provided further clarification and information related to the DGR design and the preliminary plans for its decommissioning and closure. This clarification and information addressed the:

- Underground services area in JRP IR EIS 05-207 [24].
- Design and construction of the shaft seal in JRP IRs LPSC 03-58, EIS 03-63, EIS 04-155, EIS 06-268, and EIS 10-492 [32].
- Waste rock management area in JRP IRs EIS 05-171, and in undertaking TIS 9 (CEAR 692) associated with the JRP Technical Information Session held on July 18, 2012 [35].
- Wastes from decommissioning in JRP IR LPSC 01-46 and 01-47 [32].
- Postclosure safety assessment in JRP IRs LPSC 02-55, EIS 01-19, 01-21, 04-129, 04-152, and EIS 09-466 [32].
- Normal evolution and disruption scenarios in JRP IRs LPSC 03-62, and JRP IRs EIS 01-19, 01-21, 02-36, 03- 63, 04-105, 04-152, 06-246, 07-310, 08-335, 08-385, 09-404, 09-412, 09-460, 09-461 and 09-463 [32].
- Uncertainties assessment in JRP IRs EIS 01-17, 01-20, 01-20 supplementary, 02-35, 03-56, 03-62, 03-64, 03-92,04-114, 04-116, 04-119, 04-153, 09-446, 09-457, 10-486 [32] and in undertaking TIS 16 (CEAR 715) associated with the JRP Technical Information Session held on July 18, 2012 [35].
- Waste characterization and radionuclide inventory in JRP IRs EIS 01-05, 01-06, 01-07, 01-20, 01-33, 01-06 supplementary, 01-20 supplementary, 04- 99, 06-264, 08-378, and 11-509 [32].

DGR Design - Decommissioning and Closure Description

The preliminary plan for the decommissioning of the DGR design is to place the repository, with its emplaced volume of low and intermediate level radioactive waste, into a state that ensures the protection of persons and the environment.

Repository level - At the repository level, all liquids and lubricants will be removed from the repository. Equipment at this level may be salvaged, recycled or left within the repository based on needs at the time. The underground services area and the base of the two shafts will be prepared for the construction of a concrete monolith. Bulkheads will be constructed across all the openings 60 metres from the two shafts at the repository level. The concrete will fill the shaft sumps, ramps and shaft bottoms up to the repository level. At the repository level, concrete fill all the shaft stations, tunnels and peripheral rooms located between the bulkheads and the shafts. The monolith when complete, will act as a stable foundation for the rock above and the shafts that will be filled with layers of sealing material. The concrete used for the monolith will be low heat of hydration concrete to minimize heat generation and shrinkage.

Shafts - Decommissioning the shafts includes the sequential removal of infrastructure (systems, equipment and shaft liner), the removal of shaft supports and the scaling of any loose rock to competent rock material, and the installation of shaft sealing material. This sequence will be repeated up the length of the shafts to the 185 meter level, where there are no plans to remove the shaft liner from that point to ground surface. The shaft sealing materials will include concrete, a 70:30 betonies/sand mixture, asphalt and engineered fill. The concrete layers will be keyed into the rock, support the overlying material and isolate rock sections with higher hydraulic conductivity. A concrete cap will be placed near the surface and covered with granular materials to the finished ground surface elevation.

Abandonment and Long Term Performance - After decommissioning and closure, the current plan is to request that the DGR site be from the control of the CNSC through a request for a licence to abandon. This request will be supported by placing the site under institutional controls. This period of institutional control is projected to last for 300 years.

Decommissioned DGR Design and Long Term Performance

The long term performance of the decommissioned DGR design is dependent on: the isolation and containment of the DGR geosphere characteristics; the DGR shaft and sealing material characteristics that establish isolation and containment; the conditions at the DGR Facility repository level that may affect the surrounding geosphere; and the inventory of radioactive and hazardous substances in the wastes at closure.

The DGR design provides for repository development at a nominal depth of 680m in a strong, competent, low permeability and low porosity rock formation. The repository level is capped above with a layer of thick, low permeability and low porosity rock, and below by thick, low permeability rock. The proposed sealing materials include primarily a bentonite/sand mixture, a chemically stable material; and concrete, asphalt, and engineered fills. These materials all have demonstrable characteristics that can produce isolation properties similar to the rock formations. The arrangement of the various layers of sealing materials through the length of the two shafts will be designed and constructed to minimize the potential water flow along the interfaces between different materials and to isolate the upper, more permeable rock formations.

OPG's safety arguments, using information from their borehole sampling and measurements, laboratory testing, and modelling results, establish that the closed repository is not likely to fully resituate within a million years, thereby restricting the dissolution of any radionuclides and a vehicle for the potential migration of contaminants from the repository. As gas pressure will remain lower than the overburden stress and likely lower than hydrostatic pressures, gaseous contaminants will remain contained within the repository formation by diffusion processes. OPG's geomechanical assessments also determine that the layers of cap rock will not be affected by progressive changes due to the excavations made at the repository level, and so will continue to provide containment of the repository wastes below.

Waste Inventory

For the projected emplaced volume of approximately 200,000 m^3 packaged L&ILW, the radionuclide inventory is estimated to be 17,000 terabequeral (TBq) at repository closure, assumed here as 2062 [17]. 2062 represents the current project, and does not consider the possible expansion to the DGR facility as identified in the cumulative effects assessment section of the EIS [12] for future projects. Most of this total is tritium (H-3), carbon-14, cobalt-60, niobium-94 and nickel-63. To address possible uncertainties associated with the estimates of the radionuclide inventory, performance of the Normal Evolution Scenario was assessed assuming ten times the applicant's estimated L&ILW inventory for the DGR Facility [17].

Calculated Performance

OPG's safety assessment determined the peak doses to persons for the closed repository for a number of scenarios following guidance provided in CNSC G-320 [6] and other international standards. Conservatisms were identified and applied to the calculations for the purposes of ensuring repository performance for the Normal Evolution Scenario and the Disruptive Scenarios that include human intrusion, failed shaft seals, undetected vertical faults, and unsealed borehole, would be bounded. The Normal Evolution Scenario and its variants resulted in doses at least 5 orders of magnitude below the acceptance criteria of 0.3 mSv per year. The calculated dose for the human intrusion scenario, after the institutional control

period of 300 years, is similar to the natural background dose rate; for a failed shaft scenario about 1 mSv per year; and for a poorly sealed borehole or undetected vertical fault, orders of magnitude below the acceptance criterion of 0.3 mSv per year.

CNSC Staff Assessment

OPG's assessment of the DGR facility design and its long term performance has been reviewed by CNSC staff in the context of the safety assessment; the attributes of the geosphere attributes, and the attributes of the decommissioned and closed DGR system design. CNSC staff's assessment of long term safety for the EIS is discussed in section 2.20 of the PMD 13-P1.3 [2]. More detail technical discussion is provided in section 4 of PMD 13-P1.3A [3] with section 4.2 of that document considering the geosphere attributes, 4.3 the repository system design attributes, and section 4.1 the safety assessment. It is important to remember that the three components, the geopshere, the repository, and the safety assessments, are integrated and together determine confidence that the repository is isolated and contained.

Briefly, the CNSC staff review indicates that OPG has presented credible arguments for the safety case, supported by the safety assessment for the normal development of the site over the very long term. Conservative assumptions, alternate models, sensitivity analysis, verification/validation, and quality assurance and quality control procedures were applied in the safety assessment, providing confidence that the calculated impacts are likely to be over predicted for most cases. The doses remain many orders of magnitude below acceptance criteria. For disruptive scenarios, the results are in line with international standards and are found to result in an acceptable risk.

With respect to the attributes of the geosphere supportive of the long term repository performance, CNSC staff found sufficient evidence for the stability, predictability and sufficient lateral and vertical extent of the geological formations. There is sufficient evidence of the thickness of low permeability rock above and below the repository level. With respect to contaminant transport, the evidence strongly supports the diffusion dominant transport in both the host and cap rock for the time scale relevant to the demonstration of safety for the repository. The host rock has good geomechanical stability for the operational period and in the long term; in combination with the planned size and orientation of repository openings the geomechanical performance of the host formation does not affect the isolation function of the cap rock. The low potential for natural resources indicates a low risk of intrusion for this purpose, based on current knowledge. And the assessment of the host and cap rocks supports that these rock layers remain isolated from ground and surface water resources near surface.

CNSC staff review of the repository system design which includes the DGR design features (supported by construction techniques) and the proposed waste inventory [17] has found it supports the safety arguments presented by OPG.

The nominal repository depth of 680 m contributes to isolation, remote as it is from activities typical to intrusion, and the depth supports containment, limiting possible damage by gas pressure. The depth also secures competent, strong, host rock for operational stability. The size of underground openings, a minimized excavation damaged zone (EDZ) through controlled drill and blast techniques in construction and the orientation of the openings maintain an intact cap rock in the long term. Shaft sizing and the minimized EDZ also reduces the long term risks for groundwater flow and contaminant migration and enhance long term safety.

CNSC staff are satisfied with OPG's overall management of uncertainties associated the various aspects of their safety arguments for long term safety. OPG has applied previously noted conservatisms, processes, and approaches in their assessments, and CNSC is satisfied with the evidence provided. OPG will also conduct geotechnical verification activities at key locations during shaft sinking to verify modeling and design predictions. Further the geoscientific verification program will gather additional information to confirm sub-surface conditions to support engineering decisions, the final details of design, and safety.

CNSC Staff Conclusion

Sufficient evidence has been provided by OPG for CNSC staff to conclude that following its closure, the DGR will adequately protect human health and the environment. The information on the DGR design decommissioning and closure is developed to an acceptable level to meet the requirements for a licence application to prepare a site and to construct, and provides reasonable assurance that in the long term the repository can comply with regulatory requirements for the protection of persons and the environment.

OPG plans to conduct geotechnical investigations and monitoring, as well as implement a geoscientific verification program that will obtain information that can reduce uncertainties within an acceptable safety assessment. As indicated in PMD 13-P1.3 [2], CNSC staff made recommendations related to the following areas in the safety assessment:

- Longevity of shaft seals (to address PMD 13-P1.3 [2] recommendation # 19)
- Review of long term geomechanical model and safety assessment at the end shaft construction considering the results of shaft geotechnical and geoscientific investigations (as discussed in PMD 13-P1.3 [2] recommendation # 19)
- Revisions to the waste characterization program (as discussed in PMD 13-P1.3 [2] recommendation #2)

CNSC staff are satisfied that these recommendations can be addressed under the terms of a CNSC licence and issues managed through the CNSC compliance verification activities. This is discussed further within section 4.4 of this PMD (Safety Analysis).

3.2.4 Evaluation of the DGR Facility – DGR Design and Construction

Information Presented in the Application

Section 9 of the PSR [16] describes plans for preparing the site and constructing the DGR as designed. The general underground layout was modified and the effects of the modifications presented in CEAR-336. Corrections to the text in the PSR [16] and other submissions were provided in CEAR-335.

During the public review period OPG responses to JRP IRs provided further clarification and information related to the site preparation for and construction of the DGR design. This clarification and information addressed the:

- Scheduling in JPR IR LPSC 01-25 and 01-25 supplementary [32].
- Site preparation in undertaking TIS 12 (CEAR 715) associated with the JRP Technical Information Session held on July 18, 2012 [35], JRP IR LPSC 01-25 supplementary, LPSC 01-26, and EIS 05-200 [32].
- Construction services and infrastructure (stormwater and waste rock) in JRP IRs LPSC 01-02, 01-27, 01-29, 01-45, 03-61, 06-269, and 09-403 [32], and in the JRP Technical Information Session held on July 18, 2012 [35] with OPG's submission (CEAR 636) and in responses to undertakings TIS 10 (CEAR 692) and TIS 12 (CEAR 715) associated with the JRP Technical Information Session held on July 18, 2012 [35].
- Construction in JRP IRs LPSC 01-25, 01-29, 01-30, 01-31, 01-32, 01-33, 01-35, 01-36, 01-37, LPSC 03-50, 03-57, 03-62, LPSC 04-64, and JRP IRs EIS 08-381, 09-403, 10-485 [32], and with OPG's submission (CEAR 636) and in responses to undertakings TIS 3 (CEAR 692), TIS 8 (CEAR 715), TIS 10 (CEAR 692), and TIS 12 (CEAR 715) associated with the JRP Technical Information Session held on July 18, 2012 [35].

The above list is not considered exhaustive

Construction of DGR Design

Briefly, the activities of site preparation and construction are summarized below:

- Site Preparation – includes grubbing, grading, and fencing; installation of site services and temporary utilities; having in place components of the water management system relevant to site preparation; and, preparation of WRMA and the ditches and management pond of the stormwater management system.
- Construction – includes having fully in place the temporary components of the water management system that will address process water from excavation activities; ground treatment at shaft locations; construction of headframes; shaft collar installation; installation of temporary shaft sinking hoist houses, gantry, and

temporary winch equipment; installation of temporary main and temporary ventilation shaft ventilation; sinking of main and ventilation shafts; dismantling of temporary structures and equipment; development of permanent hoisting system and ventilation system including compressor building and exhaust; lateral development underground; construction of the amenities building (control room), waste package receiving building; final site grading; the establishment of a connection to the WWMF; road and parking area; radiological zone fencing; commissioning and turnover.

Activities that will take place prior to shaft sinking involve ground improvement to control groundwater inflows and permit safe excavation in relatively dry conditions. This ground improvement will include groundwater control, expected to be grouting, for approximately 200 m of the bedrock. Construction of the shaft collars will then take place involving conventional civil construction methods through the overburden. Overburden will be removed to the bedrock contact and safety maintained by a safe angle of slope or shoring. Collar development will include 20 m of bedrock excavation and headframe foundation development. A Galloway will be established in the shaft collars for shaft development (excavation and shaft liner installation). Infrastructure for shaft sinking dewatering will be established.

The two shafts will be sunk in parallel using controlled drill and blast techniques to maintain control of excavation damage and minimize the EDZ. Cover grouting will be used where additional groundwater control is needed during construction. Below about 200 m, cover grouting will not likely be needed because the dry conditions and low permeability of the rock. Initial rock support for the exposed sections in advance the shaft liner, may include steel or fiberglass dowels, wire mesh, shotcrete or some combination. The final support for the shafts is the cast in place concrete liner. Shaft sinking activities will be scheduled to permit activities associated with the geoscientific verification program and the geotechnical investigation and rock monitoring program that gather additional information and confirm sub-surface geologic and geotechnical conditions. This information will be used to support engineering decisions, the DGR design, and used to confirm the DGR Facility Safety Case (as discussed in section 4.4) remains valid.

At the repository level, the shaft stations will be developed and the connection made between the two to complete the ventilation circuit. The permanent headframes, hoists and ventilation systems will be completed at surface. The development at the repository level will then continue, its final orientation established from measurements made at that level in the Cobourg. This includes development with multiple working faces, of the services area and the main access and ventilation tunnels, and then the two panels in parallel to completion. Excavations will be achieved by controlled drill and blast methods to minimize damage and the EDZ. Initial rock support will be rock dowells installed to minimize damage. Additional supports like wire mesh, shotcrete, cable bolting or strapping will be used where conditions require it for the planned operating life of the opening. The final surface structures will then be developed, including the waste package receiving building, amenities building and control room.

CNSC Staff Assessment

The information provided by the applicant on the construction of the proposed DGR design was considered sufficient for use in the EA of the environmental effects of the site preparation and construction. In PMD 13-P1.3 [2], section 2.5.1.3 provides a description of site preparation and construction, and section 2.5.2 staff's assessment. The potential adverse effects of the site preparation and construction activities have been identified in PMD 13-P1.3 [2]. The potential adverse effects were noise and dust. Mitigations were identified, and given the temporal nature of the issues the effects were assessed to not be significant.

OPG has identified the use of proven construction techniques to minimize overbreak and excessive EDZ. This is supportive of safety in both the near and long term. Control of the EDZ will reduce risks for groundwater flow and contaminant transfer. It will also support geomechanical stability. These construction techniques also have accepted practices and methods for implementation to address conventional worker health and safety issues and reduce the hazards. OPG has identified a number of measurements that will be made to characterize the EDZ during and after DGR construction as part of the geoscientific verification plan [29].

OPG has confirmed that the details for the collar excavation, the controlled drill and blast designs, and the rock supports, will be fully developed by the selected contractor should OPG be permitted to proceed with the DGR project. CNSC staff are satisfied that these activities can be conducted with established and proven techniques.

OPG has identified locations for a couple of additional emplacement rooms in the event that operational waste volume assumptions were underestimated. The construction would require operations to be discontinued for the period of construction. The possibility of a larger expansion was also identified in the EIS, and would be a design change. CNSC staff have noted that the construction of these are not part of this review and would need appropriate regulatory approvals should they occur in the future.

CNSC Staff Conclusions of Design and Construction

CNSC staff have concluded that the site preparation and construction activities as described in OPG's submissions and IR responses are developed to an acceptable level for a licence application to prepare a site and construct. The safety assessment of site preparation and construction is sufficient to demonstrate that these activities can meet regulatory requirements for the protection of workers, the public, and the environment during the period of site preparation and construction.

OPG plans for the completion of the details for site preparation and construction activities identify they will be developed later by contractors. As indicated in the PMD, CNSC staff have identified areas of the construction details that require verification to confirm compliance with requirements and expectations

(refer to PMD 13-P1.3 [2] recommendation #1). For construction, these areas will include but not be limited to:

- Design of the overburden excavation and dewatering
- Design of the ground improvement
- Design of shaft excavation
- Design of the excavation of the underground, lateral development
- Design of the geotechnical investigation and monitoring program

The initial rock support designs also require CNSC staff verification, as discussed in section 3.2.2.3 of this PMD.

CNSC staff are satisfied that the development of the site preparation and construction activity details can proceed under the terms of a CNSC licence and safety corroborated by the CNSC compliance verification activities. Under the terms of the licence CNSC staff can be provided with the various construction details prior to implementation. This is discussed further within section 4.3 of this PMD (Operating Performance).

3.3 Project Evaluation Summary Conclusion

Based on review of the licence application and its supporting information CNSC staff have concluded that the DGR project for L&ILW, as proposed:

- is located at a site where the conditions provide for the adequate protection of workers, the public and the environment over the near and long term;
- has a facility design that provides for its safe operation, decommissioning and closure, providing adequate protection of workers, the public and the environment over the near and long term; and
- includes the necessary site preparation and construction activities that can be conducted in a manner that provides for the adequate protection of workers, the public and the environment over the proposed licence period.

4 GENERAL ASSESSMENT OF SCAS

The specific areas that comprise the SCAs for this facility or activity type are identified in Addendum D, section D.2.

In addition to the project evaluation (Section 3), further information was provided in order to demonstrate that the applicant is qualified to perform site preparation activities, and that in carrying out the licensed activities will make adequate provision for the protection of workers, members of the public and the environment.

The purpose of the section is to provide CNSC staff's assessment of the applicant's ability to meet regulatory requirements pertaining to the activities to take place under the requested licence, which is site preparation and construction.

The information provided by the applicant and CNSC staff's assessment of the information has been grouped into the most appropriate Safety and Control Area (SCA). The SCAs are presented in a comprehensive framework of fourteen safety and control areas which are grouped into three primary "functional" areas (Management, Facility and Equipment, and Core Control Processes). There are several SCAs that are not within the scope of this PMD as they are not applicable in the context of an LPSC for this project. Rationale is provided when a safety and control area is not applicable to this licensing phase. Those SCAs not addressed in this PMD will be addressed, where applicable, in the appropriate licensing phases.

Should the requested licence be issued, OPG will be responsible under the NSCA as the licensee. It is also recognized that the finalization of engineering details, construction related programs and associated procedures will take place in accordance with the submitted licence application information and under the terms and conditions of the LPSC, if it is issued. These details will be verified through the CNSC's compliance activities to confirm they meet the regulatory and licence requirements of the recommended LPSC.

4.1 Management System

This section provides information on CNSC staff's assessment of the applicant's management system that establishes the processes and programs necessary to ensure the organization achieves its safety and protection objectives, monitors its performance against these objectives, and fosters a healthy safety culture.

The specific areas that comprise this SCA at the DGR Facility include:

- Management System
- Organization
- Performance Assessment, Improvement and Management Review
- Operating Experience (OPEX)
- Change Management
- Safety Culture
- Records Management
- Management of Contractors

CNSC staff expect the development and implementation of a management system to be graded such that the proposed management and controls are commensurate with the overall risks to be managed. With a graded approach, all of the requirements of the management system apply but to varying degrees, depending on the safety significance and complexity of the work that is being performed. Licensees are expected to develop, implement and maintain procedures and carry out licensed activities in accordance with the management system as described in the licence application.

4.1.1 Applicable Regulatory Requirements under the NSCA

The DGR Facility is a Class IB nuclear facility according to the CINFR and GNSCR. These regulations contain the requirements for a quality assurance program, organization and records. While it may not be stated explicitly, the GNSCR also covers a range of activities relevant to the promotion and maintenance of a healthy safety culture.

Subsection 3(*d*) of the CINFR stipulates that an application for a licence shall contain, in addition to other information "the proposed quality assurance program for the activity to be licensed".

Subsection 4(*d*) of the CINFR stipulates that an application for a licence to prepare a site requires "the proposed quality assurance program for the design of the nuclear facility".

Subsection 5(*g*) of the CINFR stipulates that an application for a licence to construct shall contain "the proposed quality assurance program for the design of nuclear facility".

The GNSCR requires that an application for a licence contain:

- 3(1)(*k*), the applicant's organizational management structure insofar as it may bear on the applicant's compliance with the NSCA and the regulations made under the NSCA, including the internal allocation of functions, responsibilities and authority.
- 15(*b*), the names and position titles of the persons who are responsible for the management and control of the licensed activity and the nuclear substance, nuclear facility, prescribed equipment or prescribed information encompassed by the licence.
- 27, every licensee shall keep a record of all information relating to the licence that is submitted by the licensee to the Commission.
- 28 (1), every person who is required to keep a record by the Act, the regulations made under the Act or a licence shall retain the record for the period specified in the applicable regulations made under the Act or, if no period is specified in the regulations, for the period ending one year after the expiry of the licence that authorizes the activity in respect of which the records are kept.

OPG stated in their April, 2011 licence application submission, that their management system for the DGR Project would comply with CSA standard N286-05, *Management System Requirements for Nuclear Power Plants* (CSA N286-05) [33]. CNSC staff will evaluate compliance with this CSA standard. The CSA issued a revision to N286 in June 2012. CSA N286-12 applies to all nuclear facilities, is less prescriptive and integrates the generic requirements from management system standards for health, safety, environment, security, economics and quality. OPG has indicated a willingness to revise their management system documentation to be fully compliant with N286-12. In the meantime, CSA N286-05 [33] is considered by CNSC staff to be an appropriate management system standard for this project.

Management system standard CSA N286-05 [33] contains generic and specific requirements for a management system to support the activities carried out for a long term waste management facility life cycle.

For the proposed management system for design activities, CSA N286-05 [33] clause 6.1 requires that design activities be controlled and include, among other things, establishment of design inputs, a definition of design requirements, evaluation and selection of a design concept, preparation of the detailed design, and identification of construction, commissioning and operations requirements and other requirements. CNSC staff expect that design inputs include consideration of human factors.

CNSC staff expect that licensees will manage the promotion and maintenance of a healthy safety culture through various means such as: developing the necessary organizational policies, procedures, and structures to ensure safe operation; promoting and maintaining excellence in human performance; maintaining positive and safety-conscious attitudes and culture; providing the appropriate tools, equipment, and personnel protective equipment for the job, and utilizing measures associated with error-free human performance.

CNSC staff also apply other general criteria for management system review, such as accuracy, clarity and consistency of the information presented in the management system as described in the licence application.

4.1.2 Information Presented in the Application

OPG provided various submissions that document management system and safety culture requirements specific to the DGR Project.

The description of overall management systems that are applicable to site preparation, design and construction are provided in the following submissions:

- Deep Geologic Repository Project, Management System Charter 00216-CHAR-0001 [19].

- Low and Intermediate level waste Deep Geologic Repository - Project Execution Plan, 00216-PEP-00120-00002 [19].

- Design and Construction Phase Management System DGR-PD-EN-0001. [20]
- Project Quality Plan for Design and Construction Phase DGR-PLAN-000120-0006 [37]
- Preliminary Safety Report (PSR) 00216-SR-01320-000019 [16].

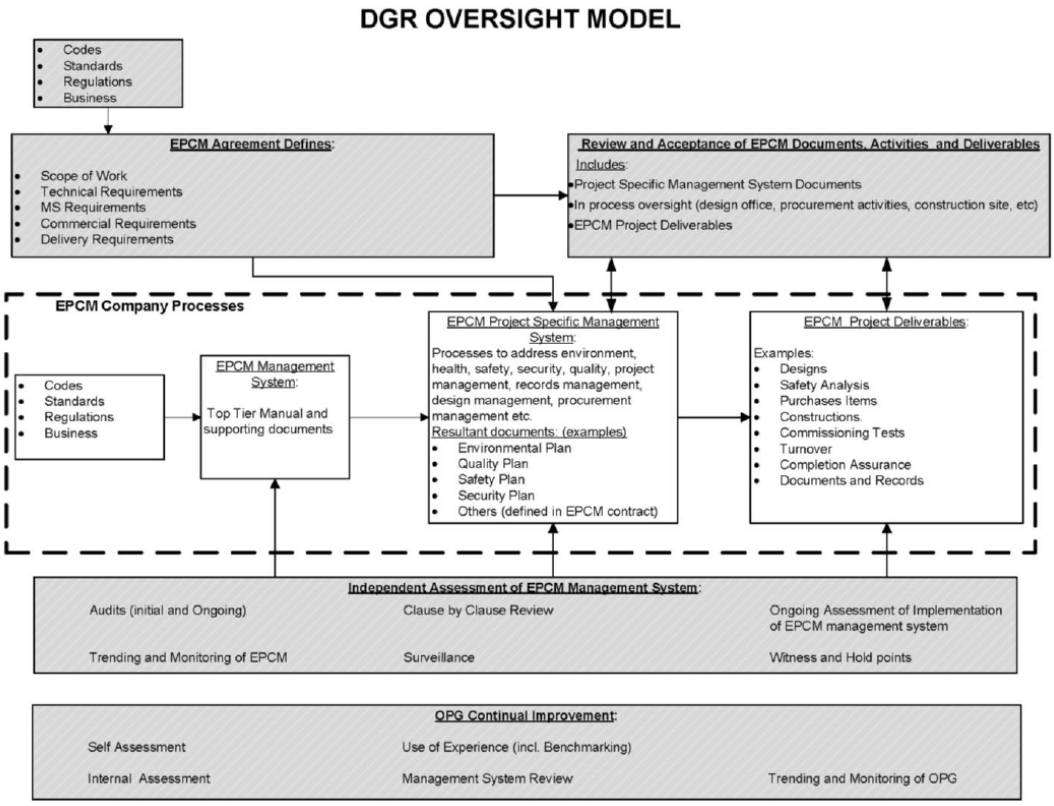
As owner and licensee, OPG will be responsible for meeting all CNSC regulatory requirements. Consequently, the primary focus of the OPG management system for the DGR Project is the oversight of NWMO activities to ensure the work performed by NWMO meets OPG's requirements. The Management System Charter [19] describes how OPG will perform its oversight role over NWMO as EPCM for the DGR Project. The Charter states that "*OPG will continue to assure itself that NWMO management system is acceptable through ongoing monitoring and observation of site preparation and construction activities, audits, and assessments against the CSA N286-05 standard*" [19]. According to OPG's Management System Charter and OPG's Project Execution Plan [19], oversight activities include surveillance, witnessing activities, ongoing monitoring and measurement, periodic audits, and OPG review and acceptance of plans and deliverables, changes /revisions to these plans and deliverables for design, procurements, construction, commissioning, management system and quality plans. The Project Execution Plan [19] describes the organizational arrangements, OPG managers' roles and responsibilities for the DGR Project.

The document Design and Construction Phase Management System [20] has been accepted by OPG. This document describes the organization, contractor's roles and responsibilities, interfaces, NWMO Corporate Governance and DGR Project specific governance, audit and management review that will be applied to the Design and Construction (D&C) phase for the site preparation, design control, construction and commissioning. The President of NWMO has the overall accountability for the NWMO's management system and for monitoring the overall performance. The Design and Construction, Project Manager is accountable for project planning, execution and monitoring including responsibilities for quality. Other organizations (e.g., engineering, procurement, project controls) and NWMO corporate functions support the Project Manager.

According to the document Design and Construction Phase Management System [20], NWMO performs the detailed design, manages the construction, procures materials and services, prepares the commissioning plans and conducts the commissioning and provides support for the development of the operational polices and procedures. This document also clarifies that "*the responsibilities for performing activities are kept separate from the responsibilities for review and oversight*". NWMO developed the generic management system procedures referenced in the Design and Construction Phase Management System and will later develop detailed procedures regarding the construction and commissioning activities.

Management system documentation provides elements essential to promoting and maintaining a healthy safety culture. The documentation indicates that safety is given high value and that the roles and responsibilities for safety have been clearly defined by OPG and their EPCM company, NWMO. The importance of occupational health and safety is also identified in the documents NWMO Health and Safety Policy and the DGR Project Health and Safety Management Plan.

By letter dated February 12, 2013, OPG submitted the revised Management System Charter and Project Execution Plan [19] to CNSC staff. Currently the DGR Project is managed by the Nuclear Project unit. The Management System Charter describes how OPG manages its internal project activities and its oversight role. Appendix B of OPG's Charter [19] illustrates the expected functional interfaces between OPG (shaded boxes) and NWMO (white boxes). A copy of this figure is presented below.



The DGR Oversight Model [19], shown in the figure above, provides a correlation map of CSA N286-05 [33] requirements to OPG Management system documents.

The OPG Tier 2 management system documents are the Programs, the Tier 3 management system documents are the Procedures and Standards and the Tier 4 management system documents include such documents as Instructions, Manuals, Plans, Guides and Forms. At the time of writing this PMD, the applicant was revising or developing Tier 2, Tier 3 and Tier 4 management system documents.

In the Management System Charter for the DGR Project [19], OPG makes the commitment to foster a healthy safety culture by exemplifying leadership behaviours and by defining and implementing practices that contribute to excellence in worker performance through the management system.

4.1.3 CNSC Staff Assessment

CNSC staff assessed the submissions and supporting documentation referenced in the submissions. In particular CNSC staff sought to determine whether there was sufficient evidence to conclude that OPG and NWMO have in place sufficient programs, processes and procedures to demonstrate the compliance with the requirements. The submitted documentation and referenced implementing documents were assessed against relevant standards, criteria and objectives. CNSC staff had several meetings with OPG to discuss the management system, their oversight activities, safety culture and CNSC staff comments in various reviews.

The following IRs were raised pertaining to OPG's management system:

JRP IR LPSC 02-48 [32] asked how through OPG oversight and assessment activities it intends to assess the Human Performance Program aspects of DGR Project activities in order to ensure consistency with OPG's existing corporate program.

JRP IR LPSC 02-49 [32] requested OPG will ensure their EMPC company will examine and verify that contractors' and subcontractors' working procedures meet OPG standards/requirements.

JRP IR LPSC 02-50 [32] requested OPG for information indicating the OPG program documentation that would be used as part of OPG oversight activities to assess and verify the promotion, assessment and maintenance of safety culture for DGR Project activities.

JRP IR LPSC 02-51 [32] requested OPG to provide information describing incident investigation completed by its contractors and OPG oversight for such investigations.

JRP IR LPSC 02-52 [32] requested OPG about agreements put in place for maintaining records produced by its contractors and subcontractors during the Design and Construction Phase.

JRP IR LPSC 02-53 [32] sought details regarding how future procedures of their EPCM company would address N286-05 [33] specific clause requirements and OPG's oversight role in reviewing these procedures.

JRP IR LPSC 02-54 [32] requested OPG to demonstrate that that the requirements of CSA N286-05 [33] clauses related to Changes, Design and Safety analysis are incorporated in the management system documents of OPG, their EPCM company and subcontractors.

In its response, the applicant committed to ensuring that all required Management Programs (including EPCM documentation) applicable to site preparation and construction would be implemented prior the commencement of licensed activities. CNSC staff obtained further clarity regarding this statement and the above noted JRP IRs in a meeting with OPG [38]. OPG also had the opportunity to clarify information contained within two documents that were submitted as part of their licence application associated with the documents OPG Management System Charter [19] and Design and Construction Phase Management System [20]. To address CNSC staff comments, the applicant submitted a revised Management System Charter and Project Execution Plan [19] to CNSC staff. CNSC staff found a notable improvement in these two documents regarding the description of the oversight role and considers them currently acceptable.

The OPG management system documents submitted provide an adequate high-level overview of the proposed management system compliance to CSA N286-05 [33], sufficient for the licence application review. OPG has been adhering to this standard corporately for many years. OPG will need to continue to develop the lower tier documents to implement the management system specific to the DGR project. As committed by the applicant, these documents must be in place prior to the start of the licensed activities. The documents will be reviewed for acceptance by CNSC staff to confirm they are consistent with the CSA standard.

4.1.4 CNSC Staff Conclusion

CNSC staff conclude that the information provided by the applicant regarding its proposed management system and organizational arrangements is sufficient to meet the regulatory requirements under the NSCA and CNSC Regulations for the issuance of an LPSC. OPG and NWMO have established specific organizations to manage the DGR Project and CNSC staff conclude that the management system can provided for the protection of workers, the public and the environment.

CNSC staff will ensure that the supporting documentation necessary for site preparation, design and construction meets or exceeds regulatory requirements and is in place prior to the commencement of the licensed activities through a ‘hold point’ in the licence. Should the requested licence be granted, CNSC compliance verification activities will be conducted to assess the effectiveness of management system activities and to verify that the controls are put in place. OPG will be required to demonstrate that it can effectively implement the documented management system and effectively provide oversight of activities of their EPCM company.

4.1.5 CNSC Staff Recommendation for LPSC

CNSC staff recommend that the licensee and its EPCM company implement and maintain a management system in accordance with the CSA N286-05 [33]. CNSC staff will evaluate compliance with this licence condition using the principles and specific requirements set out in CSA standard N286-05 applicable to DGR site preparation and construction. This recommendation is presented as Licence Condition 2.1 in the proposed Licence, provided in Part Two of this PMD. The CNSC requirements and expectations for verifying the licensee's compliance with this condition are presented in the proposed LCH under condition 2.1, also provided in Part Two of this PMD.

As OPG is using an EPCM company and subcontractors for this project, CNSC staff recommend that the proposed LPSC include a licence condition requiring that the licensee implement safety and control measures for contractors. This condition is presented as Licence Condition 2.2 in the proposed Licence, provided in Part Two of this PMD. The CNSC requirements and expectations for verifying the licensee's compliance with this condition are presented in the proposed LCH under condition 2.2, also provided in Part Two of this PMD.

CNSC staff recommend that the proposed LPSC include a licence condition requiring the applicant to have the documents required for site preparation and construction be accepted by the Commission, or person authorized by the Commission, prior to the commencement of the licensed activities. The documents required for this hold point are identified under Licence Condition 4.1 in the proposed LCH, provided in Part Two of this PMD.

4.2 Human Performance Management

This section provides information on CNSC staff's assessment of the applicant's development and implementation of processes that enable effective human performance and process safety. Effective and safe performance requires assurance of sufficient staff/workers with the necessary knowledge, skills, procedures, tools and attitudes engaged in properly designed activities with appropriate behaviours and organizational support.

The specific areas that comprise this SCA at the DGR Facility include:

- Human Performance Program
- Personnel Training and Qualification

4.2.1 Applicable Regulatory Requirements under the NSCA

Paragraphs 12(1)(*a*) and 12(1)(*b*) of the GNSCR require that licensees ensure that there are a sufficient number of properly trained and qualified workers to safely conduct the licensed activities.

Subsections 5(1) and 14(2) of the CINFR require that licence applications include the proposed "responsibilities, qualification requirements, training program and requalification program for workers"; along with the "results that have been achieved in implementing the program for recruiting, training and qualifying workers".

Subsection 14(2) of the CINFR further requires every licensee to keep a record of "the status of each worker's qualifications, requalification and training, including the results of all tests and examinations".

CNSC staff expect that licensees will manage the promotion and maintenance of a healthy safety culture through various means such as: providing the appropriate tools, equipment, and personnel protective equipment for the job; promoting and maintaining excellence in human performance; developing the necessary organizational policies, procedures, and structures to ensure safe operation; maintaining positive and safety-conscious attitudes and culture; and utilizing measures associated with error-free human performance.

CNSC staff apply other general expectations for human performance review, such as accuracy, clarity and consistency of human performance information as described in the licence application.

4.2.2 Information Presented in the Application

OPG submitted various documents that indicate human performance commitments specific to the DGR Project. Documents pertaining to human performance and training that are produced by either OPG or their EPCM company are to meet the requirements of N286-05 [33].

As discussed in section 4.1 of this PMD (Management System), OPG's *Deep Geologic Repository Project Management System Charter*, 00216-CHAR-0001 [19], states that OPG's management system integrates the requirements of the management system standards for health, safety, environment, security, quality and economics. Aspects of human performance are also addressed within the scope of OPG's program-level document *Human Resources Management*, NK054-PROG-0013. The program describes the applicant's oversight of the selected EPCM company human resources management processes. It requires procedures that will describe OPG's controls to ensure that workers are trained and assessed to confirm that they have acquired the knowledge, skills, and competencies to perform their work assignments. CNSC staff will review these documents to verify that clarifications and commitments made during the licence application process about human performance and training are adequately addressed.

The document *Design and Construction Phase Management System* [20] has been submitted as part of OPG's licence application. This document identifies requirements that all personnel are suitably qualified for the work assigned to them and have established minimum training needs. As an example, this document states

that, as part of the review of an individual's performance, managers and supervisors are required to identify any additional training that may be needed to ensure the required competency is achieved and maintained. It also requires a procedure be completed to describe activities that enable effective human performance. That procedure will be used in the development and implementation of processes to ensure that licensee staff members are sufficient in numbers in all relevant job areas and have the necessary knowledge, skills, and tools in place to safely carry out their duties. CNSC staff will review this procedure to verify that clarifications and commitments made during the licence application process about human performance and training are adequately addressed.

Following on N286-05 [33], OPG has committed that training programs based on the work performed by personnel during site preparation and construction will be systematically developed and implemented so that the required competency is achieved and maintained. Any prerequisite education, experience and training will also be identified.

4.2.3 CNSC Staff Assessment

JRP IRs LPSC 02-48 to LPSC 02-54 inclusive [32] are relevant to OPG's human performance program and were as a result of CNSC staff's review and assessment of the licence application, the Charter and its supporting documents. Since these IRs were also relevant to OPG's management system, they are documented in section 4.1.3 pertaining to the SCA 'Management System'.

Information submitted as part of the licence application provides an acceptable overview of the proposed management system compliant with CSA N286-05 [33]. All lower tier human performance program-related documents must be in place prior to the start of the licensed activities and must be considered acceptable by CNSC staff.

OPG has indicated that a number of specific human performance-related elements will be the focus of planned assessments, reviews, and spot checks of the various activities carried out by their EPCM company, and for any submissions made to OPG. The areas of focus are:

- Implementation of assessment and corrective action programs;
- Development of governance and procedural compliance;
- Implementation of training program - training and qualification requirements;
- Promotion, assessment and maintenance of a strong nuclear safety culture and safe working practices;
- Control of design and design changes;
- Use of OPEX;

- Performance expectations and management; and
- Verification of work.

Overall, the information provided by the applicant provides a sufficient overview of the proposed measures for the personnel qualifications and competencies during the site preparation phase. Detailed training plans and procedures must be in place prior to the commencement of the licensed activities as discussed in section 4.1 of this PMD. CNSC staff's expectations are that training procedures include controls for:

- the identification and definitions of qualifications and competencies required for each task including site specific requirements;
- the verification of personnel qualifications and competencies against defined qualification and competency requirements prior to permitting personnel to perform work on the site; and
- the documentation and maintenance of personnel qualification and competency records.

Should the requested licence be granted, CNSC staff will conduct compliance verification activities to monitor the development and implementation of OPG's human performance program to confirm that the program and its implementation meet regulatory requirements. The human performance program will be verified against the applicant's Tier 2 program-level document *Human Resources Management*, NK054-PROG-0013 and its associated procedural implementing documents. Compliance verification activities will include evaluation of the implementation of the document *Training Management Plan*, NWMO DGR-PLAN-08920-1001.

4.2.4 CNSC Staff Conclusion

CNSC staff conclude that the applicant's proposed measures for personnel qualifications and competencies are sufficient to meet the applicable regulatory requirements under the NSCA for the issuance of an LPSC. The information provided in the application provides sufficient information on the applicant's provisions to ensure that personnel are qualified and competent to perform assigned work while carrying out site preparation activities. Should the requested licence be granted, CNSC staff will conduct compliance verification activities to verify that the human performance program and its implementation meet regulatory requirements.

4.2.5 CNSC Staff Recommendation for LPSC

CNSC staff recommend that the proposed LPSC include a licence condition requiring the licensee to implement and maintain a human performance program. This recommendation is presented as Licence Condition 3.1 in the proposed Licence. The CNSC requirements and expectations for verifying the licensee's compliance with this SCA are presented under Licence Condition 3.1 in the proposed LCH, provided in Part Two of this PMD.

Specific to the SCA Human Performance, the main documents that are recommended to be reviewed and accepted before the commencement of any site preparation and construction work include:

- Human Resource Management, NK054-PROG-0013
- Training Management Plan, NWMO DGR-PLAN-08920-1001

These aforementioned documents are included in the proposed LCH with Licence Condition 4.1, the condition requiring documents be accepted prior to the commencement of the licensed activities. CNSC staff will also include for examination any lower-tier documents associated with the main documents. OPG's Human Resource Management is further discussed in OPG's Management System Charter document [19]. The scope of the document Training Management Plan is provided in Table 4 of Part G of the LCH, provided in Part Two of this PMD.

4.3 Operating Performance

The SCA "Operating Performance" provides an overview of the planned conduct of the activities to be licensed and the mitigation measures and controls that will enable effective performance. Because this project is a new-build, there is no operating performance data available for the typical discussion of performance. Consideration is therefore given to the applicant's performance in carrying out their site characterization activities and in completing the EA and licence application.

The main focus of this SCA for the DGR Project is the planned conduct of the proposed activities to be licensed (site preparation and construction) and the controls OPG is required to have in place to manage these activities. It places emphasis on the measures ensuring effective oversight by OPG, and also considers the activities for the progression from construction to the next phase of licensing.

The section includes information on CNSC staff's assessment of the applicant's planned conduct of licensed activities which for the DGR relates to site preparation and construction. This includes plans for the conduct of those activities that enable effective performance.

The specific areas that comprise this SCA for the DGR Facility include:

- Conduct of Licensed Activity
- Procedures
- Reporting
- Safe Construction Envelope
- Accident and Incident Management

Discussions on maintaining the safety analysis and physical design are provided in SCA 4.4 and 4.5 respectively.

4.3.1 Applicable Regulatory Requirements under the NSCA

To facilitate consideration of an application to prepare the site and construct the DGR Facility, the applicant must provide the information required by the NSCA and CNSC Regulations for a Class IB nuclear facility.

Paragraph 3(1)(*b*) of the GNSCR stipulates that an application for a licence shall contain, in addition to other information, "the activity to be licensed and its purpose". During the conduct of these activities, the licensee is expected to take all reasonable precautions to protect persons and to control the release of hazardous substances into the environment. The necessary precautions include the engineering and administrative controls needed to minimize the potential risks.

As discussed in Section 1.2.2, additional regulatory approvals outside of the context of the NSCA are required to be obtained by the applicant during the site preparation and construction phase.

Other regulatory approvals include, but are not limited to:

- Environmental Compliance Approvals (ECA) under the *Ontario Water Resources Ac*t (OWRA) and the *Environmental Protection Act* (EPA) from the Ontario Ministry of Environment (MOE);
- Permits to Take Water (PTTW) under OWRA subsection 34(1), and O. Reg 387/04 from MOE;
- Generator Registration Documents for a waste generation facility under the *Environmental Protection Act*, General Waste Management Regulation, O. Reg. 347 from the MOE;
- Authorizations under the *Technical Standards and Safety Act* from Ontario Technical Standards and Safety Authority (TSSA);
- Requirements of the SVCA; and

- Other approvals as required under the Bruce County By-Laws, and building permits and additional approvals under the Municipality of Kincardine By-Laws.

Additional federal, provincial and municipal approvals/permits from other regulatory agencies not listed above may be required during the site preparation and construction phase. It is the responsibility of the applicant to obtain the necessary authorizations from other regulatory authorities which exist outside of the context of the NSCA.

4.3.2 Information Presented in the Application

The activities to be licensed are site preparation and construction of the DGR Facility, which will also include commissioning-related activities necessary to facilitate subsequent operation of the DGR Facility.

Section 6 of OPG's PSR [16] describes the DGR Facility to be constructed. Section 3.2 of this PMD provides a summary of information from the application on the DGR facility. Section 9 of OPG's PSR [16] describes the activities necessary to prepare site and construct the DGR Facility. Section 3.2.3 of this PMD provides a summary description of these site preparation and construction activities. Briefly, physical activities requested by the applicant that will be encompassed by the LPSC include the following key elements:

- Site Preparation – includes grubbing, grading, and fencing; installation of site services and temporary utilities; having in place components of the water management system relevant to site preparation; and, preparation of WRMAs.

- Construction – includes remaining required components of the water management system; ground treatment at shaft locations; construction of headframes; installation of temporary shaft sinking hoist houses and temporary winch equipment; installation of temporary main and temporary ventilation shaft ventilation; sinking of main and ventilation shafts; lateral development underground; dismantling of temporary structures and equipment; construction of the amenities building (control room), waste package receiving building, and compressor building; establishment of the permanent ventilation system and associated structures; final site grading; road and parking area; radiological zone fencing; the establishment of a connection to the WWMF; commissioning and turnover.

OPG's licensing submission identifies documentation that will be in place for site preparation and construction activities. These include such things as the programs associated with the revised DGR Management System Charter [19] and the engineering AFC drawings for the DGR design. CNSC Staff have listed these documents identified by OPG in a table provided in the proposed LCH, provided in Part Two of this PMD, under the SCA Operating Performance.

4.3.3 CNSC Staff Assessment

CNSC staff reviewed and assessed the applicant's proposed activities that are to be encompassed by the LPSC in accordance with the applicable regulatory requirements under the NSCA and relevant codes and standards and found the information provided was satisfactory. The activities proposed by the applicant in their licence application and its supporting information, are the same as those assessed in OPG's EIS [12] and align with the EIS Guidelines [10] for the project. The potential adverse effects of the site preparation and construction activities have been identified in PMD 13-P1.3 [2]. The potential adverse effects were noise and dust. With the identified mitigations these were assessed to be not significant.

While OPG has retained an EPCM company, OPG will be responsible for meeting all CNSC regulatory requirements and is accountable to ensure the health, safety and security of persons and protection of the environment. OPG must exercise accountability through oversight of their EPCM company as it pertains to DGR Facility licensed activities.

As part of the JRP Technical Information Session held on July 18, 2012 [35], OPG provided supplemental information to their initial licence application. This information provided further clarification of the activities of site preparation and construction, including details on steps and activities associated with site preparation, initial construction, shaft sinking, underground development sequencing and associated issues with respect to mine safety, ventilation and general lateral development activities, waste rock management, and the construction of the surface facilities. CNSC staff found that information submitted in support of the licence application corroborates OPG's conclusion that plans for site preparation and construction activities are sufficiently developed to support the technical basis for the EA and the preliminary assessment of site preparation and construction safety provided in the EIS and licensing submission.

The proposed management system framework of OPG and their EPCM company, discussed earlier in this PMD, is considered to have addressed CSA N286-05 [33] requirements and was found acceptable. OPG has further summarized information from their application describing the processes for assuring adequate protection and safety during site preparation and construction in JRP IRs LPSC 04-65 and LPSC 04-66 [32]. JRP IRs LPSC 01-38 and LPSC 02-53 [32] provide further clarification on the commissioning of systems during construction. The management system and the identified processes provide assurance that activities are managed in a safe and effective manner via the following measures that are documented and controlled under this framework:

- procedures associated with licensed activities are developed and maintained;
- reporting (both internal and external) under normal and event scenarios (such as accidents incidents) addresses regulatory requirements;

- a safe construction envelope is maintained during site preparation and construction of the DGR Facility by requiring OPG to remain within licensing basis documentation;
- accident and incident management programs are developed and maintained

This management framework also that provides adequate assurance that the remaining details required for site preparation and construction activities can occur and be adequately documented and controlled under this proposed management system framework.

The DGR Facility site preparation and construction activities are sufficiently developed to support issuance of a CNSC licence. This is supported by the following rationale:

- Plans for site preparation and construction activities are sufficiently developed to support the technical basis for the EA and the preliminary assessment of site preparation and construction safety provided in the EIS and other information submitted in support of the licence application.
- There is adequate assurance that completion of remaining details of site preparation and construction activities can occur under the proposed management system framework of OPG and their EPCM company.
- Available site data and assessments provide confidence that activities necessary for repository development are technically feasible, not overly complex, can avoid significant host rock disturbance, and can comply with regulatory requirements for worker safety, environmental protection, and long-term repository performance.
- Site preparation and construction activities can be adequately executed under an acceptable licensee-EPCM relationship.
- Construction details can be completed under the terms of the CNSC licence and corroborated by CNSC compliance verification activities.

While not all details regarding DGR Facility plans for site preparation and construction are presently available, CNSC staff's recommendation is that these remaining details that support the original licence application and supplemental information provided during the public review must be in place prior to proceeding with licensed activities.

With respect to underground activities, it is recommended that DGR Facility plans for site preparation and construction be documented in a repository development plan that includes the following elements: repository development, repository excavation, ventilation, water management, waste rock management, and key general arrangement drawings. The repository development plan is intended to verify that structures, systems and components associated with the underground aspects of the DGR Facility will be carried out as described in the licence application and its supporting documents. This includes the expectation that

detailed engineering drawings for the DGR Facility will be prepared, reviewed and reach the Approved for Construction (AFC) level of design development under OPG oversight to ensure that the design aligns with requirements identified in the licence application documentation and commitments made by OPG during the JRP process. This approach is similar to that used in uranium mine development where underground construction is done using a mine development plan.

4.3.4 CNSC Staff Conclusion

CNSC staff conclude that the applicant has provided sufficient information on the activities of site preparation and construction and the management and control of these activities to address the requirements of the NSCA and CNSC Regulations for the issuance of an LPSC. This conclusion is supported below.

The applicant has adequately described the physical activities of site preparation and construction requested to be encompassed by the proposed LPSC to complete the physical works of this project are surface facilities, underground facilities, and site infrastructure. The impacts of these activities were assessed as not significantly adverse as describe in PMD 13-P1.3 [2]. An acceptable management system with the required processes and controls has been presented by the applicant that can ensure the provisions are in place to provide for the protection of workers, the public and the environment. CNSC staff conclude that the activities proposed by the applicant can be managed and adequately controlled and should be included in the LPSC.

OPG's submissions also support the CNSC staff conclusion that OPG's EPCM company also has the necessary plans to assess and confirm the safety of the structures, systems, equipment and components planned for construction through the established specifications, process and assessments and the on-site conditions verified during construction.

CNSC staff conclude that it is necessary that all documents required for site preparation and construction (as presented in section 4.3.2 above) must be in place prior to the commencement of licensed activities pertaining to the scope of each document.

Specific to underground activities, DGR Facility plans for site preparation and construction require further details to be provided in a Repository Development Plan document. The repository development plan is intended to verify that structures, systems and components associated with the underground aspects of the DGR Facility will be carried out as described in the licence application and its supporting documents. This includes the expectation that detailed engineering drawings for the DGR Facility will be prepared, reviewed and reach the Approved for Construction (AFC) level of design development under OPG oversight to ensure that the design aligns with requirements identified in the licence application documentation and commitments made by OPG during the JRP process. This approach is similar to that used in uranium mine development where underground construction is done using a mine development plan.

4.3.5 CNSC Staff Recommendation for LPSC

CNSC staff recommend that the proposed LPSC include conditions requiring that the applicant:

- ensure that licensed activities are conducted in accordance with DGR Facility plans for site preparation and construction;
- implement and maintain a program for reporting, including the reporting of events required by the NSCA and CNSC Regulations; and
- submit an annual report on the licensed activities.

The recommended conditions are presented as Licence Conditions 4.1, 4.2 and 4.3 respectively in the proposed Licence, provided in Part Two of this PMD. An LCH also provided in Part Two of this PMD has been developed to articulate and codify CNSC staff expectations for compliance with the proposed conditions including the NSCA and CNSC Regulations applicable to the LPSC.

Specific to Licence Condition 4.1, CNSC staff recommend that all documents required for site preparation and construction be in place prior to the commencement of licensed activities pertaining to the scope of each document. CNSC staff have listed these documents under Licence Condition 4.1 in the proposed LCH provided in Part Two of this PMD.

Specific to underground activities, CNSC staff's recommendation is that the plans for site preparation and construction of the DGR Facility shall be documented in a Repository Development Plan. The Repository Development Plan will include the following elements associated with underground activities: repository development, repository excavation, ventilation, water management, waste rock management, and key general arrangement drawings. Further information on the scope of the Repository Development Plan document is provided in Table 4 of Part G of the LCH, provided in Part Two of this PMD. The proposed LCH also documents CNSC staff expectations for compliance with these proposed conditions.

4.4 Safety Analysis

The SCA "Safety Analysis" is a systematic evaluation of the potential hazards associated with the conduct of a proposed activity or facility and considers the effectiveness of preventative measures and strategies in reducing the effects of such hazards. For the purposes of the DGR Facility, which is new build, this is captured as a requirement to maintain the processes necessary to identify and assess hazards and risks on an ongoing basis so as to ensure the validity of the DGR Facility design safety case. This includes the maintenance of the safety analyses that supports the long term safety case for the DGR Facility.

The specific areas that comprise this SCA for the DGR Facility include:

- Preclosure Safety Analysis
- Postclosure Safety Analysis
- Hazard Analysis
- Environmental Risk Assessment

This section provides information on CNSC staff's assessment of the validity of the DGR Facility preclosure and postclosure safety, as presented in the Preliminary Safety Report, including the applicant's proposed measures to control and maintain the safety analyses supporting the overall DGR Facility near- and long-term safety. PMD 13-P1.3 [2] and PMD 13-P1.3A [3] also provide supporting information on CNSC staff's assessment of safety analysis.

The SCA Safety Analysis focuses on aspects of safety during preclosure and postclosure of the DGR Facility. Preclosure Safety Analysis addresses safety concerns during site preparation, construction and operation as well as changes in operational safety due to: the developing engineering details; changes in the engineering details due to deviations caused by construction activities; and changes in engineering details due to the results of geoscience verification activities and geotechnical investigations and monitoring. Postclosure safety analysis addresses changes in postclosure safety due to deviations caused by construction activities, results of geoscience verification activities and the results of waste characterization.

Safety issues during the licensed activities of site preparation and construction are also considered in the functional area of management (SCA Management System, SCA Human Performance Management and SCA Operational Performance, and SCA Physical Design) and in the Core Control Processes (SCA Conventional Health and Safety).

4.4.1 Applicable Regulatory Requirements under the NSCA

To facilitate consideration of an application to prepare the site and construct the DGR Facility, the applicant must provide the information required by the NSCA and CNSC Regulations for a Class IB nuclear facility.

Section 5 of the CINFR stipulates that an application for a licence to construct a Class I nuclear facility shall contain the following information:

- ss.5 (*f*) a preliminary safety analysis report demonstrating the adequacy of the design of the nuclear facility;
- ss.5 (*i*) the effects on the environment and the health and safety of persons that may result from the construction, operation and decommissioning of the nuclear facility, and the measures that will be taken to prevent or mitigate those effects;

The EIS Guidelines [10] clarify the requirement to demonstrate preclosure and long-term safety. This consists of providing reasonable assurance that the proposed DGR will perform in a manner that protects human health and the environment and is achieved through the development of a safety case.

CSA N286-05 [33] contains the requirements for a management system to support the conduct of design, site preparation and construction activities associated with the DGR Facility. Relevant to this condition is Clause 6.2 (Safety Analysis) of CSA N286-05 [33].

Guidance for assessment of long-term safety of the DGR facility includes CNSC regulatory guidance document CNSC G-320 [6] and the International Atomic Energy Agency (IAEA) Specific Safety Guide 23: *Safety Case and Safety Assessment for the Disposal of Radioactive Waste* (IAEA 2012).

One element of the SCA Safety Analysis is environmental risk assessment (ERA), which is a process for identifying potential adverse biological effects and for predicting the magnitude, probability, and significance of the identified effects associated with nuclear facilities. The ERA provides assessment of environmental risks associated with contaminants and physical stressors in the environment relevant to the DGR Project, and to the near- and long-term safety of human health and the environment. Canadian Standard Association (CSA) standard CSA 288.6-12: *Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills* recommends methods for the assessment of risk posed by radiological contaminants, hazardous contaminants and physical stressors in the environment on humans and on non-human biota. For the DGR Facility, ERA is considered under the SCA Safety Analysis.

The licensee is responsible to maintain a process to identify and assess hazards and risks on an ongoing basis. This includes identifying and evaluating any new or unforeseen risks that were not considered at the planning and design stages. The licensee also must take into consideration results of verification and monitoring activities to validate parameters used in the DGR Facility Safety Case.

4.4.2 Information Presented in the Application

The EIS Guidelines [10] clarify the requirement to demonstrate long-term safety, which consists of providing reasonable assurance that the proposed DGR will perform in a manner that protects human health and the environment and is achieved through the development of a safety case.

The scope of OPG's PSR [16] includes "describing information required to build a safety case, and presenting a safety case that demonstrates clearly that the DGR is safe to construct, operate and decommission, and that it will provide safe long-term management of OPG's L&ILW. PSR [16] section 7 provides information assessing preclosure safety for workers, the public and the environment. PSR [16] section 8 provides information assessing postclosure safety for persons and the environment.

PSR [16] section 14 identifies the specific information and studies that contributed towards building a safety case and provides overall conclusions on the DGR Facility Safety Case. The PSR [16] is further supported by documents referenced in section 1.1.2 of this PMD.

The DGR Facility Safety Case takes into consideration OPG's EIS [12] which characterizes baseline environmental conditions, credible accident scenarios and the prediction of potential effects of the project on ecological and human health due to both radiological and hazardous substances.

Geoscientific verification and geotechnical investigation and monitoring activities are proposed by OPG during the construction phase of the DGR project to confirm parameter values used in design and construction safety considerations, and permit verification of long-term performance assessments. OPG's ongoing waste characterization program will further improve the completeness and accuracy of the inventories in the various waste streams to support the DGR design and the DGR Facility Safety Case.

In response to JRP IRs LPSC 04-65 and 04-66 [32], OPG summarized the various plans and processes included in the information submitted in support of the licence application to manage hazards and risks, as well as changes to design that can impact hazards and risks during the period of the requested licence.

4.4.3 CNSC Staff Assessment

CNSC staff's review and assessment of the DGR Facility Safety Case is presented separately in PMD 13-P1.3A [3]. As detailed in that submission to the JRP, CNSC staff reviewed and assessed near - and long-term safety in accordance with the applicable regulatory requirements under the NSCA and relevant codes and standards and found the information provided was satisfactory. The activities proposed by the applicant in their licence application and its supporting information, including OPG's EIS [12], align with the EIS Guidelines [10] for the project.

PMD 13-P1.3 [2] identifies a recommendation with respect to OPG's waste characterization program. Since the LPSC will not permit emplacement of L&ILW, waste characterization is not a requirement associated with an LPSC. However, this recommendation is forward-looking in that it will assist OPG to meet CNSC expectations for waste characterization prior to consideration of a licence to operate the DGR Facility.

As presented in the information submitted in support of the licence application, the DGR Facility Safety Case for the near-and long-term is sufficient for the purpose of an LPSC application. The continuity of these safety case assessments during site preparation and construction is further supported by the following:

- OPG and their EPCM company have the plans and programming necessary to complete the engineering design details with appropriate consideration of human factors, radiation protection and the application of the ALARA principle, fire protection, operability and performance, reliability and maintainability, and constructability ensuring safety and environmental performance.

- OPG and their EPCM company have the programs necessary to manage engineering change control during the construction to ensure safety and performance requirements are assessed and will continue to be met.

- OPG has a geoscientific verification program and a geotechnical investigation and monitoring program planned for the site preparation and construction phase to obtain data, and confirm and verify safety in the near- and long-term.

4.4.4 CNSC Staff Conclusion

CNSC staff reviewed and assessed the applicant's near- and long-term safety case assessments associated with DGR Facility site preparation and construction activities in accordance with the applicable regulatory requirements under the NSCA, relevant codes and standards and the EIS Guidelines [10] for the project.

CNSC staff conclude that OPG has completed scientifically-based assessments of the hazards and risks associated with the preclosure and postclosure safety of the DGR Facility to support a licensing decision for site preparation and construction. CNSC staff have found that OPG has presented sufficient evidence that the DGR Facility can meet regulatory requirements for the protection of workers, the public and the environment, and after its closure will adequately protect human health and the environment. The identified uncertainties in the safety assessments can be reduced by the conduct of by investigation and verification activities as detailed in PMD 13-P1.3A [3].

CNSC staff also conclude that OPG and their EPCM company have the necessary plans and processes to ensure DGR Facility safety is confirmed and can be maintained in the near- and long-term, during the site preparation and construction activities.

4.4.5 CNSC Staff Recommendation for LPSC

CNSC staff recommend the inclusion of a condition in the LPSC requiring the licensee to maintain a DGR Facility Safety Case encompassing both preclosure and postclosure safety. This recommendation is presented as Licence Condition 5.1 in the proposed Licence, provided in Part Two of this PMD. The LCH, also provided in Part Two of this PMD, articulates and codifies CNSC staff expectations for compliance with proposed conditions, the NSCA and CNSC Regulations applicable to the LPSC.

In the proposed LCH for Licence Condition 5.1, the recommended requirements of the licensee to ensure the continued validity of the DGR Facility Safety Case (near- and long-term) include the following:

- The licensee shall maintain a process to identify and assess existing and new hazards and risks that can affect the DGR Facility Safety Case. Appropriate methodologies are used to identify potential hazards and consider the effectiveness of preventative measures and strategies in reducing the effects of such hazards on the DGR Facility Safety Case.

- The licensee shall conduct geoscientific verification and geotechnical investigation activities to confirm/verify sub-surface conditions and gather further information to support the DGR design and the DGR Facility Safety Case. CNSC staff expect these activities to include, for example, geological and geochemical characterization, sealing materials demonstration, in-situ stress management, and monitoring of shaft concrete structures as well as changes in underground rock/excavation conditions (e.g., rock movement, stress, damage) to confirm design function over time.

- OPG's waste characterization program will be maintained in order to (i) confirm/verify waste characteristics of L&ILW, as defined in CSA standard N292.3, *Managing Low and Intermediate Level Radioactive Waste* (CSA N292.3) [7], to be accepted by the DGR; and (ii) to gather further information to support the DGR design and the DGR Facility Safety Case.

- The licensee will communicate to CNSC the progress of ongoing activities associated with the DGR Facility Safety Case. This will include updates of the current state of DGR Facility geoscientific verification and geotechnical investigation activities, as well as OPG's waste characterization program.

In the future, should the DGR facility proceed to the construction, the operational licence application for the DGR Project will require a new Safety Report developed to reflect the available results of the geoscientific verification program, the geotechnical investigation and monitoring program, and the as-built DGR Facility. This document will strengthen and verify information presented in the PSR [16] by utilizing relevant safety case information collected through various activities during the currently proposed licence phase of site preparation and construction.

4.5 Physical Design

The SCA "Physical Design" includes activities that impact on the ability of systems, structures, and components to meet and maintain their design basis given new information arising over time, and taking changes in the external environment into account.

As the DGR Facility is a "new build", the specific areas that comprise this SCA include:

- Site Characterization

- Engineering Change Control

- Equipment Design & Qualification

- Structure Design and Construction

- Pressure Boundary Design

- Human Factors in Design
- Waste and Effluent Management
- Fire Protection

This section provides information on CNSC staff's assessment of the applicant's control and implementation of activities that impact on the ability of the DGR design (systems, components, structures) to meet the 'licensing' basis of the facility (the general description and performance requirements for the DGR) and may affect its ability to function as a repository for the safe receipt, isolation, and containment of L&ILW. During the completion of the engineering details of the design, performance of the design may be affected by changes during the completion process. During site preparation and construction activities, the performance of the DGR design may be affected by changes occurring during the actual construction process, or by changes to the design due to results of the geoscience verification program or the geotechnical investigation and monitoring program. Communication between all parties during the completion of the engineering details; and during the site preparation and construction phase regarding construction performance, engineering changes, and the results of the geoscientific and geotechnical programs, is required.

The SCA Physical Design has overlap with the SCA Operating Performance, an SCA which relates to the conduct of the proposed activities and the mitigation measures and controls that will enable effective site preparation and construction performance as well as performance in constructing the DGR design. The SCA Physical Design includes an effective design and design changes, intended to ensure the design will operate safely and protect the environment from dose-related consequences under normal operations and due to natural events and accidents and malfunction scenarios.

4.5.1 Applicable Regulatory Requirements under the NSCA

To facilitate consideration of an application to prepare the site and construct the DGR Facility, the applicant must provide the information required by the NSCA and CNSC Regulations for a Class IB nuclear facility.

Section 5 of the CINFR stipulates that an application for a licence to construct a Class I nuclear facility shall contain the following information:

- ss.5 (*a*) a description of the proposed design of the nuclear facility, including the manner in which the physical and environmental characteristics of the site are taken into account in the design;
- ss.5 (*d*) a description of the structures proposed to be built as part of the nuclear facility, including their design and their design characteristics;

- ss.5 (*e*) a description of the systems and equipment proposed to be installed at the nuclear facility, including their design and their design operating conditions;

- ss.5 (*f*) a preliminary safety analysis report demonstrating the adequacy of the design of the nuclear facility; and

- ss.5 (*g*) the proposed quality assurance program for the design of the nuclear facility.

Subsections 5(*d*), 5(*e*) and 5(*f*) above are relevant to consideration of human factors in design. CNSC has prepared human factors guidance in the form of CNSC Regulatory Guide G-278, *Human Factors Verification and Validation Plans* (CNSC G-278) [64]. CNSC also provides guidance on design authority expectations in Section 5.1 of CNSC Regulatory Document RD-337, *Design of New Nuclear Power Plants* (November 2008) [39].

For the proposed management system for design activities, CSA N286-05 [33] clause 6.1 requires that design activities be controlled and include, among other things, establishment of design inputs. CNSC staff expect that design inputs will include consideration of human factors.

CSA N286-05 [33] requires that design activities be controlled and include, among other things, establishment of design inputs, a definition of design requirements, evaluation and selection of a design concept, preparation of the detailed design, and identification of commissioning and other requirements.

CSA N286-05 [33] Management System Requirements for Nuclear Power Plants clause 5.12 requires that design changes be controlled, and that the changes be justified and reviewed.

4.5.2 Information Presented in the Application

The main elements of the DGR design strategy are identified as:

- Advance design in multiple steps. Each step was accompanied by safety assessment and internal and external reviews.

- Use of proven technology. Use of proven technology is made to ensure that the DGR Project facility design and construction are feasible and consistent with repository design of a similar type.

- Safe constructability and operability. Safety is a key consideration in design and construction of the DGR Project. Potential hazards were identified and assessed through all stages of design to date and will continue to be assessed as the design is advanced. Features have been incorporated into the DGR Project design to mitigate hazards and construction methods will be selected to mitigate hazards associated with construction of the facility.

- Design optimization. Design optimization has been carried out in several areas, including radiological safety, shaft design and sealing, facility location and layout, configuration of selected waste packages and underground waste package handling. The design continues to evolve based on new data about the site generated during subsurface investigations, the results of safety assessment, further definition of the inventory and categories of waste to be emplaced.

The DGR's physical design is described and documented within the PSR [16]. Sections 3.2.2 and 3.2.3 of this PMD also identify IR responses that provided additional information on the design. Section 6 of the PSR [16] provides an overview of the key structures and services of the DGR Facility, and lists the major requirements influencing their design as follows:

- The DGR shall be able to safely accept and emplace all L&ILW resulting from the operations and refurbishment of OPG-owned or operated reactors, including L&ILW currently in storage at OPG's licensed facilities.

- The closed repository, including shaft seals, and the surrounding geosphere shall passively contain and isolate the radioactive waste so as to protect the environment, and the health and safety of persons.

- The design capacity is nominally 200,000 m3 of packaged L&ILW.

- The facility shall be capable of being operated for 100 years (including waste emplacement, preclosure monitoring and decommissioning periods).

- The facility shall be capable of operating with a throughput of not less than 24 LLW packages or 2 ILW packages per 8-hour shift.

- The facility shall be located on OPG-retained lands on the Bruce nuclear site close to OPG's WWMF to minimize waste transfer distances.

- The facility shall meet all regulatory requirements.

- The width of an emplacement room pillar shall have a dimension that is no less than twice the average effective width of adjacent emplacement rooms.

- The underground DGR facilities shall maintain a minimum off-set of 100 m from any deep borehole.

Applicable regulations, standards and codes associated with the design of the DGR Facility are provided in the document Project Requirements (NWMO DGR-PDR-00120-0001) [18] submitted as part of the licence application.

Building and structure requirements pertaining to design include the following:

- Ontario *Construction Projects Regulations* (Reg 213/91)

- Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete (CSA-A23.1 and CSA –A23.2) and Design for Concrete Structure (CSA-A23.3)

- Design of Steel Structures (CSA S16)

- National Building Code of Canada

- National Fire Code of Canada

Building and structure requirements pertaining to underground construction activities include the following:

- shaft, hoist, repository, fire protection, and ventilation requirements of the Ontario *Mines and Mining Plants Regulations* R.R.O. 1990 (Reg. 854); and

- pressurized system requirements of CSA standard N285.0, *General Requirements for Pressure Retaining Systems and Components in CANDU Nuclear Power Plants* (CSA N-285-0) [40] and CSA standard B51-09, *Boiler, Pressure Vessel, and Pressure Piping Code* (CSA B51-09) [41].

The Design and Construction Phase Management System [20] also states that "the Human Factors Engineering Plan identifies the scope, activities, deliverables and schedule for the human factors assessment of the design of the DGR. This document will normally be incorporated into the Engineering Management Plans.

OPG has provided information on the management plans and processes to complete the details of the DGR design and to manage and control changes to the design during the construction process within the OPG's Charter and Project Execution Plan [19] and the document Design and Construction Phase Management System [20]. The plans and processes provide for the involvement of OPG, the EPCM company and the constructor in the completion of the engineering design details and in engineering change control during the construction period. The information has been further summarized in IR responses LPSC 04-65 and 66, and in LPSC 02-55.

OPG has committed to completing a preliminary Fire Hazard Assessment (FHA) and to integrate the results into the fire protection design. OPG has indicated that the process for developing the final design of the fire protection for the DGR facility will include a fire protection Design Requirements document to capture all the applicable codes and other requirements to be used in developing the detailed fire protection design. Once the fire protection design is developed a code compliance review report will be prepared to confirm that the design meets the requirements. An independent third party review will be completed of both the FHA and the code compliance review report.

4.5.3 CNSC Staff Assessment

As indicated in sections 3.2.2, 3.2.3, and 3.2.4 CNSC staff reviewed and assessed the applicant's proposed design for the DGR Facility and found the information in the application in accordance with the applicable regulatory requirements under the NSCA and CNSC Regulations. The information has also identified key relevant codes and standards that will be applied in completing the engineering details of the design. The assessment determined that OPG's application had the required level of detail to assess the effects of the project and establish that regulatory requirements can be met.

OPG's submissions provided information on quality assurance and the program to manage the engineering change control during design and construction. OPG's Project Execution Plan [19] states that OPG has Design Authority responsibilities to accept the design of the DGR for L&ILW. OPG's EPCM company has established a program for the control of design changes, as specified in Design and Construction Phase Management System [20] and its specific sub tier documentation.

CSA N286-05 [33] requires that design activities be controlled and include, among other things, establishment of design inputs, a definition of design requirements, evaluation and selection of a design concept, preparation of the detailed design, and identification of commissioning and other requirements. CSA N286-05 [33] Clause 5.12 requires that design changes be controlled, and that the changes be justified and reviewed. The management system identified in OPG's licensing submission includes the required elements.

CNSC expects applicants and licensees to implement and maintain a design control process to ensure that design outputs are verified against design inputs and performance expectations. This must include consideration of human factors in issues such as interface design, training, procedures, and organization and job design may affect the reliability of humans performing tasks under various conditions. Further the principles of human factors need to be applied to design and design changes so that the design is directed at preventing human error and limiting the effects of human error. This includes attention to the design of the DGR Facility, equipment, and procedures (administrative, operational and emergency), including maintenance and inspection, to facilitate the conduct of work. All these requirements are assessed by CNSC staff as having being addressed by OPG's management system that is compliant with CSA N286-05 [33].

OPG has identified in the project requirements the application of CSA standard 285.0-08, *General requirements for pressure-retaining systems and components in CANDU nuclear power plants/Material Standards for reactor components for CANDU nuclear power plants,* CSA Standard B51-09 *Boiler, Pressure Vessel, and Pressure Piping Code* [41]and the *Technical Standards and Safety Act* to the design of pressurized systems. These CSA standards clarify safety expectations for the design, manufacture, fabricate, procure, install, modify, repair, test, examine, inspect or otherwise perform work related to vessels, boilers, systems, piping,

fittings, parts, components and supports. These standards also include provisions for their subsequent safe operation that includes requirement to keep them maintained in a safe condition. CNSC staff is satisfied with OPG's identification of these specific standards.

OPG provided information in the preliminary ALARA assessment report that demonstrates consideration of radiation protection in the design for worker protection. OPG has also confirmed in IR response LPSC 01-08 that as the details of the design are developed, additional optimization of the design will include doses to workers during operation. CNSC staff is satisfied with the information provided on OPG's plans for further consideration of ALARA in completing the details of the design.

OPG provided additional information on fire protection in the DGR design in IR responses LPSC 01-15, 01-15a, 01-16, 01-21, and 01-22. OPG established a methodology acceptable to CNSC staff for completing the fire protection in design that includes a FHA, a code compliance review report and third party review.

In summary, the DGR Facility design as presented in the licence application was found to be developed to an acceptable level of detail to support the technical basis for the assessment of construction, operation, and postclosure safety. Safety assessments were also deemed sufficient to demonstrate that the repository design as presented can meet regulatory requirements for worker and environmental protection during the operational period. Reasonable assurance was also provided of public and environmental protection and safety in the postclosure phase. This is supported by the following rationale:

- The repository design has made appropriate use of the geological setting to support operational and long term safety.
- Safety assessments are sufficient to demonstrate that the repository design as presented can meet regulatory requirements for worker and environmental protection during the operational period and provides reasonable assurance of public and environmental protection in the very long term.
- Planning for the completion of the engineering details is acceptable, as is change control planning during construction, and can proceed under the terms of the CNSC licence and corroborated by the CNSC compliance verification activities.

CNSC staff expectations for the completion of the engineering details of the DGR include the design requirements and design-related commitments made during the JRP process. These are expected to be carried forward into the AFC drawings, specifications and other design information used to procure materials and equipment and to construct the DGR Facility. OPG has confirmed that the AFC drawings will be part of a Repository Development Plan which is identified in SCA Operating Performance, section 4.3 of this CMD. Further geological and geotechnical verification and monitoring activities are also proposed by the licensee during construction to confirm design and constructions safety and permit verification of long term performance assessments. Should the requested licence be granted, CNSC staff will conduct compliance verification activities to confirm these requirements have been met and have been clearly documented.

4.5.4 CNSC Staff Conclusion

Following a detailed review of documentation related to safety and safety management, CNSC staff conclude that:

- The design of the DGR Facility proposed by the applicant in their licence application and its supporting information, including OPG's EIS [12], addresses CNSC regulatory requirements and aligns with the EIS Guidelines [10] for the project;
- OPG has committed to complete the DGR Facility design, including building and structure design, in accordance with the requirements of applicable codes and standards;
- OPG and their EPCM company have the plans and programs necessary to complete the engineering design details with appropriate consideration of human factors, radiation protection and fire protection;
- OPG and their EPCM company have the programs necessary to manage engineering change control during the construction to ensure safety and performance requirements continue to be met;
- OPG has a program to manage the engineering change control during design and construction and this program will be revised to take in consideration its oversight role. OPG and OPG's EPCM engineering change programs are sufficient to meet the regulatory requirements and CNSC staff expectations;
- OPG has a plan for the integration of the fire protection into the DGR design;

The licensee is also obligated to ensure that adequate oversight of licensed activities is taking place such that it is clear that requirements of this condition are being met. Should the requested licence be granted, CNSC staff will conduct compliance verification activities to verify requirements of this condition are being met.

4.5.5 CNSC Staff Recommendation for LPSC

In support of the above-noted conclusions, CNSC staff recommend that the licensee's plans for the completion of engineering details be in accordance with the design information provided in licensing submission and the design clarifications and commitments to the development of the details provided in IR responses. CNSC staff recommend several conditions in the LPSC to ensure this, with the LCH articulating and codifying CNSC expectations for compliance.

So, to ensure that the DGR Facility design reflects what has been presented and committed to in the licence submissions the proposed licence will:

- require the applicant conduct the licensed activities within the licensing basis documents (i.e., within the terms of the information submitted in licensing submission and IR responses);
- require that the applicant obtain CNSC approval for any activities not within the licensing basis documents; and for changes in these documents
- require confirmation that changes to do not impact the licensing basis.

These above-noted requirements are addressed under proposed General Licence Conditions 1.1 and 1.2. The proposed licence and the proposed LCH describing the expectations to meet these conditions are provided in Part Two of this PMD.

CNSC staff will then verify that OPG complies with conditions and their commitments with respect to the engineering details through CNSC compliance verification activities. Under recommended Licence Condition 4.1 and as discussed in section 4.3.5 of this PMD, CNSC staff will be able to verify that the engineering details of the DGR facility design provided in the Repository Development Plan comply with requirements before related activities proceed on the DGR site.

To ensure that the details of the design and any changes are managed and controlled in accordance with the management system, CNSC staff recommend requiring the licensee to implement and maintain a physical design program. This recommendation is presented as Licence Condition 6.1. The expectations associated with this condition are in the LCH, The LCH requires that the licensee follow: the accepted management system design process to the AFC level of design development; the accepted management system engineering change control process that ensures after the AFC stage. Both the design process and the engineering change control process require the design intent is maintained and considered under OPG oversight so the overall design remains within the licensing basis.

CNSC staff recommend inclusion of further condition in the LPSC for the implementation and maintenance of a pressure boundary program and a formal agreement with an Authorized Inspection Agency (AIA). OPG has an existing arrangement with the Technical Safety and Standards Authority, a recognized AIA. CNSC staff find this arrangement acceptable.

This recommendation is presented as Licence Condition 6.2 in the proposed Licence and the LCH identifies the expectations.

4.6 Fitness for Service

The SCA "Fitness for Service" covers activities that impact on the physical condition of systems, components and structures to ensure that they remain effective over time. This includes programs that ensure all equipment is available to perform its intended design function when called upon to do so.

The specific areas that comprise this SCA at the DGR Facility include:

- Equipment, System and Component Commissioning, Equipment Performance
- Maintenance Periodic Inspection and Testing

This section provides information on CNSC staff's assessment of how control will be established over the construction activities and their impact on the physical condition of the temporary and permanent systems, components, and structures to ensure they remain effective over the construction period. This includes the activities that ensure all equipment is available to perform its design function when called upon to do so during this licence period and in the future (i.e., adjustments and commissioning of permanent systems at the end of construction for the operational period).

This SCA is intended to ensure that the operating condition of systems, equipment and devices are preserved so that they can perform their function reliably. This requires that components of the DGR Facility under construction are commissioned and maintained in a manner consistent with their design and the licensing basis and accuracy is maintained by planning and carrying out periodic adjustments, calibrations, repairs, and replacement where necessary.

4.6.1 Applicable Regulatory Requirements under the NSCA

To facilitate consideration of an application to prepare the site and construct the DGR Facility, the applicant must provide the information required by the NSCA and CNSC Regulations for a Class IB nuclear facility.

Section 5 of the CINFR stipulates that an application for a licence to construct a Class I nuclear facility shall contain the following information:

- ss.5 (*d*) a description of the structures proposed to be built as part of the nuclear facility, including their design and their design characteristics;
- ss.5 (*e*) a description of the systems and equipment proposed to be installed at the nuclear facility, including their design and their design operating conditions; and

- ss.5 (*l*) the proposed program and schedule for recruiting, training and qualifying workers in respect of the operation and maintenance of the nuclear facility.

4.6.2 Information Presented in the Application

The applicant has committed to commission temporary and permanent systems, equipment and components that are in use during the conduct of site preparation and construction activities so that they can perform their function reliably. The applicant has also committed to maintain temporary and permanent systems, equipment and components that are in use during the conduct of site preparation and construction activities so that they can perform their function reliably.

4.6.3 CNSC Staff Assessment

CNSC staff reviewed and assessed the applicant's proposed activities to be encompassed by the LPSC in accordance with the applicable regulatory requirements under the NSCA and found the information provided was satisfactory. CNSC staff note that effective commissioning and preventive maintenance programs are both required to ensure that critical equipment remains fully functional over the proposed licence period.

CNSC staff expectations for commissioning during the proposed licence period include: a defined process flow for commissioning activities, and related activities and their sequence: clearly identified commissioning management structure and responsibilities; documented planning and scheduling of commissioning tests and related activities; commissioning documentation is reviewed for conformity to the design; and that commissioning reports clearly identify the acceptability of the commissioning results. The approach in OPG's licence application is consistent with these expectations.

CNSC staff expectations for maintenance during the proposed licence period include: the calibration and maintenance of systems, equipment, and devices such that they can perform their design function; the requirement for inspection and testing of equipment; and the implementation and maintenance of preventative and corrective measures. The approach in OPG's licence application is consistent with these expectations.

4.6.4 CNSC Staff Conclusion

The applicant's information provided to support this SCA was found to be satisfactory. CNSC staff note that both effective commissioning and preventive maintenance programs are required at the commencement of construction activities to ensure that critical equipment remains fully functional over the proposed licence period and into subsequence phases of the DGR Project.

4.6.5 CNSC Staff Recommendation for LPSC

CNSC staff recommend that the proposed LPSC includes a condition requiring that the licensee implement safety and control measures for the commissioning and maintenance of the temporary and permanent structures, systems and components. This condition is presented as Licence Condition 7.1 in the proposed Licence and the proposed LCH provided in Part Two of this PMD.

4.7 Radiation Protection

The SCA Radiation Protection covers the implementation of a radiation protection program in accordance with the *Radiation Protection Regulations*[17] (RPR). This SCA is not within the scope of this PMD as the applicant has not requested permission to possess, transfer, use, or store nuclear substances under the LPSC.

Due to the proximity of the Bruce NGS and the WWMF, workers at the DGR Facility site may be exposed to low levels of radiation above background levels. Underground construction activities may also result in exposure to naturally-occurring radon and airborne radon progeny. The applicant's Radon Assessment report [26] adequately assessed this exposure to be low and not significant.

While there is no requirement for a radiation protection program as a component of the LPSC, CNSC staff have identified that OPG's corporate radiation protection program sufficiently manages dose to a level As Low As Reasonably Achievable (ALARA), social and economic factors being taken into account.

CNSC staff expectations include implementation of measures under the SCA Conventional Health and Safety to ensure that doses to workers are kept ALARA and well below the CNSC's regulatory dose limits for persons who are not Nuclear Energy Workers (NEW). Confirmatory measurements will be taken during the construction phase of the DGR project to address this expectation. Guidance on aspects of radiation protection is provided in CNSC Regulatory Guide G-129, *Keeping Radiation Exposures and Doses "As Low As Reasonably Achievable" (ALARA)* (CNSC G-129) [42] and CNSC Regulatory Guide G-4, *Measuring Airborne Radon Progeny at Uranium Mines and Mills* (CNSC G-4 [43]).

4.8 Conventional Health and Safety

This Safety and Control Area covers the implementation of programming to manage workplace safety hazards and to protect personnel during the licensed period of site preparation and construction. The information will also include an explanation of the overlap of responsibility with the Ontario Ministry of Labour (MOL) for this project and how the CNSC will work cooperatively with the Ministry to assure worker safety.

[17] SOR/2000-203

4.8.1 Applicable Regulatory Requirements under the NSCA

The regulatory requirements under the NSCA applicable to this SCA are found in the CINFR, and require the applicant to submit information regarding:

- the proposed worker health and safety policies and procedures (subsection 3(*f*) of the CINFR);
- the effects on the environment and the health and safety of persons that may result from the activity to be licensed, and the measures that will be taken to prevent or mitigate those effects (subsection 4(*e*) of the CINFR); and
- the effects on the environment and the health and safety of persons that may result from the construction, operation and decommissioning of the nuclear facility, and the measures that will be taken to prevent or mitigate those effects (subsection 5(*i*) of the CINFR).

By regulations made under the *Canada Labour Code*[18] in 1998, Ontario Hydro (now OPG) nuclear facilities are excluded from the application of the *Canada Labour Code*[19] and made subject to the Ontario *Occupational Health and Safety Act*[20] (OHSA) including any regulations made under that Act. OHSA and its CNSC Regulations are administered by the Ontario Ministry of Labour.

4.8.2 Information Presented in the Application

OPG had committed that a program would be implemented during the construction of the DGR Facility that would meet the requirements of OPG's Environmental, Health and Safety Management Plan, DGR-PLAN-08960-1001 [44]. OPG has since provided as part of its licence application a document that separates health and safety from environment in the form of a DGR Health and Safety Management Plan, NWMO DGR-PLAN-08962-1001 [45].

OPG has hired an EPCM company, NWMO (see section 1.1) to manage the construction of the DGR facility. NWMO will assume the role and responsibilities of "Constructor" (OH&SA s.23) and "Employer" (OH&SA s.25 and s.26). As constructor, the NWMO is accountable for the health and safety of its employees and of its subcontractors.

The document DGR Project Health and Safety Management Plan (DGR-PLAN-08962-1001) submitted by OPG commits to:

- Providing the necessary resources (materials, personnel and training).
- Meeting or exceeding all legislative requirements.

[18] SOR/98-180, SOR/98-181
[19] R.S.C., 1985, c. L-2
[20] R.S.O., 1990, Chapter O.1

- Developing, implementing, and maintaining health and safety management systems.
- Adopting practices that meet or exceed industry standards as an integral part of efficient management of the project.
- Making decisions that take proper account of safety, health and environmental implications.
- Developing and implementing appropriate programs that include comprehensive employee training and awareness of safety and health issues.
- Communicating openly to sustain mutual understanding of safety and health issues.

Contractors will also be expected to ensure the health and safety of their employees is protected and will be required to operate in full compliance with the DGR Project Health and Safety Management Plan.

Through a preliminary conventional safety assessment [22], OPG determined that the conventional safety implications for the DGR Project during site preparation and surface construction are similar to surface construction activities that occur from time to time at OPG facilities like the WWMF. Conventional safety implications for the DGR Project during underground aspects of DGR Facility construction will reflect standard practice within the mining industry. The assessment was conducted using a Screening Process Hazard Analysis combined with a Job Hazard Analysis approach. Following a systematic assessment of potential hazards and possible outcomes, control measures and recommendations for their implementation were developed. The control and mitigation measures for each hazard identified are organized according to phases of work, for example site preparation.

Ventilation & Underground Air Quality

OPG has stated that repository ventilation systems must meet Ontario Regulation 854/90, *Mines and Mining Plants*; American Society of Heating Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 62.1-2004; and ACGIH, Threshold Limit Valves (TLVs) and Biological Exposure Indices (BEIs).

Design requirements specified by OPG for ventilation include requirements that air temperature, humidity and quality meet ASHRAE requirements for underground workers; that the ventilation system prevent accumulation of toxic, asphyxiating, radioactive, flammable or explosive gases; and that accidental entry to non-ventilated emplacement rooms be prevented by barriers.

OPG has committed to conduct underground air quality monitoring during construction to ensure that ventilation systems function as specified and to ensure the health and safety of workers. This monitoring program will ensure that airflows remain adequate for the equipment or activity in active work areas and that there is no accumulation of toxic, asphyxiating, or radioactive gases (including airborne radon progeny), or flammable and explosive gases.

4.8.3 CNSC Staff Assessment

The during construction DGR Facility is subject to provincial health and safety legislation which contains provisions addressing most of the conventional health and safety issues associated with proposed construction activities. The notable exception is O.Reg. 854, *Mines and Mining Plants* (O.Reg. 854). While underground development and construction methods for the DGR Facility are very similar to that used in the mining industry, the underground development of the DGR Facility is not a mine. This creates a potential regulatory gap for health and safety with respect to underground development activities (e.g., shafts, hoists, fire protection and ventilation requirements.) OPG has committed to voluntarily comply with O.Reg. 854, and the CNSC staff recommendation for a repository development plan, in section 4.3 of this CMD, will serve to align site preparation and construction activities more closely with this regulation.

OPG has engaged the NWMO as an EPCM company and, given the terms of that arrangement, NWMO is accountable under OHSA for the health and safety of its employees and its contractors during site preparation and construction. However, OPG is responsible as the licensee under the NSCA to ensure that licence requirements are met. This is to be accomplished through their oversight of the project, exercised through their management system. OPG's management system, which was assessed by CNSC staff and found acceptable (Section 4.1), is designed to comply with CSA N286-05 [33].

4.8.4 CNSC Staff Conclusion

CNSC staff conclude that the applicant's proposed measures for occupational health and safety are sufficient to meet the regulatory requirements under the NSCA and CNSC Regulations for the issuance of an LPSC. The information provided in the application provides a reasonable demonstration that the applicant will make adequate provision for the protection of workers while carrying out site preparation and construction activities.

4.8.5 CNSC Staff Recommendation for LPSC

CNSC staff recommend that the proposed LPSC include conditions requiring that the licensee

- implement and maintain a conventional health and safety program; and
- confirm compliance with relevant regulations of the Ontario OHSA.

These conditions are presented as Licence Condition 8.1 and 8.2 respectively in the proposed Licence provided in Part Two of this PMD. The LCH articulates and codifies CNSC staff expectations for compliance with proposed conditions, the NSCA and CNSC Regulations applicable to the LPSC.

4.9 Environmental Protection

The SCA "Environmental Protection" covers programs that identify, control, and monitor all releases of radioactive and hazardous substances and effects on the environment from facilities or as the result of licensed activities.

The specific areas that comprise this SCA at the DGR Facility include:

- Effluent and Emissions Control (releases);
- Environmental Management System (EMS);
- Assessment and Monitoring; and
- Protection of the Public.

This SCA addresses the adequacy of applicant's program to identify, control, and monitor releases of radioactive and hazardous substances to the environment. During the site preparation and construction period, DGR Facility releases are expected to be typical of construction activities associated with the excavation of large amounts of bedrock.

Applicable Regulatory Requirements under the NSCA

The regulatory requirements under the NSCA applicable to this SCA during site preparation and construction are found in section 3 of the CINFR. Under that section applicants are required to submit with their application

- the proposed environmental protection policies and procedures (subsection 3(g) of the CINFR); and
- the proposed effluent and environmental monitoring programs (subsection 3(h) of the CINFR).

CNSC Regulatory Standard S-296, *Environmental Protection Policies, Programs and Procedures at Class I Nuclear Facilities and Uranium Mines and Mills* (CNSC S-296 [47]), including the requires licensees to establish, implement and maintain an Environmental Management System that satisfies the requirements set by CSA's ISO 14001: 2004, *Environmental Management Systems – Requirements with Guidance for Use* (CSA ISO 14001 [48]).

Licensees are required to develop and implement environmental protection policies, programs and associated procedures that comply with requirements of the NSCA and CNSC Regulations and account for other applicable federal and provincial regulatory requirements. The programs are intended to protect the environment and control and management of the releases of radioactive and hazardous substances into the environment. Licensee's programs are expected to include provisions for effluent monitoring, environmental monitoring and environmental effects monitoring. The programs must also include management and control requirements for effluents released to the environment. Licensees are also expected to have suitably trained and qualified staff to effectively develop, implement and maintain their environmental protection programs.

4.9.1 Information Presented in the Application

The environmental protection policies, programs and procedures implemented by OPG are incorporated in their environmental management program.

The applicant states that environmental protection will conform to the document Design and Construction Phase Management System [20] that includes implementation of its Environmental Policy, NWMO-POL-ES-0001 [49]. The Environmental Policy [49] describes the minimum requirements for environmental management and applies to all work conducted at the DGR site. It also requires the implementation of an environmental management system that is compliant with the CSA ISO 14001 [48]. The applicant also states that the DGR Facility will be designed to ensure that the environment is protected in accordance with OPG's environmental protection programs and procedures. The applicant states that the execution of the DGR Project will be accomplished under OPG oversight through an integrated set of documented activities, typical of an Environmental Management System which will be aligned with the CNSC S-296 [47] and CSA ISO 14001 [48] and will meet the requirements of OPG's Environmental Management Program.

In relation effluent and environmental monitoring, the applicant states that the DGR Project site will be monitored during site preparation, construction, and operation and that as part of the DGR Facility Environmental Management System, an environmental monitoring program, consistent with the CSA Standard N288.4 *Environmental Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills* [50] will be implemented. The applicant also states that an EA Follow-Up Monitoring Program [9] will be implemented to verify that the environmental and cumulative effects of the DGR Project are consistent with predictions in the EA. The applicant states that the EA Follow-Up Monitoring Program [9] will also be used to verify that mitigation measures are effective once implemented and determine whether there is a need for additional mitigation measures.

OPG had committed that a program would be implemented for the DGR Facility that would meet the requirements of OPG's Environmental, Health and Safety Management Plan, DGR-PLAN-08960-1001 [44]. OPG has since provided as part of its licence application a document that separates environment from health and safety in the form of a DGR Project Environmental Management Plan, DGR-PLAN-07002-1001 [46].

This document outlines the Roles and Responsibilities of key individuals with specific environmental responsibilities and the environmental responsibilities of all workers associated with the DGR Project. OPG's EPCM company, NWMO has indicated that all activities will be planned and conducted in a manner that meets or exceeds applicable legislation, and that environmental management system and environmental monitoring programs will be implemented and maintained, and consistent with CSA ISO 14001 [48]. The Environmental Management Plan [46] also states that the DGR Project site will be monitored during all phases of site preparation and construction. The monitoring plan will address radiological contaminants, chemical contaminants and physical stressors that may present a risk to either human health or non-human biota. Monitoring will continue into operation when the possession of nuclear substance would occur. Long-term monitoring beyond closure will also be conducted as required based on information and technologies then available and in consultation with stakeholders at that time.

The proposed DGR Facility water management system comprises a system of ditches and the SWMP. This system will be used to collect and treat all stormwater run-off from the DGR surface infrastructure area, the WRMA as well as any water pumped to surface during shaft sinking and underground development. However, water pumped to surface from underground will be treated in a temporary water treatment plant, as required, prior to discharge into the existing ditch system and then to the SWMP. The SWMP will discharge into the existing Bruce nuclear site drainage ditch network for release to MacPherson Bay (Lake Huron).

With respect to the monitoring and control of liquid effluent discharges to the natural environment, the applicant has committed to ensure that all releases from the water treatment system will comply with ECA requirements under Ontario's EPA and OWRA. The Ontario MOE document, *Guide to Applying for an Environmental Compliance Approval* (1WW), sets out application requirements for obtaining an ECA including the steps necessary to plan for control, treatment and ultimately effluent released to the natural environment.

JRP IR EIS-05-172 [32] discussed the proposed stormwater management system and corresponding monitoring program associated with site preparation and construction of the DGR Facility. The subject of toxicity testing of final treated effluent from the DGR Facility was also discussed. OPG's response stated that the proposed stormwater management system and corresponding monitoring program have been designed to prevent the release of deleterious substances to Lake Huron. The stormwater management system directs all surface water (including the shaft sump

discharge) from the site to a SWMP via a perimeter ditch system for a single point of discharge from the site. Vegetated perimeter ditches are proposed to control sediments and suspended solids. An oil/water separator is also proposed will control for the potential release of suspended solids, metals and hydrocarbons. In addition, the proposed shaft liner design will minimize the amount of groundwater seepage into the shaft, thus minimizing overall discharges to the environment. Finally, site discharges would be conveyed through approximately 1 km of vegetated drainage ditch prior to discharge to MacPherson Bay. These design features are intended to manage and control contaminant concentrations associated with DGR Facility liquid discharges to the natural environmental during site preparation and construction activities.

The applicant has also committed that air releases to the environment will comply with provincial Environmental Compliance Approval (ECA) requirements of the Ontario Environmental Protection Act. The Ontario MOE document *Guide to Applying for an Environmental Compliance Approval* [51], sets out application requirements for obtaining an MOE Environmental Compliance Approval (ECA) including the steps necessary to plan for control, treatment and ultimately effluent released to the natural environment. Further discussion of air releases to the environment is provided in section 3.1.2.

OPG has an existing groundwater monitoring program in place based on a network of groundwater sampling holes for the WWMF. Under OPG's existing groundwater monitoring program, a new network of groundwater sampling holes will be used in order to distinguish groundwater associated with the operation of the DGR from any groundwater impacts associated with the WWMF and the NGSs on the Bruce nuclear site. A groundwater monitoring plan specific to the new groundwater sampling holes network for the DGR will be prepared prior to obtaining the operating licence.

4.9.2 CNSC Staff Assessment

CNSC staff's review indicates that SCA Environmental Protection requirements have been addressed in a credible manner for all activities to be conducted during site preparation and construction phases of the project.

The applicant has demonstrated that, when effectively implemented, the applicant's licensing programs will provide adequate assurance of protection of the environment.

An important aspect of the environmental protection program is the control, monitoring and recording of releases to the natural environment from site preparation and construction activities. This includes monitoring and control of airborne releases from the DGR surface infrastructure area and underground ventilation into the natural environment, as well as monitoring and control of stormwater run-off from the DGR surface infrastructure area, the WRMA and any water pumped to surface during shaft sinking and underground development. It is recommended that

CNSC staff review and accept the detailed sampling plans associated with the licensee's environmental protection program prior to the commencement of site preparation and construction activities.

CNSC staff's review indicates that the applicant has provided an adequate framework for the oversight of the EPCM company's environmental programs.

CNSC staff's review indicates that the applicant has demonstrated that they are qualified and has made adequate provisions for protection of the environment through an integrated set of documented activities that meet the requirements of CNSC S-296 [47] and CSA ISO 14001 [48].

CNSC staff's review indicates that the applicant's Follow up Monitoring Program [31] adequately captures the assessment reviews from OPG's EIS [12].

Prior to commencing licensed activities, OPG has committed to develop and implement the DGR Facility water management system in manner that aligns with design details as described in the licence application and its supporting information. This commitment also addresses water management and waste rock effluent management requirements identified by CNSC staff in their review of the licence application and its supporting information. This is also a prerequisite to obtain an ECA from MOE to discharge liquid effluent to a surface water body. To verify adequate provision for the protection of the environment at certain stages of construction CNSC staff may request aquatic toxicity testing of final treated effluent quality using appropriate and validated biological test methods.

To verify this commitment has been met, written notification to CNSC confirming MOE approval prior to the commencement of any associated licensed activities is a recommended requirement. This recommendation is intended to ensure that the applicant demonstrates that the air and water management systems are fully in place before licensed activities that have the potential to generate releases to the environment occurs.

4.9.3 CNSC Staff Conclusion

CNSC staff conclude that the applicant's proposed measures for environmental protection form an adequate basis to meet the regulatory requirements under the NSCA and CNSC Regulations for the issuance of the LPSC. The information provided in the application provides a reasonable demonstration that the applicant will make adequate provision for the protection of the environment while carrying out site preparation and construction activities.

4.9.4 CNSC Staff Recommendation for LPSC

CNSC staff recommend that the proposed LPSC includes conditions requiring that the licensee:

- implement and maintain an environmental protection program.

- confirmation of compliance with Ontario MOE's ECA requirements.

These conditions are presented as Licence Condition 9.1 and 9.2 respectively in the proposed Licence and the proposed LCH provided in Part Two of this PMD.

CNSC staff will plan activities during the licence period to promote a nuclear safety culture with the applicant, transparency with the local communities and Aboriginal groups, and to establish a working relationship with provincial regulators including Ontario MOE.

4.10 Emergency Management and Fire Protection

This SCA addresses provisions for emergency preparedness and response capability, including fire response, to mitigate hazards to persons and the environment from accidental releases attributable to emergencies and non-routine conditions. This SCA also addresses the implementation of a comprehensive fire protection program to minimize the risk fire poses to the environment and to the health and safety of persons through fire protection systems design, fire safety analysis, fire safety operation and fire prevention. For the DGR Project, this means during the period of site preparation and construction. The design of the fire protection for the DGR Facility is considered in the discussion of physical design in section 4.5 of this PMD.

4.10.1 Applicable Regulatory Requirements under the NSCA

The regulatory requirements under the NSCA applicable to this SCA are found in the GNSCR and the CINFR. Under these regulations, the applicant is required to:

- take all reasonable precautions to protect the environment and the health and safety of persons and to maintain the security of nuclear facilities and of nuclear substances (paragraph 12(1)(*c*) of the GNSCR);

- take all reasonable precautions to control the release of radioactive nuclear substances or hazardous substances within the site of the licensed activity and into the environment as a result of the licensed activity (paragraph 12(1)(*f*) of the GNSCR);

- immediately report situations or events that require the implementation of a contingency plan in accordance with the licence (paragraph 29(1)(*d*) of the GNSCR).

- provide a description of the structures proposed to be built as part of the nuclear facility, including their design and their design characteristics (subsection 5(*d*) of the CINFR);

- provide a description of the systems and equipment proposed to be installed at the nuclear facility, including their design and their design operating conditions (subsection 5(*e*) of the CINFR).

4.10.2 Information Presented in the Application

Emergency Management

The applicant's assessment of potential initiating events at the DGR Facility is discussed in detail in *Malfunctions, Accidents and Malevolent Acts*, NWMO DGR-TR-2011-07, March 2011 [52].

The applicant identified and analyzed three categories of initiating events: operations, geotechnical and external initiating events. The applicant proposes a variety of mitigation measures, contingency plans, and emergency preparedness strategies to prevent or mitigate occurrence and/or impact of initiating events.

The Bruce Power site is served by its own emergency response organization with capability for medical and fire response. OPG has stated that these resources will be available to the DGR through an OPG Bruce nuclear site services agreement (as noted in JRP IR LPSC 01-45 [32]). Backup resources are also available through the municipal fire department, the Regional Medical Officer of Health, and other Kincardine health and safety service providers that work cooperatively with Bruce Power when needed.

Prior to the commencement of any licensed activities, OPG has committed to have in place emergency response capabilities to protect workers. Prior to commencing underground activities, mine rescue capabilities as required by Ontario's Regulation 854 Mines and Mining Plants are also required.

Programs in place for the DGR Project will align with applicable standards such as CSA Z16000-08 Emergency Management and Business Continuity Programs [53] and CSA Z-731-03 Emergency Preparedness and Response [54].

Fire Protection

A hazard assessment was performed by the applicant and forms the basis of their information on the proposed contingency and emergency response plans and the approach to fire protection during the construction period.

As part of infrastructure development, firewater is being provided to the site for construction and other phases of the project. For construction, a fire protection plan and program will be in place to address the development of the surface buildings and the underground repository level. The program and plan will be developed in accordance with the applicable codes, such as the National Building Code, National Fire Code, the Ontario Health and Safety Act and guidance from the National Fire Protection Association, amongst others.

The plan will outline the fire protection measures to be implemented during the various stages of the facility construction, and will make use of the facility systems as they become available during the construction. The plan will also include the segregation of hazardous material, limits on combustible materials, the availability of fire extinguishers, and fire response.

OPG has committed to complete a preliminary Fire Hazard Assessment (FHA) that, in addition to addressing integrated fire protection in the detailed design of DGR Facility, will address the fire hazard over the period of site preparation and construction. The FHA will assess the consequences of fires that pose a risk to: release of radioactive or otherwise hazardous material to the environment; increased radiation dose to site personnel including emergency responders; and, non radiation-related injury to site personnel This FHA will be reviewed by an independent third party. OPG has submitted their methodology (IR LPSC 01-15a) for ensuring that fire protection requirements and the associated issues of access, protection, suppression, and defence-in-depth over the period of construction and into its operation, are addressed.

4.10.3 CNSC Staff Assessment

Emergency Management

CNSC staff reviewed OPG's submissions, including responses to JRP information requests, to determine if adequate and appropriate emergency management provisions have been developed and/or addressed for the DGR Project, with particular emphasis on the site preparation and construction phases.

The hazard assessment performed by the applicant forms the basis of their proposed contingency and emergency response plans and procedures. For the purposes of this early stage of the project, the applicant has done a thorough assessment of the hazards. The components of a successful emergency management program have been anticipated and are addressed in the submission documentation. This documentation includes identification of the appropriate and applicable standards and guidelines, together with a commitment to address each component in the detailed programs and procedures before the project commences.

The following IRs were raised pertaining to emergency management:

JRP IR LPSC-01-41 [32] requested an assessment of a potential emergency originating at the Bruce Power site and the impact that might have on the DGR facility. In OPG Response's to LPSC-01-41 [32], this was addressed by OPG's response that the DGR would go into a shutdown mode once all staff were accounted for and removed from the underground area at a safe and appropriate time.

JRP IR LPSC-01-45 [32] requested clarification on emergency response preparedness arrangements for the construction phase of the DGR Facility. In OPG Response's to LPSC-01-45 [32], OPG stated that an Emergency Response Plan document will be developed prior to commencement of construction activities and

will describe how the project will deal with emergencies during the construction phase, including emergencies at surface, underground and off-site. That plan will be modified through the project phases in response to the work being performed and the parties involved. Emergency preparedness planning will be conducted in conjunction with contractors, OPG and Bruce Power. Service agreements with Bruce Power for medical and fire response support, and mutual aid agreements with local mining operations for mine rescue support will be in place prior to the commencement of construction.

JRP IR EIS 08-354 provided a summary of the information in the IR responses addressing emergency response and fire protection planning during construction and operation of the DGR facility.

Fire Protection

CNSC staff reviewed the application to confirm that fire protection provisions are adequately addressed through appropriate planning that addresses prevention, protection, control, mitigation, response to, and recovery from fires.

CNSC staff require the applicant to demonstrate that a defence-in-depth approach is being applied. This can be achieved by adequate fire protection features such as programs and procedures, fire prevention, fire detection, fire warning, emergency communication, fire by-product management, fire suppression and fire containment, non-combustible construction and robust design of fire protection systems, structures and components for the protection of persons and the environment.

CNSC staff review of the initial licence application documents [1] found that additional information was required to demonstrate how fire protection will be implemented in a controlled and coordinated manner. OPG responded with additional information on roles, fire water supply, fire suppression, fire hazard assessment, etc, in IRs LPSC 01-15, 01-15a, 01-20, 01-22, 01-36, 01-45, and others focused on emergency response.

OPG has committed to develop a Fire Protection Program document prior to commencement of licensed activities that will completely describe the elements for fire protection required by CNSC staff. The program will include roles and responsibilities, fire response, fire assessments, managing changes that affect fire protection, work practice and procedures, fire planning, inspection and maintenance of fire protection systems, quality assurance, housekeeping, storage and handling of hazardous goods, control of ignition sources, transient material, reporting and drills.

CNSC staff is satisfied with the information provided by the applicant on the plans and programs for fire protection during site preparation and construction CNSC staff will review the above fire protection elements as detailed engineering drawings for the DGR Facility reach the AFC level of design development under OPG oversight (see section 4.3.4), to ensure that requirements of the NSCA and CNSC Regulations, applicable Codes and Standards, and OPG commitments are met.

4.10.4 CNSC Staff Conclusion

Emergency Management

CNSC staff conclude that the information provided by the applicant regarding the proposed measures for emergency management is sufficient to meet the applicable regulatory requirements under the NSCA for the issuance of an LPSC. CNSC staff also concludes that OPG and their EPCM company, have the necessary plans and processes to complete all details of the emergency preparedness and response plan, including signed agreements with Bruce Power and other non-OPG response organizations. Should a licence be issued, CNSC staff will verify that the emergency preparedness and response plan and agreements are in place before related activities begin on the DGR site.

Fire Protection

CNSC staff conclude that the information provided by the applicant regarding fire protection measures is sufficient to meet the applicable regulatory requirements under the NSCA for the issuance of an LPSC. CNSC staff also conclude that OPG and their EPCM company have the necessary plans and processes to complete the FHA and the details of the Fire Protection Program. Should a licence be issued CNSC staff will verify that all is in place before related on-site activities begin.

4.10.5 CNSC Staff Recommendation under LPSC

CNSC staff recommend that the proposed LPSC include conditions requiring that the licensee

- implement and maintain an emergency preparedness and response program; and
- implement and maintain a fire protection program.

These conditions are presented as Licence Condition 10.1 and 10.2 respectively in the proposed Licence and the proposed LCH provided in Part Two of this PMD.

CNSC staff recommend that the Emergency Response Plan and Fire Protection Program documents be reviewed and accepted by CNSC staff prior to the commencement of licensed activities. This recommendation has been captured under Licence Condition 4.1 in the proposed Licence and the proposed LCH provided in Part Two of this PMD.

The scope of the Emergency Response Plan and Fire Protection Program is clarified in Part G, Table 4 of the LCH. CNSC staff will review these documents to confirm that OPG has provided evidence that adequate measures are in place to deal with emergencies at, or affecting the DGR Facility. CNSC staff will conduct compliance verification activities to verify the sufficiency of OPG's proposed measures for emergency management and fire protection.

4.11 Waste Management

This SCA addresses management of wastes generated by site preparation and construction activities up to the point where the waste is removed offsite to a separate waste management facility. This SCA also covers the planning for decommissioning at the end of the LPSC should the DGR Facility not become operational.

4.11.1 Applicable Regulatory Requirements under the NSCA

The regulatory requirements under the NSCA applicable to this SCA are found in the GNSCR and the CINFR. Under these regulations the applicant is required to submit

- the name, quantity, form, origin and volume of any radioactive waste or hazardous waste that may result from the activity to be licensed, including waste that may be stored, managed, processed or disposed of at the site of the activity to be licensed, and the proposed method for managing and disposing of that waste. (paragraph 3(1)(*j*) of the GNSCR); and

- the proposed plan for decommissioning of the nuclear facility or of the site. (subsection 3(k) of the CINFR)

CSA Standard N294-09 *Decommissioning of facilities containing nuclear substances* (CSA N294-09) [55] is also applicable to this SCA, as is CNSC Regulatory Guide G-219 *Decommissioning Planning for Licensed Activities* (CNSC G-219) [56].

4.11.2 Information Presented in the Application

Waste Management

OPG states that all wastes that arise as a result of site preparation and construction, and operations activities will be safely managed so as to protect the environment from avoidable adverse effects. In support of this, they have committed to ensuring that all aspects of site preparation and construction of the DGR facility comply with the document Environmental Management Plan [46]. They have further committed that all activities under the licence will comply with all applicable federal and provincial environmental protection laws and regulations, which includes ensuring that all applicable permits and approvals that are required under provincial and federal legislation are obtained.

OPG's application does not encompass any nuclear materials. The activities associated with site preparation and construction will generate conventional and hazardous wastes typical of construction projects. These include waste rock, wood and stumps, conventional construction and domestic waste, sanitary waste, and hazardous waste. OPG proposes to minimize waste through recycling and re-use, where possible, of waste rock and waste construction materials.

OPG's estimated volumes of waste produce include approximately 1,000,000 m3 waste rock; 35,000 kg/yr conventional domestic waste; and 12,000 kg/yr sanitary waste. Hazardous wastes are expected to include up to 45,000 l/yr oils and greases; 200 kg/yr batteries; and 2,500 l/yr solvents and paints.

Waste Rock

During construction of the DGR, waste rock resulting from shaft sinking and underground excavation of the repository will be brought to surface and stored in the Waste Rock Management Area (WRMA).

Overburden, dolostones, shales and limestones will be stored in separate sections of the WRMA. Limestone is expected to be stored in the long-term on-site while the remaining materials will be re-purposed during construction activities. As some of the waste rock will remain in storage long-term, it is addressed in OPG's Preliminary Decommissioning Plan [21].

Waste rock storage piles will be designed with slope ratios of 2.5:1 to ensure stability. The limestone pile will be the largest at approximately 9 ha in size and 15 m in height. A buffer of 200m from Interconnecting Road will be planted with trees for visual screening. Stormwater run-off from the WRMA will be directed to the SWMP.

Information provided by OPG was supplemented by their responses to JRP IRs and to undertakings arising at JRP Technical Information Sessions. A summary of the IRs and undertakings relevant to this SCA follow.

JRP IR LPSC-01-29 [32] requested an estimated range of annual output of sanitary wastes and of waste rock. OPG's response confirmed the volume of sanitary wastes expected to be produced. OPG stated they are reviewing the opportunity to tie in to Bruce Power's sanitary services.

JRP IR EIS-02-34 [32] requested further information on management of waste rock with enriched metals content found at depths between 471 and 647 m. OPG indicated that feasibility for use of this material in brick manufacture or on-site for berm development or site grading. In the interim, these materials are to be held in a separate pile in the WRMA, and run-off from this pile was to be directed to the SWMP. The SWMP will be subject to an environmental compliance approval (ECA) which will include effluent discharge criteria.

See section 3.1.3 and section 4.9 of this PMD for further information on potential environmental impact and environmental monitoring of the WRMA.

Other Wastes

OPG states that:

- wood and stumps will be chipped and held on site for future use;

- conventional construction and domestic waste will be collected at the site in industrial bins and disposed of or recycled off-site at a licensed waste management facility;

- sanitary wastes will be managed by the contractor, with disposal off-site. This will include sanitary and mine dry facilities (change room and showers); and

- hazardous materials for disposal will primarily consist of oils and lubricants used to maintain and operate construction equipment. These wastes will be collected in totes on both surface and underground and transferred to an off-site licensed facility for disposal.

Explosives will be utilized during site preparation and construction, but no wastes are expected to result. However, in the event that explosives are damaged these will be collected and transferred to surface where they will be returned to the supplier for off-site disposal.

Preliminary Decommissioning Planning

The applicant provided a Preliminary Decommissioning Plan (PDP) entitled *OPG's Deep Geologic Repository for Low & Intermediate Level Waste Preliminary Decommissioning Plan* NWMO-PLAN-DGR-TR-2011-39 [21] to describe the activities that would be undertaken to decommission all structures, systems and components on the DGR Project site. The plan is also applicable in the event the DGR Project does not proceed to operation, the only difference being the absence of radiological hazards.

OPG provided additional information regarding wastes from decommissioning in JRP IR LPSC 01-46 and 01-47 [32]. JRP IR LPSC 01-46 was a request for clarification regarding the PDP's inclusion of hazardous materials. JRP IR LPSC 01-47 was a request for clarification regarding activities associated with decommissioning following construction.

The PDP includes a cost estimate for decommissioning activities. The financial guarantee associated with decommissioning costs is discussed under section 5.4 of this PMD.

OPG specified that the PDP complies with CSA Standard N294-09 [55] and CNSC Regulatory Guide G-219 *Decommissioning Planning for Licensed Activities* [56].

OPG provided a mapping table between its PDP and the requirements of CSA N294-09 and CNSC G-219 [56].

This plan includes or references the following:

- A description of the site and the structures, systems and components to be decommissioned;

- A description of the decommissioning scope, objective, end state and strategy;
- A description of the activities performed during the decommissioning;
- A schedule for decommissioning activities;
- An estimate of the decommissioning cost;
- A discussion of the human factors considerations involved in the decommissioning;
- An estimated inventory of the hazardous and radioactive wastes that will be generated during decommissioning;
- An assessment of the potential environmental impacts of decommissioning;
- An assessment of the radiological, chemical and industrial safety hazards involved in the decommissioning;
- A brief discussion of administrative aspects of the decommissioning such as quality assurance, documentation and records; and
- A commitment to periodically review and, if necessary update this PDP.

Planning for decommissioning of the DGR Facility is based on the following fundamental assumptions:

- Decommissioning will start following the end of waste emplacement operations and a period of monitoring and surveys;
- Underground facilities will be sealed from entry and waste emplaced in the DGR will remain in the facility emplacement rooms in perpetuity;
- The ventilation shaft infrastructure will be dismantled and the shaft will be sealed;
- The main shaft infrastructure will be dismantled and the shaft will be sealed;
- Surface infrastructure and buildings will be dismantled and removed;
- Ontario Power Generation (OPG) will retain ownership of the DGR Facility site area during all stages of and following decommissioning; and
- A period of institutional controls, assumed to last for several hundred years, will follow the decommissioning work.

OPG also provided an appendix to the PDP describing decommissioning following construction, that is, prior to emplacement of any wastes. In this instance, decommissioning begins once the decision not to emplace wastes is made. The applicant states that the scope of decommissioning under this scenario would

remain the same and that the desired end-state of the facility would dictate the decommissioning strategy. Given the similarities to mines and the absence of radiological materials in this situation, the decommissioning strategy would also be consistent with Ontario Regulation 240, *Mine Development and Closure*. Following decommissioning, the applicant proposes to prepare a Decommissioning End-State Report, abandon the site in-situ and make it available for other uses.

4.11.3 CNSC Staff Assessment

Waste Rock:

CNSC requirements for sound management of waste rock during site preparation, construction, operation and decommissioning of new uranium mines is set out in CNSC regulatory document RD/GD-370, *Management of Uranium Mine Waste Rock and Mill Tailings* [59]. Although not by definition a mine, waste rock management at the DGR facility was evaluated against the best practices in this document.

CNSC RD/GD-370 [59] differentiates between clean waste rock and mineralized waste rock. Clean waste rock does not have the potential to release hazardous and/or nuclear substances that could have a significant adverse effect on human health, or be deleterious to the environment. Geochemical testing indicates that there is a potential for the water from the waste rock to increase metal, ammonia, nitrate and salinity values, as compared to the PWQOs. [40]

Requirements of CNSC RD/GD-370 [59] include segregation of clean waste rock and overburden from mineralized waste rock; follow-up monitoring and performance measurement (field data to validate predicted values). OPG submitted information that modeled the effect of the WRMA and the SWMP, to which the effluent from the WRMA is directed, on the surface and groundwater. While not expected to result in a significant adverse effect, OPG has proposed a waste rock monitoring program for runoff and seepage water from the WRMA. CNSC staff's acceptance of this approach is reflected in recommendation #6 in PMD 13-P1.3 [2].

Other Wastes

In Ontario, conventional construction and domestic waste that is not recyclable must be transferred to a licensed waste management facility via a licensed waste management system (carrier). A separate but similar system exists for hazardous wastes in Ontario with the added features of requiring generators of hazardous wastes to register with the MOE and to ship hazardous wastes using a manifesting system. Sanitary wastes are also regulated in Ontario and, like conventional construction and domestic waste, must be transferred to a licensed facility via a licensed carrier. All three of these waste streams are regulated by the Ontario MOE. CNSC staff have reviewed OPG's submissions with respect to these waste streams and find that they are acceptable.

Preliminary Decommissioning Plan

CNSC staff reviewed and assessed OPG's proposed measures for decommissioning planning [21] against the requirements of CNSC G-219 [56] and CSA N294-09 [55]. G-219 specifies the information that should be contained in a PDP (s. 6.1.2). CSA N294-09 is also used by CNSC staff when reviewing PDPs. As this is a new facility, it is expected that the applicant will provide further details in its next PDP on plans and programs associated with decommissioning.

4.11.4 CNSC Staff Conclusion

CNSC staff conclude that the applicant's proposed measures for waste management and preliminary decommissioning planning [21] are sufficient to meet the applicable regulatory requirements under the NSCA for the issuance of an LPSC.

4.11.5 CNSC Staff Recommendation for LPSC

CNSC staff recommend that the proposed LPSC include licence conditions requiring the licensee to implement and maintain a waste management program, and to maintain a PDP. These recommendations are presented as Licence Conditions 11.1 and 11.2 respectively in the proposed Licence and the proposed LCH provided in Part Two of this PMD. This is a standard condition of the CNSC for a Class I nuclear facility.

Under Section 4.2.5, CNSC staff recommend that the proposed LPSC include a licence condition requiring that the licensee implement safety and control measures to ensure that all work conducted for and at the DGR Facility complies with the licence. This recommendation was made due to the use of an EPCM company and multiple contractors at the site, and thus contractors are likely to play a key role in waste management. Consequently, that recommendation is also important to this SCA. That recommendation is presented as Licence Condition 2.2 in the proposed Licence and the proposed LCH provided in Part Two of this PMD.

4.12 Security

The SCA "Security" covers the programs required to implement and support the security requirements stipulated in the regulations, in their licence, in orders, or in expectations for their facility or activity.

4.12.1 Applicable Regulatory Requirements under the NSCA

The OPG DGR Facility is a Class IB nuclear facility for the purpose of waste management, proposing to store low and intermediate level waste that falls below category III nuclear material as defined in the *Nuclear Security Regulations*[21] (NSR). Therefore, the NSR do not apply for the proposed licence. However, the licensee is still obligated to meet the following security requirements of the GNSCR:

[21] SOR/2000-209

Section 3(1) (*g*) (*h*) of the GNSCR states that the licence application shall contain:

- the proposed measures to control access to the site of the activity to be licensed and the nuclear substance, prescribed equipment or prescribed information; and
- the proposed measures to prevent loss or illegal use, possession or removal of the nuclear substance, prescribed equipment or prescribed information.

Section 12(*c*), (*g*), (*h*) (*j*) of the GNSCR states that the licensee shall demonstrate that measures will be in place to

- take all reasonable precautions to protect the environment and the health and safety of persons and to maintain the security of nuclear facilities and of nuclear substances;
- implement measures for alerting the licensee to the illegal use or removal of a nuclear substance, prescribed equipment or prescribed information, or the illegal use of a nuclear facility;
- implement measures for alerting the licensee to acts of sabotage or attempted sabotage anywhere at the site of the licensed activity; and
- instruct the workers on the physical security program at the site of the licensed activity and on their obligations under that program.

4.12.2 Information Presented in the Application

Sections 2.1.5 and 2.3 of OPG's PSR [16] indicate that the entire Bruce property is fenced and that the WWMF which lies adjacent to the proposed DGR Facility fenced and restricted to qualified personnel and those escorted by qualified personnel. Figure 1 identifies these boundaries. Access to the Bruce nuclear site (including all sites within that boundary, such as WWMF) is strictly controlled by Bruce Power security. OPG currently contracts with Bruce Power to provide security for its current facilities on the Bruce nuclear site (including the adjacent WWMF). This is accomplished through a Bruce nuclear site Services Agreement. This same manner is proposed to address site security needs for the DGR Facility.

OPG's submissions to the JRP [1, 60] indicate that measures are planned to meet the applicable security requirements of the GNSCR. This includes controlled access to the project site and adherence to necessary security protocols. Individuals requiring access will be required to undergo security clearance processes prior to obtaining a valid site access badge in advance of access to the site. All persons, vehicles and materials/packages requiring access to the site will also be subject to search at entry, exit, or any time while on the property. Access badges will be required at all times while at the DGR Facility site.

OPG has established that the project will require explosives to be brought to the nuclear site for the construction of the shafts and underground repository openings. The JRP requested in JRP IR EIS-09-403 [24] that OPG provide additional details regarding security requirements for explosives storage. OPG's response reaffirmed that coordination with Bruce Power for the security and safe transport of explosives on the Bruce nuclear site would occur. Current plans identify that a location has been proposed for on-site storage of these explosives with a commitment to implement Natural Resources Canada (NRCan) requirements for storage, possession and transportation. It is understood that explosives and initiating devices could be stored on surface at the site with periodic replenishment until underground explosives storage for the materials is constructed and commissioned, however other options are being examined. Further details are also provided in OPG's response to this IR and also within a separate confidential submission to the JRP.

4.12.3 CNSC Staff Assessment

CNSC staff reviewed and assessed the applicant's proposed measures for security. CNSC staff find that OPG's proposed path forward to address these measures prior to initiating licensed activities is satisfactory.

Site preparation and construction of the DGR Facility does not have unique site security requirements except for the storage, use and transportation of explosives which affects the risks to the site.

Details regarding the proposed security arrangements and measures to address the potential impacts to other facilities at the site have yet to be formalized. Therefore CNSC staff cannot provide assessment of the adequacy of security measures and arrangements associated with this issue. Therefore, CNSC staff require review and acceptance of the necessary documentation required that details the necessary security measures prior to the initiation of licenses activities.

4.12.4 CNSC Staff Conclusion

OPG is required to have the necessary site security measures in place prior to the initiation of licenses activities.

4.12.5 CNSC Staff Recommendation for LPSC

CNSC staff recommend that the proposed LPSC include licence conditions requiring that the licensee implement and maintain a security program for the DGR Facility site. This condition is presented as Licence Condition 12.1 in the proposed Licence and the proposed LCH provided in Part Two of this PMD.

CNSC staff also recommend that the proposed Site Security Plan document be reviewed and accepted by CNSC staff prior to proceeding with licensed activities. This recommendation has been captured under Licence Condition 4.1 in the proposed Licence and the proposed LCH provided in Part Two of this PMD. The expected scope of each this PMD is also clarified in Part G, Table 4 of the LCH.

CNSC staff will review the Site Security Plan document to confirm that OPG has provided evidence that adequate site security measures are in place for the DGR Facility. CNSC staff will conduct compliance verification activities to verify the sufficiency of OPG's proposed measures for site security.

4.13 Safeguards and Non-Proliferation

The SCA Safeguards and Non-Proliferation addresses programs required for the successful implementation of obligations arising from the Canada/IAEA Safeguards Agreement. This SCA is not relevant to this PMD, as there are no obligations arising from the Canada/IAEA Safeguards Agreement encompassed by the proposed LPSC.

4.14 Packaging and Transport

The SCA Packaging and Transport covers the safe packaging and transport of nuclear substances and radiation devices to and from a licensed facility. With respect to the safe transport of radioactive material in Canada, this responsibility is shared jointly between the CNSC and Transport Canada. While Transport Canada's *Transportation of Dangerous Goods Regulations*[22] deal with the transport of all classes of dangerous goods, the CNSC has regulatory programs to ensure health, safety, security and protection of the environment related to the safe packaging and transport of the special characteristics of radioactive material (Class 7 dangerous goods). CNSC regulations incorporate the international transport of nuclear materials standards published by the International Atomic Energy Agency (IAEA).

The SCA Packaging and Transport is not relevant to this PMD, as the proposed LPSC does not authorize possession of nuclear substances for the site preparation and construction of the DGR Facility.

5 OTHER MATTERS OF REGULATORY INTEREST

Matters of regulatory interest relevant to this PMD include EA, aboriginal consultation, cost recovery, financial guarantees, improvement plans and significant future activities, and the applicant's public information program.

5.1 Environmental Assessment

As required by the *Canadian Environmental Assessment Act*[23] (CEAA 2012), an EA for the project must be carried out before federal authorities can take any action for the purpose of enabling the project to proceed, in whole or in part. This is to ensure that the project does not cause significant adverse environmental effects taking proposed mitigation measures into account. The results of CNSC staff's review of the EIS [12] is provided in PMD 13-P1.3 [2].

[22] SOR/2001-286
[23] S.C. 2012, c.19, s.52

5.1.1 CNSC Staff Assessment

CNSC staff's PMD 13-P1.3 [2] addresses staff's review of OPG's EIS and related information based on the EIS Guidelines [10]. It provides staff's conclusions and recommendations for consideration by the JRP in support of the EA being conducted by the JRP for OPG's proposed new DGR.

5.1.2 CNSC Staff Conclusion

The Environmental Assessment concluded, and CNSC staff concur, that the DGR Project for L&ILW will not likely cause significant adverse environmental effects provided the mitigation measures proposed and commitments made by OPG are implemented, as outlined in section 2.0 of PMD 13-P1.3 [2].

5.1.3 CNSC Staff Recommendation for LPSC

A key element of the EA process is the design and implementation of a follow up monitoring program for verifying the accuracy of the EA and determining the effectiveness of any measures taken to mitigate the adverse environmental effects of the project.

Based on review of the licence application and its supporting information, CNSC staff recommend that the proposed LPSC include a licence condition requiring that the licensee implement the EA decision outcomes that are applicable to this licence. This includes implementation of the final EA Follow up Monitoring Program [31]. This condition is presented as Licence Condition 13.2 in the proposed Licence and the proposed LCH provided in Part Two of this PMD.

CNSC staff will plan activities during the licence period to promote a nuclear safety culture with the applicant, transparency with the local communities and Aboriginal groups, and to establish a working relationship with provincial regulators including Ontario MOE and MOL.

5.2 Aboriginal Consultation

This section describes the Aboriginal consultation process that has been developed and implemented by the CNSC for the proposed DGR Project for L&ILW. It includes the CNSC's role in the Aboriginal consultation process and a summary of issues raised by Aboriginal groups to date.

5.2.1 Aboriginal Consultation Process

The common law duty to consult and accommodate, where appropriate, with Aboriginal groups applies when the Crown contemplates actions that may adversely affect potential or established Aboriginal or treaty rights. The CNSC as an agent of the Crown and as Canada's nuclear regulator recognizes and understands the importance of consulting and building relationships with Canada's Aboriginal

peoples. The CNSC ensures that all its licensing decisions under the NSCA[24] and recommendations / decisions pertaining to EAs under CEAA 2012[25] uphold the honour of the Crown and consider Aboriginal peoples' potential or established Aboriginal or treaty rights pursuant to section 35 of the Constitution Act, 1982[26] (together, the "Aboriginal Interests").

Applicants of nuclear projects do not bear the Crown's legal obligation to consult Aboriginal peoples under section 35 of the Constitution Act, 1982. However, where appropriate, the applicant's engagement with Aboriginal groups is important because consultation activities can inform and assist CNSC staff and help the JRP make effective decisions. The outcomes of consultation activities, including any proposed mitigation and accommodation measures by Ontario Power Generation (OPG) may also form part of the evidence presented to the JRP for consideration.

Following the whole-of-government approach, Aboriginal consultation has been integrated into both the EA and regulatory review processes. As the only Responsible Authority (RA), the CNSC has acted as the Crown Consultation Coordinator for the federal review in relation to the DGR Project. This role includes but is not limited to:

- coordinating and facilitating the Crown's consultation activities during the federal EA, and if permitted to proceed with licensing, during all licensing phases for the DGR Project;
- ensuring that the consultation activities required for the DGR Project are integrated within the EA and licensing processes, as a means to discharge the Crown's duty to consult;
- ensuring that a consultation process is in place for the regulatory review; and,
- tracking and referring DGR Project specific issues raised by Aboriginal peoples to the appropriate parties (e.g., other federal authorities, OPG).

The Aboriginal consultation utilized for the DGR Project is detailed in Addendum C of PMD 13-P1.3 [2]. It includes information regarding the process by which Aboriginal groups that may have an interest in the DGR were identified; background information on those groups; how those groups were engaged; and status of engagement with each group at the time of writing. The Addendum also provides details of the CEA Agency's Participant Funding Program, the Aboriginal Funding Envelope and Aboriginal groups that received funding related to this project.

[24] S.C. 1997, c.9
[25] S.C. 2012, c.19, s.52
[26] 1982, c. 11 (U.K.), Schedule B

CNSC staff began engagement early, and made themselves available to meet with groups throughout the regulatory review process meeting. In 2006, CNSC staff met with Saugeen Ojibway Nation (SON) who, at that time, had been identified as the only Aboriginal group that may be impacted by the DGR Project. CNSC staff also met with the SON, the Métis Nation of Ontario (MNO), the Historic Saugeen Métis, the United Chiefs and Council of Mnidoo Mnising, and the Wikwemikong Unceded Indian Reserve.

5.2.2 Aboriginal Concerns Raised to Date

In addition to the above, Aboriginal groups also raised the following issues and concerns specific to the DGR Project in communications with CNSC staff:

- the proximity of the DGR to Lake Huron
- the potential placement of used nuclear fuel in the DGR
- risk of displacement of Aboriginal groups if an accident contaminated their traditional lands
- risk of contamination of drinking water
- impacts of noise and vibration on Aboriginal interests
- impacts on fishing and harvesting rights
- respect for cultural heritage and traditional knowledge
- impacts on access to, and value or quality of cultural activities undertaken by the SON at the burial ground on the Bruce nuclear site
- potential adverse socio-economic impacts

Based on the findings in the EIS, the applicant concluded that only one residual adverse effect on Aboriginal Interests will likely result due to the DGR Project. This is changed aesthetics and temporary increases in noise and dust level both on and off-site have the potential to diminish the quality or value of activities undertaken by the SON at the Aboriginal burial ground (Jiibegmegoong Spirit Place) at the Bruce nuclear site. The ability of the SON to undertake cultural and ceremonial activities will not change due to consideration of in-design mitigation measures and that the access to the Aboriginal burial site will not change.

5.2.3 CNSC Staff Conclusions

CNSC staff further conclude that the information provided in the EIS and related documentation is sufficient to determine that the DGR Project is not likely to result in significant adverse effects on Aboriginal interests, taking into account the implementation of mitigation measures.

The common law duty to consult and accommodate, where appropriate, with Aboriginal groups applies when the Crown contemplates actions that may adversely affect potential or established Aboriginal or treaty rights. Based on all information that has been received to date, CNSC staff are not aware of any adverse impacts the DGR Project may have on any potential or established Aboriginal or treaty rights. CNSC staff continue to encourage Aboriginal groups to participate in the review process including the JRP hearings in order to advise the Panel members directly of any issues or concerns they have with the DGR Project, as well as to identify any adverse impacts to any potential or established Aboriginal rights. Should the DGR Project receive approval, the CNSC is committed to continuing its engagement and consultation activities with the interested Aboriginal groups.

5.3 Cost Recovery

5.3.1 Applicable Regulatory Requirement under the NSCA

OPG's DGR facility is subject to Part 2 of the *Canadian Nuclear Safety Commission Cost Recovery Fees Regulations*[27]. Fees are charged on an annual basis and are paid by OPG on a quarterly basis.

5.3.2 Information Presented in the Application

Cost recovery was not specifically addressed in the LPSC application.

5.3.3 CNSC Staff Assessment

Although not specifically addressed in the licence application, OPG has consistently paid their cost recovery fees in full for this licence application as well as for its other CNSC licensed nuclear facilities.

5.3.4 CNSC Staff Conclusion

Based on OPG's previous performance, there was no concern raised by CNSC staff regarding OPG's future payments of cost recovery fees.

5.3.5 CNSC Staff Recommendation for LPSC

There are no recommended requirements regarding the payment of cost recovery fees in the proposed LPSC.

[27] SOR/2003-212

5.4 Financial Guarantees

5.4.1 Applicable Regulatory Requirement under the NSCA

Paragraph 3(1)(*l*) of the GNSCR stipulates that an application for a licence shall contain, in addition to other information, "a description of any proposed financial guarantee relating to the activity to be licensed".

5.4.2 Information Presented in the Application

OPG's licence application proposed a financial guarantee in the form of a Letter of Credit through a third-party financial institution. In the letter dated April 14, 2011 [58], the applicant provided a plan for a decommissioning financial guarantee associated with the licensed activities of site preparation for and construction of the DGR Facility. The financial guarantee is for the decommissioning of a constructed DGR prior to placing the facility in operation, and return of the site to pre-licence state.

The applicant proposed that the financial guarantee will provide assurance that adequate funds are available to fund decommissioning obligations during the DGR construction period in case such a need arises. The proposal is for the guarantee value to increase commensurate with the actual financial liabilities to remediate the site. The financial guarantee amount for each year is determined based on the decommissioning liability incurred by the end of the given year. Therefore, the proposed Letter of Credit is on a sliding scale basis that escalates as the financial guarantee obligation increases during the construction program.

OPG also stated that regular reports will be submitted to the CNSC to provide a status on program progress, estimated cost and the required financial guarantee. Additionally, the financial guarantee estimate for the ensuing period before the next update will be used to determine the value of the Letter of Credit for that period.

The applicant specified that with its application for an operating licence, it will submit an appropriate financial guarantee commensurate with decommissioning financial liabilities. At that time the applicant will update the PDP and cost estimate in accordance with CNSC regulatory guidance to serve as the basis for the value of the financial guarantee to be proposed.

5.4.3 CNSC Staff Assessment

CNSC Regulatory Guide G-206, *Financial Guarantees for the Decommissioning of Licensed Activities* (CNSC G-206 [57]), indicates that a financial guarantee, to be acceptable, must provide assurance that adequate resources will be available to fund decommissioning activities. The assurance of such a guarantee is intended to address the potential that the CNSC would find itself responsible for performance of the decommissioning effort.

CNSC staff concur with the applicant that the financial guarantee is associated with the licensed activities of site preparation for and construction of the DGR to return the site to the pre-licence condition. Therefore, the Letter of Credit will be on a sliding scale basis that escalates as the financial guarantee obligation increases during the construction program.

The applicant will be required to provide an updated PDP and financial guarantee when submitting its application for an operating licence for the DGR.

5.4.4 CNSC Staff Conclusion

CNSC staff conclude that the applicant's proposed financial guarantee for the activity to be licensed is acceptable and meets the regulatory requirements under the NSCA for the issuance of an LPSC.

5.4.5 CNSC Staff Recommendation for LPSC

Similar to all Class I Nuclear Facilities, CNSC staff recommend that the proposed LPSC include a condition requiring the licensee to maintain a financial guarantee that is acceptable to the Commission. This condition is presented as Licence Condition 1.6 in the proposed Licence and the proposed LCH provided in Part Two of this PMD.

5.5 Improvement Plan and Significant Future Activities

5.5.1 Activities to be Completed During the Current Licensing Phase

As discussed earlier in this PMD, the applicant has indicated that additional data collection will occur during the site preparation and construction phase to confirm the site characteristics and support to support the DGR design and the DGR Facility Safety Case. Examples include activities proposed under geoscientific verification and geotechnical investigation activities as well as OPG's waste characterization program.

CNSC staff will continue to provide regulatory oversight on the implementation of this work during the site preparation and construction phase. Results will be reported to CNSC staff as part of the annual report on the licensed activities as discussed in Section 4.3.5 of this PMD.

5.5.2 Development of an Application for a Licence to Operate

It is the applicant's responsibility to ensure that an application for a licence to operate contains all necessary information to support a licensing decision by the Commission. This includes information necessary to operate a Class I nuclear facility as required by the NSCA and CNSC Regulations. If the LPSC is granted, information will be obtained by OPG during proposed site preparation and construction activities that will confirm site characteristics and support the DGR design and DGR Facility Safety Case. In addition, OPG is expected to address

commitments made during the JRP process including implementing mitigating measures and EA follow-up monitoring program requirements as identified in the JRP Report. These activities will also support the information necessary for OPG's application for a licence to operate. CNSC staff will continue to communicate with OPG the expectations of this next licensing phase.

5.6 Applicant's Public Information Program

5.6.1 Applicable Regulatory Requirement under the NSCA

The regulatory requirements under the NSCA applicable to this SCA during site preparation and construction are found in subsection 3(*j*) of the GNSCR. Subsection 3(*j*) of the GNSCR requires that an application for a licence contain "the proposed program to inform persons living in the vicinity of the site of the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from the activity to be licensed"

CNSC staff expect that the proposed program conform with CNSC Regulatory Guide G-217, *Licensee Public Information Programs* (CNSC G-217) [61]. Within the framework of the CNSC G -217, the primary goal of a public information program is to ensure that environmental and health and safety issues that may arise as a result of the facility entering a new licensing phase are effectively communicated to the public, in a manner that complies with established regulations. Information submitted for an EA early in the licensing process, including the planning and implementation of public communications and consultation programs may provide one of the primary building blocks for establishing the public information program documentation that will be required at a later stage.

5.6.2 Information Presented in the Application

The applicant's documentation regarding public information and involvement consist of a forward looking communications and consultation approach for the DGR Project. This includes planned engagement activities during the site preparation and construction phases of the project from 2011 to approximately five years following the receipt of an LPSC. The NWMO, as OPG's EPCM company, will support OPG in the development and delivery of the proposed public information and involvement program.

The documentation provided indicates that communications will continually be developed over site preparation and construction and subsequent phases of the project in a manner that ensures citizens are made aware of the general nature and characteristics of the anticipated effects of the DGR project on the environment and health and safety of persons. The intent is to have in place annual communications plans related to key milestones, charting the development of the DGR Project and the progression of the regulatory process. Consistent with public communications undertaken throughout the course of the DGR Project, specific engagement strategies during the site preparation and construction phase and subsequent licensing phases will continue to use a multitude of communication methods and tools.

The applicant's proposed approach to public information and involvement includes the following components: Overview; Objectives; Responsibilities (between OPG and NWMO); Target Audience; Public and Media Opinion; Public Information Program; Communication Calendar; Evaluation Process and Records.

A broad range of communication tools and activities will be used, including: public notifications; stakeholder briefings and presentations; DGR Project newsletters; fact sheet/brochure; DGR Website; DGR mobile exhibit; advertorials; open houses/community information sessions/Community Consultation Centre; media briefings; telephone communication; employee communication; issue management and tracking database; and program evaluation process.

The content of the communication activities planned during site preparation and construction will reflect project activities and progress, mitigation efforts and their effectiveness, and the results of monitoring activities undertaken to confirm predicted effects. As an example, those living in the general vicinity of the DGR would be notified of activities such as the starting of blasting and the presence of large equipment on area roads during harvesting season.

There will also be communication about the results of follow-up monitoring for conventional air quality, surface water quality, aquatic habitat, groundwater quality, the results of public attitude research, and of any other undertakings from the public hearings.

5.6.3 CNSC Staff Assessment

The documentation provided by the applicant about their proposed public information and involvement is credible. The assessment is also based on the strength of the communications and participation programs implemented by OPG from 2002 to 2011. CNSC staff concluded that these programs, which took place prior to, during and after the EIS phase, were satisfactory.

JRP IR EIS 09-458 [32] requested OPG to provide a conceptual public consultation plan for the site preparation and constructions phases of the project. OPG's response to the IR was complete and satisfactory.

Overall, the applicant's documentation regarding public information and involvement provides a solid framework and the key building blocks for implementation during the LPSC of the DGR project public information program and related communications plans.

5.6.4 CNSC Staff Conclusion

CNSC staff conclude that the documentation provided by OPG sufficiently provides a credible demonstration that the applicant has an adequate public information program for communicating risks to the public, specifically health and safety risks. As such, no issues were identified for the applicant to address.

The information provided meets the requirements under the GNSCR and CNSC G-217 [61].

5.6.5 CNSC Staff Recommendation for LPSC

The CNSC regulatory document RD/GD-99.3, *Public Information and Disclosure* (CNSC RD/GD-217) [62], was published in March, 2012 and replaces CNSC regulatory guide G-217. In addition to a public information program, RD/GD 99.3 also requires a public disclosure program.

CNSC staff recommend that the proposed LPSC includes a licence condition requiring that the licensee implement and maintain a public information and disclosure program. This condition is presented as Licence Condition 1.5 in the proposed Licence and the proposed LCH provided in Part Two of this PMD.

The LCH has been developed to articulate and codify CNSC staff expectations for compliance with proposed licence conditions, the NSCA and CNSC Regulations applicable to the LPSC.

CNSC staff will plan activities during the licence period to promote a nuclear safety culture with the applicant, transparency with the local communities and Aboriginal groups, and to establish a working relationship with other regulators.

6 OVERALL CONCLUSIONS AND RECOMMENDATIONS

6.1 Overall Conclusions

CNSC staff conclude that the applicant has provided the information required under the NSCA and CNSC Regulations for an LPSC.

The information provided in support of the licence application was sufficient to evaluate the suitability of the site and DGR design. The information adequately established the external events and specific site characteristics for use in the DGR design and the safety case and safety assessments. The information presented by OPG and the results of CNSC staff evaluation demonstrate that the proposed design can be constructed, can meet regulatory requirements for the protection of persons and the environmental during the operational period and after closure, can provide reasonable assurance through conservative assessments of public and environmental protection in the very long term. The information on the applicant's plans for managing the completion of the engineering details and the site preparation and construction activities demonstrates they are knowledgeable of the project, requirements and responsibilities under the NSCA and CNSC Regulations, and that they will retain appropriate oversight during the requested licensing phase.

On this basis, and CNSC staff's assessment of the results of the EIS [12] (no significant adverse effects from the project), CNSC staff conclude with respect to paragraphs 24(4)(*a*) and (*b*) of the NSCA that the applicant:

- is qualified to carry on the activity authorized by the licence; and
- will, in carrying out that activity, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

6.2 Overall Recommendations

CNSC staff recommend that the Panel, as temporary Commission Members:

- accept CNSC staff conclusions as summarized in subsection 6.1 above.

Should an EA decision by the federal Minister of the Environment permit the Commission to proceed with its authority to take a decision under the section 24 of the NSCA, CNSC staff also recommend that the Panel, as temporary Commission Members:

- approve the issuance of the Licence to Prepare Site and Construct (LPSC), WFCL-W6-3900.00/2024, for a term of ten (10) years;
- accept the proposed financial guarantee for decommissioning; and,
- confirm the delegation of authority summarized in 1.2.3 and outlined in the LCH.

A summary of the CNSC staff recommendations for the proposed LPSC is presented below. Additional licence conditions have been included in the proposed LPSC as they are standard conditions typically included in CNSC Class I Facility licenses. The proposed licence (WFCL-W6-3900.00/2024) and accompanying Licence Conditions Handbook are presented in Part Two of this CMD.

Table 6.2-1. Summary of CNSC Staff Recommendations for proposed licence conditions for the LPSC.

Safety and Control Area	Proposed Licence Condition	PMD Section	Licence Condition #
Management System	The licensee shall implement and maintain a management system.	4.1.5	2.1
	The licensee shall ensure that all work and contractors working for the DGR Facility comply with this licence and requirements of the NSCA and CNSC Regulations.	4.1.5 4.11.5	2.2

Safety and Control Area	Proposed Licence Condition	PMD Section	Licence Condition #
Human Performance	The licensee shall implement and maintain a human performance program.	4.2.5	3.1
Operating Performance	The licensee shall ensure that licensed activities are conducted in accordance with DGR Facility plans for site preparation and construction.	4.1.5 4.2.5 4.3.5 4.5.5 4.10.5 4.12.5	4.1
	The licensee shall implement and maintain a program for reporting, including the reporting of events required by the NSCA and CNSC Regulations.	4.3.5	4.2
	The licensee shall, within 90 days of the end of the calendar year, submit an annual report summarizing licensed activities for the year.	4.3.5	4.3
Safety Analysis	The licensee shall maintain the DGR Facility Safety Case.	4.4.5	5.1
Physical Design	The licensee shall implement and maintain a physical design program.	4.5.5	6.1
	The licensee shall implement and maintain a pressure boundary program and maintain a formal agreement with an Authorized Inspection Agency deemed acceptable to the Commission or a person authorized by the Commission.	4.5.5	6.2
Fitness for Service	The licensee shall implement and maintain safety and control measures for the commissioning and maintenance of the temporary and permanent structures, systems and components.	4.6.5	7.1
Conventional Health and Safety	The licensee shall implement and maintain a conventional health and safety program.	4.8.5	8.1
	The licensee shall provide to the Commission or a person authorized by the Commission confirmation of compliance with requirements of the Ontario Occupational Health and Safety Act and Regulations relevant to the DGR Facility.	4.8.5	8.2

Safety and Control Area	Proposed Licence Condition	PMD Section	Licence Condition #
Environmental Protection	The licensee shall implement and maintain an environmental protection program.	4.9.5	9.1
	The licensee shall provide to the Commission or a person authorized by the Commission confirmation of compliance with environmental compliance approval requirements of the Ontario Environmental Protection Act and Regulations and Ontario Water Resources Act and Regulations relevant to the DGR Facility.	4.9.5	9.2
Emergency Management and Fire Protection	The licensee shall implement and maintain an emergency preparedness and response program.	4.10.5	10.1
	The licensee shall implement and maintain a fire protection program.	4.10.5	10.2
Waste Management	The licensee shall implement and maintain a waste management program.	4.11.5	11.1
	The licensee shall maintain a preliminary decommissioning plan that shall be reviewed and updated every five years, or when requested by the Commission or a person authorized by the Commission.	4.11.5	11.2
Security	The licensee shall implement and maintain a security program for the DGR Facility site.	4.12.5	12.1
General Licence Conditions Note: These are standard conditions of the CNSC for a Class 1 nuclear facility.	The licensee shall conduct the activities described in Section IV of this licence in accordance with the licensing basis, as defined in CNSC document INFO-0795 LICENSING BASIS OBJECTIVE AND DEFINITION, unless otherwise approved in writing by the Canadian Nuclear Safety Commission (hereinafter "the Commission") or a person authorized by the Commission.	4.5.5	1.1
	The licensee shall give written notification to the Commission, or a person authorized by the Commission, of any changes made to the documents needed to support the licence application.	4.5.5	1.2

Safety and Control Area	Proposed Licence Condition	PMD Section	Licence Condition #
	The licensee shall report to the Commission or a person authorized by the Commission any apparent material non-compliance to applicable laws at the federal, provincial or municipal level that pertains to the licensed activities under this licence.	See note at left.	1.3
	The licensee shall, in the event of any apparent conflict or inconsistency between licence conditions, codes, standards or regulatory documents referenced in this licence, direct the conflict or inconsistency to the Commission or a person authorized by the Commission for resolution.	See note at left.	1.4
	The licensee shall implement and maintain a public information and disclosure program.	5.6.5	1.5
	The licensee shall maintain a financial guarantee acceptable to the Commission.	5.4.5	1.6
Project Specific / Other Matters of Regulatory Interest	The licensee shall implement commitments made during the DGR Joint Review Panel process that are applicable to this licence.	Applies to all SCAs	13.1
	The licensee shall implement the Environmental Assessment decision outcomes that are applicable to this licence.	5.1.3	13.2

REFERENCES

[1] Letter, Sweetnam, A. (OPG) to Joint Review Panel *Submission of Information in Support of OPG's Licence Application for a Deep Geologic Repository for Low and Intermediate Level Waste*, April 14, 2011. e-Doc 3709306

[2] CNSC. 2013. Panel Member Document regarding *Ontario Power Generation's Proposed Environmental Impact Statement for OPG's Deep Geologic Repository (DGR) Project for Low and Intermediate Level Waste*, 2013. e-Doc 4091317

[3] CNSC. 2013. Panel Member Document regarding *Ontario Power Generation Long-term Safety Case for the Deep Geologic Repository (DGR) Project for Low and Intermediate Level Waste*, 2013. e-Doc 4117984

[4] Natural Resources Canada. *Radioactive Waste Policy Framework*. http://www.nrcan.gc.ca/energy/sources/uranium-nuclear/1423

[5] CNSC. 2004. *Regulatory Policy P-290: Managing Radioactive Waste*. July 2004. http://nuclearsafety.gc.ca/pubs_catalogue/uploads/P290_e.pdf

[6] CNSC. 2006. *Guidance Document G-320: Assessing the Long-term Safety of Radioactive Waste Management*. December 2006. http://nuclearsafety.gc.ca/pubs_catalogue/uploads/G-320_Final_e.pdf

[7] CSA. 2008. Standard N292.3: *Managing Low and Intermediate Level Radioactive Waste*

[8] Letter, Nash, K. (NWMO) to Howden, B. (CNSC) *Intent to Construct a Geologic Repository for Low and Intermediate Level Waste*. December 2, 2005. e-Doc 1294561

[9] NWMO. 2012. *DGR EA Follow-up Monitoring Program*. March 2012. NWMO DGR-TR-2011-10 R000. e-Docs 3709202

[10] CEAA and CNSC. 2009. *Guidelines for the Preparation of the Environmental Impact Statement for the Deep Geologic Repository for Low- and Intermediate-Level Radioactive Wastes*. January 2009. e-Doc 3808854

[11] Letter, Nash, K. (NWMO) to Howden, B. (CNSC) *Deep Geologic Repository for Low and Intermediate Level Waste (DGR) – Application for the Site Preparation and Construction Licence*, August 13, 2007. 00216-CORR-00531-00033. e-Doc 3070094

[12] OPG. 2011. *OPG's Deep Geologic Repository for Low and Intermediate Level Waste – Environmental Impact Statement Volume 1: Main Report and Volume 2: Appendices*. Prepared by Golder Associates Ltd. 00216-REP-07701-00001-R000. http://www.ceaa-acee.gc.ca/050/documents_staticpost/17520/49818/vol1.pdf

[13] Letter, MacEacheron R. (OPG) to CNSC *Persons Authorized to Act on Behalf of OPG in Dealings with the CNSC*, May 16, 2013. N-CORR-00531-06032. e-Doc 4140596

[14] Letter, Sweetnam A. to Joint Review Panel *Submission of Information in Support of OPG's Licence Application for a Deep Geologic Repository for Low and Intermediate Level Waste*, Attachment #2, *Proof of Land Ownership*, April 14, 2011. e-Doc 3709315

[15] Letter, Swami, L. (OPG) to Howard, D. (CNSC) *Deep Geologic Repository Project for Low and Intermediate Level Waste – Site Preparation and Construction Licence Period*. May 31, 2013. e-Docs 4146599

[16] OPG. 2011. *Preliminary Safety Report OPG's Deep Geologic Repository Project for Low & Intermediate Level Waste*. Prepared by NWMO. March 2011. 00216-SR-01320-00001. e-Doc 3709316

[17] OPG. 2010. *Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository*. December 2010. 00216-REP-03902-00003-R003. e-Docs 3709329

[18] NWMO. 2010. *Project Requirements*. September 22, 2010. NWMO DGR-PDR-00120-0001. e-Docs 3709327

[19] Letter, Sweetnam, A. (OPG) to Howard, D. (CNSC). *Deep Geologic Repository Project for Low and Intermediate Level Waste-Submission of Revised Management System Charter and Project Execution Plan,* February 12, 2013. 00216-CHAR-0001R000 and 00216-PEP-00120-00002. e-Doc#4097784.

[20] NMWO. 2011. *Design and Construction Phase Management System.* February 18, 2011. DGR-PD-EN-0001. e-Doc#3709318.

[21] OPG. 2011. *OPG's Deep Geologic Repository for Low & Intermediate Level Waste Preliminary Decommissioning Plan.* Prepared by: NWMO and Candesco. March 2011. NWMO-PLAN-DGR-TR-2011-39. http://www.nwmo.ca/uploads/DGR%20PDF/Licensing/Preliminary-Decommissioning-Plan.pdf

[22] NWMO. 2011. *Preliminary Conventional Safety Assessment*. Prepared by March Consulting Associates Inc. March 2011. NWMO DGR-TR-2011-37. e-Docs 3709325

[23] NWMO. 2011. *Preliminary ALARA Assessment.* Prepared by SENES Consultants Ltd. March 2011. NWMO DGR-TR-2011-36. e-Docs 3709324

[24] NWMO. 2011. *Postclosure Safety Assessment*. Prepared by Quintessa Ltd., Geofirma Engineering Ltd. and SENES Consultants Ltd. March 2011. NWMO DGR-TR-2011-25. e-Docs 3709323

[25] NWMO. 2011. *Maximum Flood Hazard Assessment*. Prepared by AMEC NSS Ltd. March 2011. NWMO DGR-TR-2011-35. e-Docs 3709333

[26] NWMO. 2011. *Radon Assessment*. March 2011. NWMO DGR-TR-2011-34. e-Docs 3709328

[27] NWMO. 2011. *Geosynthesis*. March 2011. NWMO DGR-TR-2011-11. e-Docs 3709322

[28] NWMO. 2011. *Descriptive Geosphere Site Model*. Prepared by Intera Engineering Ltd. March 2011. NWMO DGR-TR-2011-24. e-Docs 3709331

[29] NWMO. 2011. *Geoscientific Verification Plan*. March 2011. NWMO DGR-TR-2011-38. e-Docs 3709321

[30] IAEA. 2012. *Specific Safety Guide 23: Safety Case and Safety Assessment for the Disposal of Radioactive Waste*.

http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1553_web.pdf

[31] IAEA. 2011. Specific Safety Guide 14: *Geological Disposal Facilities for Radioactive Waste.*
http://www-pub.iaea.org/MTCD/publications/PDF/Pub1483_web.pdf

[32] OPG. 2013. *Updated Consolidated Responses to JRP's Information Requests for Deep Geologic Repository Project for Low and Intermediate Level Waste up to and including package #11*. June 6, 2013.
http://www.ceaa.gc.ca/050/documents/p17520/89872E.pdf.

[33] CSA. 2007. Standard N286-05: *Management System Requirements for Nuclear Power Plants.*

[34] Letter, Sweetnam, A. (OPG) to Joint Review Panel. *Updates to the DGR design submitted April 14, 2011 and changes to the environmental impact statement and safety assessment arising from the design updates*, February 10, 2012.
http://www.ceaa.gc.ca/050/documents/54285/54285E.pdf

[35] OPG. 2013. *Information provided during JRP Technical Information Sessions on July 18, 2012, October 11, 2012, and March 20, 2013*. July 4, 2013. CEAR #1211.
http://www.ceaa.gc.ca/050/documents/p17520/90649E.pdf

[36] NWMO. 2011. *Seismic Hazard Assessment*. Prepared by AMEC Geomatrix, Inc. March 2011. NWMO DGR-TR-2011-20. e-Docs 3709900

[37] Letter, Wilson, D. (NWMO) to Klassen, K. (CNSC) *DGR Project for OPG's L&ILW – Project Quality Plan for Design and Construction Phase*. May 25, 2011. e-Doc 3729418

[38] CNSC. 2012. *OPG Clarifications to JRP IRs as noted in CEAR #523*. September 19, 2012. CEAR #827. http://www.ceaa.gc.ca/050/documents/p17520/83853E.pdf

[39] CNSC. 2008. Regulatory Document RD-337: *Design of New Nuclear Power Plants*. http://www.nuclearsafety.gc.ca/pubs_catalogue/uploads/RD-337_e.pdf

[40] CSA. 2008. Standard N285.0: *General Requirements for Pressure Retaining Systems and Components in CANDU Nuclear Power Plants*

[41] CSA. 2009. Standard B51-09: *Boiler, Pressure Vessel, and Pressure Piping Code*

[42] CNSC. 2004. Regulatory Guide G-129: *Keeping Radiation Exposures and Doses "As Low As Reasonably Achievable" (ALARA)*. October 2004. http://nuclearsafety.gc.ca/pubs_catalogue/uploads/G129rev1_e.pdf

[43] CNSC. 2003. Regulatory Guide G-4: *Measuring Airborne Radon Progeny at Uranium Mines and Mills*. June 2003. http://nuclearsafety.gc.ca/pubs_catalogue/uploads/44019-G4E.pdf

[44] NWMO. 2011. *DGR Project Health, Safety, and Environmental Management Plan*. January 28, 2011. DGR-PLAN-08960-1001. e-Docs 3801677

[45] NWMO. 2012. *DGR Health and Safety Management Plan.* March 12, 2012. DGR-PLAN-08962-1001. e-Docs 3910106

[46] NWMO. 2012. *DGR Project Environmental Management Plan*. March 22, 2012. DGR-PLAN-07002-1001. e-Docs 3910109

[47] CNSC. 2006. Regulatory Standard S-296: *Environmental Protection Policies, Programs and Procedures at Class I Nuclear Facilities and Uranium Mines and Mills*. March 2006. http://nuclearsafety.gc.ca/pubs_catalogue/uploads/S-296_E.pdf

[48] CSA and ISO. 2004. CSA ISO 14001:2004 *Environmental Management Systems – Requirements with Guidance for Use*

[49] NWMO, 2011. *Environmental Policy*. February 14, 2011. NWMO-POL-ES-0001. e-Docs 3801869

[50] CSA. 2010. Standard N288.4: *Environmental Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills.*

[51] OMOE. 2012. *Guide to Applying for an Environmental Compliance Approval.* December 2012. http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/stdprod_090808.pdf

[52] NWMO. 2011. *Malfunctions, Accidents and Malevolent Acts*. Prepared by AMEC NSS Ltd. March 2011. DGR-TR-2011-07. http://www.ceaa.gc.ca/050/documents/45777/45777E.PDF

[53] CSA. 2008. Standard Z16000-08: *Emergency Management and Business Continuity Programs*

[54] CSA. 2003. Standard Z-731-03: *Emergency Preparedness and Response*

[55] CSA. 2009. Standard N294-09: *Decommissioning of facilities containing nuclear substances*

[56] CNSC. 2000. Regulatory Guide G-219: *Decommissioning Planning for Licensed Activities*. June 2000. http://nuclearsafety.gc.ca/pubs_catalogue/uploads/G219_e.pdf

[57] CNSC. 2000. Regulatory Guide G-206: *Financial Guarantees for the Decommissioning of Licensed Activities*. June 2000. http://nuclearsafety.gc.ca/pubs_catalogue/uploads/G206_e.pdf

[58] Letter, Sweetnam, A. (OPG) to Howard, D. (CNSC) *Financial Guarantee in Support of OPG's Licence Application for Low and Intermediate Level Waste Deep Geologic Repository*. April 14, 2011. 00216-CORR-00531-00092. e-Doc 3709158

[59] CNSC. 2012. Regulatory Document RD/GD 370: *Management of Uranium Mine Waste Rock and Mill Tailings.* March 2012. http://nuclearsafety.gc.ca/pubs_catalogue/uploads/March-2012-RDGD-370-Management-of-Uranium-Mine-Waste-Rock-and-Mill-Tailings_e.pdf

[60] Letter, Webster, A. (OPG) to Joint Review Panel *Deep Geologic Repository Project for Low and Intermediate Level Waste – Information on Explosives for DGR Construction Additional to IR EIS-09-403,* April 15, 2013. (CONFIDENTIAL – SECURITY PROTECTED)

[61] CNSC. 2004. Regulatory Guide G-217: *Licensee Public Information Programs.* January, 2004. http://www.nuclearsafety.gc.ca/pubs_catalogue/uploads/G217_e.pdf

[62] CNSC. 2012. Regulatory Document RD/GD 99.3: *Public Information and Disclosure.* March, 2012. http://nuclearsafety.gc.ca/pubs_catalogue/uploads/RD_GD-99_3-eng.pdf

[63] OPG. *OPG's Deep Geologic Repository Project for Low & Intermediate Level Waste: Protecting Lake Huron*. March 2013. CEAR #927. http://www.ceaa.gc.ca/050/documents/p17520/87465E.pdf

[64] CNSC. 2003. Regulatory Guide G-278: *Human Factors Verification and Validation Plans*. June 2003. http://www.nuclearsafety.gc.ca/pubs_catalogue/uploads/G278_e.pdf

ACRONYMS

AFC	Approved for Construction
ALARA	As Low as Reasonably Achievable
ANSI	Areas of Natural or Scientific Interest
AIA	Authorized Inspection Agency
bgs	below ground surface
BMP	Best Management Practices
CCME	Canadian Council of the Minister of the Environment
CEAA	Canadian Environmental Assessment Act, 2012
cm	centimeter
CMLF	Central Maintenance and Laundry Facility
CNSC	Canadian Nuclear Safety Commission
CSA	Canadian Standards Association
CINFR	*Class I Nuclear Facilities Regulations*
DGR	Deep Geologic Repository
EA	Environmental Assessment
ECA	Environmental Compliance Approvals
EDZ	Excavation Damaged Zone
EIS	Environmental Impact Statement
EPCM	Engineering, Procurement, and Construction Management
ERA	Environmental Risk Assessment
GD	Guidance Document
GNSCR	*General Nuclear Safety and Control Regulations*
IAEA	International Atomic Energy Agency

ILW	Intermediate-Level Radioactive Waste
IR	Information Requests
JRP	Joint Review Panel
km	kilometer
L&ILW	Low and Intermediate Level Waste
LCH	Licence Conditions Handbook
LLW	Low-Level Radioactive Waste
LPSC	Licence to Prepare Site and Construct
LSA	Local Study Area
mASL	meters above sea level
MNO	Métis Nation of Ontario
MOE	Ministry of Environment, Ontario
MOL	Ministry of Labour, Ontario
mSv	millisievert
NDR	National Dose Registry
NEWs	Nuclear Energy Worker
NGS	Nuclear Generating Station
NSCA	*Nuclear Safety and Control Act*
NSR	*Nuclear Security Regulations*
NWMO	Nuclear Waste Management Organization
OHSA	Occupational Health and Safety Act
OMNR	Ontario Ministry of Natural Resources
OPG	Ontario Power Generation
PDP	Preliminary Decommissioning Plan
PMD	Panel Member Document

PMP	Probable Maximum Precipitation
PWQO	Provincial Water Quality Objectives, Ontario
PSR	Preliminary Safety Report
PSW	Provincially Significant Wetlands
PTTW	Permit to Take Water
RD	Regulatory Document
REMP	Radiological Environmental Monitoring Program
RPR	*Radiation Protection Regulations*
SARA	Species at Risk Act
SCA	Safety and Control Area
SON	Saugeen Ojibway Nation
SSA	Site Study Area
SVCA	Saugeen Valley Conservation Authority
SWMP	Stormwater Management Pond
TBq	Terabequeral
THMC	Thermal-Hydrological-Mechanical-Chemical
TSD	Technical Support Document
TSSA	Technical Standards and Safety Authority
µSv	microsievert
WFCL	Waste Facility Site Preparation and Construction Licence
WRMA	Waste Rock Management Area
WWMF	Western Waste Management Facility

A. RISK RANKING

The CNSC uses a risk-informed regulatory approach in the management and control of regulated facilities and activities. CNSC staff have therefore established an approach to identifying appropriate levels of regulatory monitoring and control for specific classes of licensed facilities and types of licensed activities based on risk ranking.

Risk ranking is applied to each SCA, and is determined by considering the probability and consequence of adverse incidents associated with each SCA as it relates to the given facility and activity types.

The methodology used to determine risk ranking is based on CSA guideline CAN/CSA-Q850, *Risk Management: Guideline for Decision Makers* (CAN/CSA-Q850*)*. This guideline provides a description of the major components of the risk management decision process and their relationship to each other, and describes a process for acquiring, analyzing, evaluating, and communicating information that is necessary for making decisions.

In section 2.1 of this PMD, in the Relevant Safety Control Areas table, the "Risk Ranking" column shows a high (H), moderate (M) or low (L) indicator for each SCA that is relevant to the current facility and activities being addressed in this PMD. The risk rankings are not static and will change over time for a given facility and activities (e.g., facilities age, facilities and equipment are upgraded, activities cease or begin, licensees change, technology and programs mature, knowledge and understanding of impacts and probabilities increase, etc.).

The following matrix provides a high-level overview of risk ranking, and the management and monitoring approach associated with the various degrees of risk.

Table A-1 Approach to assessing and managing potential risk.

CONSEQUENCE	MANAGEMENT/MONITORING APPROACH		
Significant Impact	Considerable management of risk is required	Must manage and monitor risk with occasional control	Extensive management is essential. Constant monitoring and control
Moderate Impact	Occasional monitoring	Management effort is recommended	Management effort and control is required
Low Impact	Random monitoring	Regular monitoring	Manage and monitor
Probability of Occurrence	Unlikely to Occur	Might Occur	Expected to Occur

Table A-2 Risk-ranking scale.

L	Low Risk	**M**	Moderate Risk	**H**	High Risk

On this basis, a high-risk SCA would be subject to increased regulatory scrutiny and control while a low-risk SCA would generally require minor verification and control.

B. RATING LEVELS

Table B-1 Rating terminology used by the CNSC.

RATING LEVEL	DESCRIPTION
FS	Fully Satisfactory
SA	Satisfactory
BE	Below Expectations
UA	Unacceptable

The following describes the rating terminology used by the CNSC.

Fully Satisfactory (FS)

Compliance with regulatory requirements is fully satisfactory. Compliance within the area exceeds requirements and CNSC expectations. Compliance is stable or improving, and any problems or issues that arise are promptly addressed.

Satisfactory (SA)

Compliance with regulatory requirements is satisfactory. Compliance within the area meets requirements and CNSC expectations. Any deviation is only minor, and any issues are considered to pose a low risk to the achievement of regulatory objectives and CNSC expectations. Appropriate improvements are planned.

Note: For the DGR facility, the term SA (Satisfactory) indicates the licence application and its supporting information, including commitments made by OPG, meet the requirements of the NSCA and CNSC Regulations and expectations of CNSC staff.

Below Expectations (BE)

Compliance with regulatory requirements falls below expectations. Compliance within the area deviates from requirements or CNSC expectations to the extent that there is a moderate risk of ultimate failure to comply. Improvements are required to address identified weaknesses. The licensee or applicant is taking appropriate corrective action.

Unacceptable (UA)

Compliance with regulatory requirements is unacceptable, and is seriously compromised. Compliance within the overall area is significantly below requirements or CNSC expectations, or there is evidence of overall non compliance. Without corrective action, there is a high probability that the deficiencies will lead to an unreasonable risk. Issues are not being addressed effectively, no appropriate corrective measures have been taken, and no alternative plan of action has been provided. Immediate action is required.

C. BASIS FOR THE RECOMMENDATIONS

C.1 Regulatory Basis

The recommendations provided in this PMD are based on compliance objectives and expectations associated with the relevant SCAs and other matters. The regulatory basis for the matters that are relevant to this PMD are as follows.

GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS (GNSCR)

Section	Regulatory Requirement
3 (1) (*a*)	An application for a licence shall contain the following information:
	the applicant's name and business address;
3 (1) (*b*)	the activity to be licensed and its purpose;
3 (1) (*c*)	the name, maximum quantity and form of any nuclear substance to be encompassed by the licence;
3 (1) (*d*)	a description of any nuclear facility, prescribed equipment or prescribed information to be encompassed by the licence;
3 (1) (*e*)	the proposed measures to ensure compliance with the *Radiation Protection Regulations* and the *Nuclear Security Regulations;*
3 (1) (*f*)	any proposed action level for the purpose of section 6 of the *Radiation Protection Regulations;*
3 (1) (*g*)	the proposed measures to control access to the site of the activity to be licensed and the nuclear substance, prescribed equipment or prescribed information;
3 (1) (*h*)	the proposed measures to prevent loss or illegal use, possession or removal of the nuclear substance, prescribed equipment or prescribed information;
3 (1) (*i*)	a description and the results of any test, analysis or calculation performed to substantiate the information included in the application;
3 (1) (*j*)	the name, quantity, form, origin and volume of any radioactive waste or hazardous waste that may result from the activity to be licensed, including waste that may be stored, managed, processed or disposed of at the site of the activity to be licensed, and the proposed method for managing and disposing of that waste;
3 (1) (*k*)	the applicant's organizational management structure insofar as it may bear on the applicant's compliance with the Act and the regulations made under the Act, including the internal allocation of functions, responsibilities and authority;
3 (1) (*l*)	a description of any proposed financial guarantee relating to the activity to be licensed; and

3 (1) (*m*)	any other information required by the Act or the regulations made under the Act for the activity to be licensed and the nuclear substance, nuclear facility, prescribed equipment or prescribed information to be encompassed by the licence.
3 (1.1) (a)	The Commission or a designated officer authorized under paragraph 37(2)(c) of the Act, may require any other information that is necessary to enable the Commission or the designated officer to determine whether the applicant is qualified to carry on the activity to be licensed; or
3 (1.1) (b)	will, in carrying on that activity, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.
15 (*a*)	Every applicant for licence and every licensee shall notify the Commission of the persons who have authority to act for them in their dealings with the Commission.
15 (*b*)	the names and position titles of the persons who are responsible for the management and control of the licensed activity and the nuclear substance, nuclear facility, prescribed equipment or prescribed information encompassed by the licence.
27	Every licensee shall keep a record of all information relating to the licence that is submitted by the licensee to the Commission.
28	(1) Every person who is required to keep a record by the Act, the regulations made under the Act or a licence shall retain the record for the period specified in the applicable regulations made under the Act or, if no period is specified in the regulations, for the period ending one year after the expiry of the licence that authorizes the activity in respect of which the records are kept. (2) No person shall dispose of a record referred to in the Act, the regulations made under the Act or a licence unless the person (a) is no longer required to keep the record by the Act, the regulations made under the Act or the licence; and (b) has notified the Commission of the date of disposal and of the nature of the record at least 90 days before the date of disposal. (3) A person who notifies the Commission in accordance with subsection (2) shall file the record, or a copy of the record, with the Commission at its request.

OPG's licence application included the information required by 3(1), 15, 27, and 28 of the *General Nuclear Safety and Control Regulations*.

CLASS I NUCLEAR FACILITIES REGULATIONS (CINFR)

Section	Regulatory Requirement
3 (*a*)	An application for a licence in respect of a Class I nuclear facility, other than a licence to abandon, shall contain the following information in addition to the information required by section 3 of the *General Nuclear Safety and Control Regulations*: a description of the site of the activity to be licensed, including the location of any exclusion zone and any structures within that zone;
3 (*b*)	plans showing the location, perimeter, areas, structures and systems of the nuclear facility;
3 (*c*)	evidence that the applicant is the owner of the site or has authority from the owner of the site to carry on the activity to be licensed;
3 (*d*)	the proposed quality assurance program for the activity to be licensed;
3 (*e*)	the name, form, characteristics and quantity of any hazardous substances that may be on the site while the activity to be licensed is carried on;
3 (*f*)	the proposed worker health and safety policies and procedures;
3 (*g)*	the proposed environmental protection policies and procedures;
3 (*h*)	the proposed effluent and environmental monitoring programs;
3 (*i*)	if the application is in respect of a nuclear facility referred to in subsection 2(b) of the *Nuclear Security Regulations*, the information required by section 3 of those Regulations;
3 (*j*)	the proposed program to inform persons living in the vicinity of the site of the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from the activity to be licensed; and
3 (*k*)	the proposed plan for the decommissioning of the nuclear facility or of the site.
4 (*a*)	An application for a licence to prepare a site for a Class I nuclear facility shall contain the following information in addition to the information required by section 3: a description of the site evaluation process and of the investigations and preparatory work that have been and will be done on the site and in the surrounding area;
4 (*b*)	a description of the site's susceptibility to human activity and natural phenomena, including seismic events, tornadoes and floods;

4 (*c*) the proposed program to determine the environmental baseline characteristics of the site and the surrounding area;

4 (*d*) the proposed quality assurance program for the design of the nuclear facility; and

4 (*e*) the effects on the environment and the health and safety of persons that may result from the activity to be licensed, and the measures that will be taken to prevent or mitigate those effects.

5 (*a*) An application for a licence to construct a Class I nuclear facility shall contain the following information in addition to the information required by section 3:

a description of the proposed design of the nuclear facility, including the manner in which the physical and environmental characteristics of the site are taken into account in the design;

5 (*b*) a description of the environmental baseline characteristics of the site and the surrounding area;

5 (*c*) the proposed construction program, including its schedule;

5 (*d*) a description of the structures proposed to be built as part of the nuclear facility, including their design and their design characteristics;

5 (*e*) a description of the systems and equipment proposed to be installed at the nuclear facility, including their design and their design operating conditions;

5 (*f*) a preliminary safety analysis report demonstrating the adequacy of the design of the nuclear facility;

5 (*g*) the proposed quality assurance program for the design of the nuclear facility;

5 (*h*) the proposed measures to facilitate Canada's compliance with any applicable safeguards agreement;

5 (*i*) the effects on the environment and the health and safety of persons that may result from the construction, operation and decommissioning of the nuclear facility, and the measures that will be taken to prevent or mitigate those effects;

5 (*j*) the proposed location of points of release, the proposed maximum quantities and concentrations, and the anticipated volume and flow rate of releases of nuclear substances and hazardous substances into the environment, including their physical, chemical and radiological characteristics;

5 (*k*) the proposed measures to control releases of nuclear substances and hazardous substances into the environment;

5 (*l*) the proposed program and schedule for recruiting, training and qualifying workers in respect of the operation and maintenance of the nuclear facility;

5 (*m*) a description of any proposed full-scope training simulator for the nuclear facility.

14 (1) Every licensee shall keep a record of the results of the effluent and environmental monitoring programs referred to in the licence.

14 (2) Every licensee who operates a Class I nuclear facility shall keep a record of

(a) operating and maintenance procedures;

(b) the results of the commissioning program referred to in the licence;

(c) the results of the inspection and maintenance programs referred to in the licence;

(d) the nature and amount of radiation, nuclear substances and hazardous substances within the nuclear facility; and

(e) the status of each worker's qualifications, requalification and training, including the results of all tests and examinations completed in accordance with the licence.

14 (3) Every licensee who decommissions a Class I nuclear facility shall keep a record of […]

14 (4) Every person who is required by this section to keep a record referred to in paragraph (2)(*a*) to (*d*) or (3)(*a*) to (*d*) shall retain the record for 10 years after the expiry date of the licence to abandon issued in respect of the Class I nuclear facility.

14 (5) Every person who is required by this section to keep a record referred to in paragraph (2)(e) or (3)(e) shall retain the record for the period that the worker is employed by the licensee and for five years after the worker ceases to be so employed.

OPG's licence application included the information required by sections 3, 4, 5, and 14 of the *Class I Nuclear Facilities Regulations*.

RADIATION PROTECTION REGULATIONS (RPR)

Section	Regulatory Requirement
4 (*a*)	Every licensee shall implement a radiation protection program and shall, as part of that program, keep the amount of exposure to radon progeny and the effective dose and equivalent dose received by and committed to persons as low as is reasonable achievable, social and economic factors being taken into account, through implementation of (i) management control over work practices, (ii) personnel qualification and training, (iii) control of occupational and public exposure to radiation, and (iv) planning for unusual situations; and
4 (*b*)	ascertain the quantity and concentration of any nuclear substance released as result of the licensed activity (i) by direct measurement as a result of monitoring, or (ii) if the time and resources required for direct measurement as a result of monitoring outweigh the usefulness of ascertaining the quantity and concentration using that method, by estimating them.
5 (1)	For the purpose of keeping a record of doses of radiation in accordance with section 27 of the Act, every licensee shall ascertain and record the magnitude of exposure to radon progeny of each person referred to in that section, as well as the effective dose and equivalent dose received by and committed to that person.
5 (2)	A licensee shall ascertain the magnitude of exposure to radon progeny and the effective dose and equivalent dose (a) by direct measurement as a result of monitoring; or (b) if the time and resources required for direct measurement as a result of monitoring outweigh the usefulness of ascertaining the amount of exposure and doses using that method, by estimating them.
6 (1)	In this section, “action level” means a specific dose of radiation or other parameter that, if reached, may indicate a loss of control of part of a licensee’s radiation protection program and triggers a requirement for specific action to be taken.
6 (2)	When a licensee becomes aware that an action level referred to in the licence for the purpose of this subsection has been reached, the licensee shall (a) conduct an investigation to establish the cause for reaching the action level; (b) identify and take action to restore the effectiveness of the radiation protection program implemented in accordance with section 4; and (c) notify the Commission within the period specified in the licence.

OPG’s licence application included the information required by sections 4, 5, and 6 of the *Radiation Protection Regulations*.

URANIUM MINES AND MILLS REGULATIONS (UMMR)

Paragraph	Regulatory Requirement
3 (*a*) (i)	An application for a licence in respect of a uranium mine or mill, other than a licence to abandon, shall contain the following information in addition to the information required by section 3 of the General Nuclear Safety and Control Regulations: in relation to the plan and description of the mine or mill, a description of the site evaluation process and of the investigations and preparatory work to be done at the site and in the surrounding area,
3 (*a*) (ii)	a surface plan indicating the boundaries of the mine or mill and the area where the activity to be licensed is proposed to be carried on,
3 (*a*) (iii)	a plan showing the existing and planned structures, excavations and underground development,
3 (*a*) (iv)	a description of the mine or mill, including the installations, their purpose and capacity, and any excavations and underground development,
3 (*a*) (v)	a description of the site geology and mineralogy,
3 (*a*) (vi)	a description of any activity that may have an impact on the development of the mine or mill, including any mining-related activity that was carried on at the site before the date of submission of the application to the Commission,
3 (*a*) (vii)	a description of the design of and the maintenance program for every eating area,
3 (*a*) (viii)	the proposed plan for the decommissioning of the mine or mill, and
3 (*a*) (ix)	a description of the proposed emergency power systems and their capacities;
3 (*b*) (i)	in relation to the activity to be licensed, a description of and the schedule for the planned activity,
3 (*b*) (ii)	a description of the proposed methods for carrying on the activity,
3 (*b*) (iii)	a list of the categories of material proposed to be mined and a description of the criteria used to determine those categories,
3 (*b*) (iv)	the anticipated duration of the activity, and
3 (*b*) (v)	the proposed quality assurance program for the activity;

3 (*c*) (i)	in relation to the environment and waste management, the program to inform persons living in the vicinity of the mine or mill of the general nature and characteristics of the anticipated effects of the activity to be licensed on the environment and the health and safety of persons,
3 (*c*) (ii)	the program to determine the environmental baseline characteristics of the site and the surrounding area,
3 (*c*) (iii)	the effects on the environment that may result from the activity to be licensed, and the measures that will be taken to prevent or mitigate those effects,
3 (*c*) (iv)	the proposed positions for and qualifications and responsibilities of environmental protection workers,
3 (*c*) (v)	the proposed environmental protection policies and programs,
3 (*c*) (vi)	the proposed effluent and environmental monitoring programs,
3 (*c*) (vii)	the proposed location, the proposed maximum quantities and concentrations, and the anticipated volume and flow rate of releases of nuclear substances and hazardous substances into the environment, including their physical, chemical and radiological characteristics,
3 (*c*) (viii)	the proposed measures to control releases of nuclear substances and hazardous substances into the environment,
3 (*c*) (ix)	a description of the anticipated liquid and solid waste streams within the mine or mill, including the ingress of fresh water and any diversion or control of the flow of uncontaminated surface and ground water,
3 (*c*) (x)	the proposed measures to prevent or mitigate the effects of accidental releases of nuclear substances and hazardous substances on the environment, the health and safety of persons and the maintenance of security, including measures to
3 (*c*) (x) (A)	assist off-site authorities in planning and preparing to limit the adverse effects of an accidental release,
3 (*c*) (x) (B)	notify off-site authorities of an accidental release or the imminence of an accidental release,
3 (*c*) (x) (C)	report information to off-site authorities during and after an accidental release,
3 (*c*) (x) (D)	assist off-site authorities in dealing with the adverse effects of an accidental release, and
3 (*c*) (x) (E)	test the implementation of the measures to control the adverse effects of an accidental release,
3 (*c*) (xi)	the anticipated quantities, composition and characteristics of backfill, and

3 (*c*) (xii) a description of the proposed waste management system;

3 (*d*) (i) in relation to health and safety,

the effects on the health and safety of persons that may result from the activity to be licensed, and the measures that will be taken to prevent or mitigate those effects,

3 (*d*) (ii) the proposed program for selecting, using and maintaining personal protective equipment,

3 (*d*) (iii) the proposed worker health and safety policies and programs,

3 (*d*) (iv) the proposed positions for and qualifications and responsibilities of radiation protection workers,

3 (*d*) (v) the proposed training program for workers,

3 (*d*) (vi) the proposed measures to control the spread of any radioactive contamination,

3 (*d*) (vii) the proposed ventilation and dust control methods and equipment for controlling air quality, and

3 (*d*) (viii) the proposed level of effectiveness of and inspection schedule for the ventilation and dust control systems; and

3 (*e*) in relation to security, the proposed measures to alert the licensee to acts of sabotage or attempted sabotage at the mine or mill.

4 (1) In this section, "action level" means a specific dose of radiation or other parameter that, if reached, may indicate a loss of control of part of a licensee’s radiation protection program or environmental protection program, and triggers a requirement for specific action to be taken.

4 (2) (*a*) An application for a licence in respect of a uranium mine or mill, other than a licence to abandon, shall contain a proposed code of practice that includes any action level that the applicant considers appropriate for the purpose of this subsection.

4 (2) (*b*) a description of any action that the applicant will take if an action level is reached; and

4 (2) (*c*) the reporting procedures that will be followed if an action level is reached.

5 (1) (*a*) An application for a licence to prepare a site for and construct a uranium mine shall contain the following information in addition to the information required by section 3 and subsection 4(2):

a description of the proposed design of the mine;

5 (1) (*b*) the proposed construction program, including its schedule;

5 (1) (*c*) a description of the components, systems and equipment proposed to be installed at the mine, including their design operating conditions;

5 (1) (*d*) the proposed quality assurance program for the design of the mine;

5 (1) (*e*) the results of a process-hazard analysis and a description of how those results have been taken into account;

5 (1) (*f*) a description of the proposed design, construction and operation of the waste management system, including the measures to monitor its construction and operation, the construction schedule, the contingency plans for construction and the measures to control the movement of water in existing waterways;

5 (1) (*g*) a description of the proposed disposition of the ore;

5 (1) (*h*) the anticipated quantities and grade of ore and waste rock that will be removed, their proposed storage location, and the proposed method, program and schedule, for their removal and disposal;

5 (1) (*i*) the proposed mining methods and programs; and

5 (1) (*j*) the proposed commissioning plan for the components, systems and equipment to be installed at the mine.

11 (*a*) Every licensee shall, with respect to the ventilation systems established in accordance with the licence, ensure that each main fan is equipped with a device that provides a warning signal when the main fan is not functioning properly;

11 (*b*) ensure that a person is designated to receive and respond to a warning signal provided by a device referred to in paragraph (a); and

11 (*c*) implement measures to prevent any person or activity from interfering with the proper operation of the ventilation systems

12 (1) (*a*) Where a ventilation system in a work place is not functioning in accordance with a licence, the licensee shall implement alternative measures to protect the health and safety of its workers; and

12 (1) (*b*) ensure that only the work necessary to restore that system is performed in the work place.

12 (2) Before a worker performs any work that is necessary to restore a ventilation system, the licensee shall inform the worker of the protective measures that have been taken and are to be taken in connection with the work.

13 No licensee shall rely on the use of a respirator to comply with the Radiation Protection Regulations unless the use of the respirator

(a) is for a temporary or unforeseen situation; and

(b) is permitted by the code of practice referred to in the licence.

16 (1) (*a*) Every licensee shall keep a record of its operating and maintenance procedures;

16 (1) (*b*) Every licensee shall keep a record of its mine plans showing the actual and planned mine workings;

16 (1) (*c*) the schedules for all of its planned mining operations;

16 (1) (*d*) the plans of every tailings-containment structure and area and every diversion structure and system associated with the waste management system;

16 (1) (*e*) the design of the uranium mine or mill and of the components and systems installed at the mine or mill;

16 (1) (*f*) the method and relevant data used to ascertain the doses of radiation received by the workers at the uranium mine or mill and the intake of radioactive nuclear substances by those workers;

16 (1) (*g*) any measurement made in accordance with the licence or the regulations made under the Act;

16 (1) (*h*) the inspections and maintenance carried out in accordance with the licence or the regulations made under the Act;

16 (1) (*i*) the quantity of air delivered by each main fan;

16 (1) (*j*) the performance of each dust control system; and

16 (1) (*k*) the training received by each worker.

16 (2) Every licensee shall make the records referred to in subsection (1) available at the uranium mine or mill to the workers and a workers' representative.

16 (3) Every licensee shall retain a record of the training referred to in paragraph (1) (*k*) for the period that the worker is employed at the uranium mine or mill.

16 (4) Every licensee shall post, at a location within the uranium mine or mill that is accessible to all workers and where it is most likely to come to their attention, a record of the measurements made in respect of every work place in accordance with the licence and these Regulations.

OPG's licence application included the information required by sections 3, 4, 5, 11, 12, 13, and 16 of the *Uranium Mines and Mills Regulations*.

C.2 Technical Basis

The recommendations provided in this PMD are based on compliance objectives and expectations associated with the relevant SCAs and other matters. The technical basis for the matters that are relevant to this PMD include Standards and codes as well as regulatory documents as listed below.

Table C.1-1. Standards and codes

Document Title	Document Number
Boiler, pressure vessel, and pressure piping code	B51-09
Environmental management systems – requirements with guidance for use	CSA-ISO 14001/04
Emergency Management and Business Continuity Programs	CSA Z16000-08
Emergency Preparedness and Response	CSA Z-731-03
Environmental Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills	N288.4-10
General requirements for pressure-retaining systems and components in CANDU nuclear power plants/Material Standards for reactor components for CANDU nuclear power plants	N285.0-08, Update Number 2
Management System Requirements for Nuclear Power Plants	N286-05, Update No. 1
Management of Low and Intermediate Level Radioactive Waste.	N292.3-08
Decommissioning of Facilities Containing Nuclear Substances	N294

Table C.1-2. Regulatory documents

Document Title	Document Number
CNSC Regulatory Guide: Measuring Airborne Radon Progeny at Uranium Mines and Mills	G-4
CNSC Regulatory Policy P-290: Managing Radioactive Waste.	P-290
CNSC Regulatory Document / Guidance Document: Public Information and Disclosure	RD/GD 99.3
CNSC Regulatory Guide: Keeping Radiation Exposures and Doses "As Low As Reasonably Achievable" (ALARA)	G-129
CNSC Regulatory Guide: Financial Guarantees for the Decommissioning of Licensed Activities.	G-206
CNSC Regulatory Guide G-217: Licensee Public Information Programs	G-217
CNSC Regulatory Guide: Decommissioning Planning for Licensed Activities	G-219
CNSC Regulatory Guide: Human Factors Verification and Validation Plans	G-278
CNSC Regulatory Standard: Environmental Protection Policies, Programs and Procedures at Class I Nuclear Facilities and Uranium Mines and Mills	S-296
CNSC Regulatory Guide: Assessing the Long-term Safety of Radioactive Waste Management	G-320
CNSD Regulatory Document RD/GD 370: Management of Uranium Mine Waste Rock and Mill Tailings	RD/GD 370
CNSC Regulatory Document: Design of New Nuclear Power Plants	RD-337
International Atomic Energy Agency (IAEA) Safety Guide: Geological Disposal Facilities for Radioactive Waste	SSG-14
International Atomic Energy Agency (IAEA) Safety Guide: Safety Case and Safety Assessment for the Disposal of Radioactive Waste	SSG-23

D. SAFETY AND CONTROL AREA FRAMEWORK

D.1 Safety and Control Areas Defined

The SCAs identified in section 2.1, and discussed in summary in sections 3.1 through 3.14 are comprised of specific areas of regulatory interest which vary between facility or activity types.

The following table provides a high-level definition of each SCA. The specific areas within each SCA are identified in Addendum D.2.

Table D.1-1. SCA framework

Functional Area	Safety and Control Area	Definition
Management	Management System	Covers the framework which establishes the processes and programs required to ensure an organization achieves its safety objectives and continuously monitors its performance against these objectives and fostering a healthy safety culture.
	Human Performance Management	Covers activities that enable effective human performance through the development and implementation of processes that ensure that workers/staff are sufficient in number in all relevant job areas; and have the necessary knowledge, skills, procedures and tools in place to safely carry out their duties.
	Operational Performance	This includes an overall review of the conduct of the licensed activities which for the DGR relates to site preparation and construction. This includes plans for the conduct of those activities that enable effective performance.
Facility and Equipment	Safety Analysis	Maintenance of the safety analysis that supports that overall safety case for the facility. Safety analysis is a systematic evaluation of the potential hazards associated with the conduct of a proposed activity or facility and considers the effectiveness of preventative measures and strategies in reducing the effects of such hazards.
	Physical Design	Relates to activities that impact on the ability of systems, components and structures to meet and maintain their design basis given new information arising over time and taking changes in the external environment into account. For the DGR the activities under the site preparation and construction licence that impact on the ability of the systems, components, and structures under construction to meet and maintain their design basis.

Functional Area	Safety and Control Area	Definition
	Fitness for Service	Covers activities that impact on the physical condition of systems, components and structures to ensure that they remain effective over time. This includes programs that ensure all equipment is available to perform its intended design function when called upon to do so. For the DGR, fitness for service covers the activities that impact on the physical condition of temporary and permanent systems, components and structures that are in use during the site preparation and construction phase to ensure that they remain effective. This includes the commissioning of temporary and permanent systems, components, and structures that will be in use during the construction period; the inspections and maintenance of those same systems, components, and structures during the construction period
Core Control Processes	Radiation Protection	Covers the implementation of a radiation protection program in accordance with the RP Regulations. This program must ensure that contamination and radiation doses received are monitored and controlled.
	Conventional Health and Safety	Covers the implementation of a program to manage workplace safety hazards and to protect personnel and equipment.
	Environmental Protection	Covers programs that identify, control and monitor all releases of radioactive and hazardous substances and effects on the environment from facilities or as the result of licensed activities.
	Emergency Management and Fire Protection.	Covers emergency plans and emergency preparedness programs which exist for emergencies and for non-routine conditions. This also includes any results of exercise participation.
	Waste Management	Covers internal waste-related programs which form part of the facility's operations up to the point where the waste is removed from the facility to a separate waste management facility. Also covers the planning for decommissioning.
	Security	Covers the programs required to implement and support the security requirements stipulated in the regulations, in their license, in orders, or in expectations for their facility or activity.

Functional Area	Safety and Control Area	Definition
	Safeguards	Covers the programs required for the successful implementation of the obligations arising from the Canada/IAEA Safeguards Agreement.
	Packaging and Transport	Programs that cover the safe packaging and transport of nuclear substances and radiation devices to and from the licensed facility.

D.2 Specific Areas for this Facility and/or Activity

The following table identifies the specific areas that comprise each SCA for this PMD.

Table D.1-2. DGR Facility functional areas, SCAs and specific areas.

Functional Areas	Safety and Control Area	Specific Area
Management This functional area addresses the applicant's proposed control and management of the licensed activities in the following three safety and control areas: management system; human performance management; and the conduct of the licensed activities. The licensed activities concern site preparation and construction and related work such as the development of the engineering details and of the details of the construct methods, and the implementation of associated tests and inspections.	Management System	Management System Organizational Structure Performance Assessment, Improvement and Management Review Use of Experience Change Management Safety Culture Records Management Management of Contractors
	Human Performance Management	Human Performance Program Personnel Training and Qualification
	Operating Performance	Conduct of Licensed Activity Procedures Reporting Safe Construction Envelope Accident and Incident Management
Facility and Equipment This functional area concerns the applicant's control and maintenance of SCAs related to: safety analyses; facility design; and the fitness for service of the temporary and permanent systems and equipment that are installed and used in construction activities.	Safety Analysis	Postclosure Safety Analysis Hazard Analysis Environmental Risk Assessment
	Physical Design	Site Characterization Engineering Change Control Equipment Design & Qualification Structure Design and Construction Pressure Boundary Design Human Factors in Design Waste Management Systems Fire Protection System

Functional Areas	Safety and Control Area	Specific Area
	Fitness for Service	Equipment, System and Component Commissioning, Equipment Performance Maintenance Periodic Inspection and Testing
Core Control Processes This functional area concerns eight safety and control programs that ensure the protection of the environment, workers and the public during the site preparation and construction period that is the subject of the current licence application.	Radiation Protection	Not within scope
	Conventional Health and Safety	Performance Practices Awareness
	Environmental Protection	Effluent and Emissions Control (releases) Environmental Management System (EMS) Assessment and Monitoring Protection of the Public
	Emergency Management and Fire Protection	Conventional Emergency Preparedness and Response Nuclear Emergency Response Fire Emergency Preparedness and Response
	Waste Management	Waste Management Practices Decommissioning Plans
	Security	Facilities and Equipment Response Arrangements
	Safeguards	Not within scope
	Packaging and Transport	Not within scope

E. Mapping of applicable CNSC regulations to OPG Submissions

GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS (GNSCR)			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
3 (1) (*a*)	An application for a licence shall contain the following information:	• OPG Letter, K.E. Nash to B. Howden, "Deep Geologic Repository for Low and Intermediate Level Waste (DGR) - Application for the Site Preparation and Construction Licence", CD# 00216-CORR-00531-00033, August 13, 2007	*None*
	the applicant's name and business address;		*None*
3 (1) (*b*)	the activity to be licensed and its purpose;	• OPG Letter, K.E. Nash to B. Howden, "Deep Geologic Repository for Low and Intermediate Level Waste (DGR) - Application for the Site Preparation and Construction Licence", CD# 00216-CORR-00531-00033, August 13, 2007 • Deep Geologic Repository for Low and Intermediate Level Waste – Preliminary Safety Report, OPG 00216-SR-01320-00001 R000, March 2011: – Section 9.2, Site Preparation – Section 9.3 Other Activities Required for Construction – Section 9.4 Construction	**Section 9.2, Site Preparation** 606 IR-LPSC-01-25 363 IR-LPSC-01-26 776 IR-EIS-05-200 **Section 9.3 Other Activities Required for Construction** 363 IR-LPSC-01-45 IR-LPSC-01-27 IR-LPSC-01-28 IR-EIS-01-02 IR-LPSC-01-29 608 IR-LPSC-03-61 823 IR-EIS-06-269 886

GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS (GNSCR)			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			IR-EIS-08-352 957 IR-EIS-09-403 **Section 9.4 Construction** 363 IR-LPSC-01-30 IR-LPSC-01-31 IR-LPSC-01-32 IR-LPSC-01-33 IR-LPSC-01-35 IR-LPSC-01-17 IR-LPSC-01-34 IR-LPSC-01-35 IR-LPSC-01-35 IR-LPSC-01-36 IR-LPSC-01-37 IR-LPSC-01-38 606 IR-LPSC-01-25 IR-LPSC-01-05 IR-LPSC-03-17 949 IR-LPSC-04-64 608 IR-LPSC-03-57 IR-LPSC-03-62 IR-EIS-03-50 IR-EIS-03-50 IR-EIS-03-53 886 IR-EIS-08-381 IR-EIS-08-381 IR-EIS-08-392

GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS (GNSCR)			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			776 IR-EIS-05-187 990 IR-EIS-10-485 759 IR-EIS-04-101
3 (1) (*c*)	the name, maximum quantity and form of any nuclear substance to be encompassed by the licence;	• Evidence not required	
3 (1) (*d*)	a description of any nuclear facility, prescribed equipment or prescribed information to be encompassed by the licence;	Description of the DGR Facility is provided in: • PSR, Chapter 6, Facility Description • PSR, Chapter 17, Engineering Drawings Description of waste inventories and packages to be handled at the DGR Facility is provided in: • PSR, Chapter 5, Waste Inventory • Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository, OPG 00216-REP-03902-00003-R003, December 2010	**PSR, Chapter 6, Facility Description** 704 IR-EIS-04-102 363 IR-LPSC-01-04 IR-LPSC-01-05 IR-LPSC-01-06 IR-LPSC-01-08 IR-LPSC-01-09 IR-LPSC-01-09 IR-LPSC-01-10 IR-LPSC-01-12 IR-LPSC-01-13 IR-LPSC-01-14 IR-LPSC-01-15 IR-LPSC-01-16 IR-LPSC-01-17 IR-LPSC-01-19 IR-LPSC-01-20 IR-LPSC-01-21 IR-LPSC-01-22 IR-LPSC-01-23

GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS (GNSCR)			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			IR-LPSC-01-24 IR-LPSC-01-35 IR-LPSC-01-43 606 IR-LPSC-01-05 IR-LPSC-01-15 IR-LPSC-01-16 IR-LPSC-03-17 IR-LPSC-01-21 IR-LPSC-01-22 608 IR-EIS-03-56 IR-LPSC-03-59 IR-LPSC-03-60 IR-EIS-03-61 IR-EIS-03-62 776 IR-EIS-03-53 IR-EIS-05-187 IR-EIS-05-192 IR-EIS-05-192 IR-EIS-05-200 IR-EIS-05-207 IR-EIS-05-217 IR-EIS-05-229 IR-EIS-05-229 843 IR-EIS-07-285 IR-EIS-07-280 886 IR-EIS-08-352 IR-EIS-08-381 949 IR-EIS-09-472

***GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS* (GNSCR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			IR-LPSC-04-63 IR-EIS-09-409 759 IR-EIS-04-154 IR-EIS-04-151 IR-EIS-04-150 725 IR-EIS-04-134 990 IR-EIS-10-496 793 IR-EIS-05-186 823 IR-EIS-06-269 **PSR, Chapter 5, Waste Inventory** 608 IR-EIS-03-59 IR-EIS-03-50 IR-EIS-03-58 704 IR-EIS-04-99 IR-EIS-04-147 1163 IR-EIS-11-504 IR-EIS-11-509 949 IR-EIS-09-474 823

GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS (GNSCR)			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			IR-EIS-06-260 IR-EIS-06-264 886 IR-EIS-08-342 IR-EIS-08-343 IR-EIS-08-347 IR-EIS-08-348 IR-EIS-08-350 IR-EIS-08-378 990 IR-EIS-10-488 363 IR-EIS-01-33 IR-EIS-01-05 IR-EIS-01-06 IR-EIS-01-07 IR-EIS-01-20 606 IR-EIS-01-06 IR-EIS-01-20 **Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository, OPG 00216-REP-03902-00003-R003, December 2010** 823 IR-EIS-06-263 704 IR-EIS-04-102 IR-EIS-04-107 IR-EIS-04-108 1163 IR-EIS-11-509

***GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS* (GNSCR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			608 IR-EIS-03-50 363 IR-EIS-01-05 IR-EIS-01-06 IR-EIS-01-07 IR-EIS-01-20 606 IR-EIS-01-06 949 IR-EIS-09-474 832 IR-EIS-06-264 IR-EIS-06-262 915 IR-EIS-08-384
		• OPG Letter, A. Sweetnam to JRP Chair, "Deep Geologic Repository (DGR) for Low and Intermediate Level Waste – Security Provisions" (OPG-Confidential), CD# 00216-CORR-00531-00089, April 2011	*None*
3 (1) (*e*)	the proposed measures to ensure compliance with the *Radiation Protection Regulations* and the *Nuclear Security Regulations;*	• PSR, Section 9.4.9.2, Radiological Safety	None
		Since the purpose of the DGR is long-term management of L&ILW, radiological safety during operations is described in the licensing submissions as follows: • PSR, Chapter 6, Facility Description: – Section 6.2.1.2, Waste	**PSR, Chapter 6, Facility Description** **Section 6.2.1.2, Waste Package Receiving Building** 363 IR-LPSC-01-08 **Section 6.3.4 Underground**

GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS (GNSCR)			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		Package Receiving Building – Section 6.3.4 Underground Shaft and Services Area – Section 6.3.5 Emplacement Rooms – Section 6.3.8, Underground Ventilation – Section 6.5.1 (Methods of Surface Waste Package Handling) General – Section 6.5.3, Underground Transfer and Emplacement in Rooms – Section 6.10, Zoning – Section 6.11, Radiation Monitoring • PSR, Section 10.1, Radiation Protection Program: – Section 10.1.1, Keeping Doses ALARA Section 10.1.2, Control of Radiation Exposure and Contamination	**Shaft and Services Area** 608 IR-LPSC-03-60 776 IR-EIS-05-187 **Section 6.3.5 Emplacement Rooms** 776 IR-EIS-05-187 **Section 6.3.8, Underground Ventilation** 759 IR-EIS-04-154 **Section 6.5.1 (Methods of Surface Waste Package** 990 IR-EIS-10-496 **Section 6.5.3, Underground Transfer and Emplacement in Rooms** 363 IR-LPSC-01-16 608 IR-EIS-03-61 **Section 6.10, Zoning** 363 IR-LPSC-01-08 **Section 6.11, Radiation Monitoring** 363

***GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS* (GNSCR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			IR-LPSC-01-23 **PSR, Section 10.1, Radiation Protection Program** 363 IR-LPSC-01-08 IR-LPSC-01-44
3 (1) (*f*)	any proposed action level for the purpose of section 6 of the *Radiation Protection Regulations;*	• PSR, Section 9.4.9.2, Radiological Safety • Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011: – Section 4.2, Estimated Radon Concentration and Doses in the DGR during Construction Phase	**PSR, Section 9.4.9.2, Radiological Safety** *None* **Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011. Section 4.2, Estimated Radon Concentration and Doses in the DGR during Construction Phase** *None*
3 (1) (*g*)	the proposed measures to control access to the site of the activity to be licensed and the nuclear substance, prescribed equipment or prescribed information;	• PSR, Section 2.3, Site Security • PSR, Section 9.2.1, Fencing and Security	**PSR, Section 2.3, Site Security** *None* **PSR, Section 9.2.1, Fencing and Security** *None*
		• OPG Letter, A. Sweetnam to JRP Chair, "Deep Geologic Repository (DGR) for Low and Intermediate Level Waste – Security Provisions" (OPG-Confidential), CD# 00216-CORR-00531-00089, April 2011	*None*

***GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS* (GNSCR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
3 (1) (*h*)	the proposed measures to prevent loss or illegal use, possession or removal of the nuclear substance, prescribed equipment or prescribed information;	• OPG Letter, A. Sweetnam to JRP Chair, "Deep Geologic Repository (DGR) for Low and Intermediate Level Waste – Security Provisions" (OPG-Confidential), CD# 00216-CORR-00531-00089, April 2011	*None*
3 (1) (*i*)	a description and the results of any test, analysis or calculation performed to substantiate the information included in the application;	• PSR, Chapter 3, Site Evaluation and Characterization • PSR Chapter 4, Geoscience • Geosynthesis, NWMO DGR-TR-2011-11 R000, March 2011: – Chapter 2, Geological Framework – Chapter 3, Geomechanical Framework – Chapter 4, Hydrogeochemistry – Chapter 5, Hydrogeology – Chapter 6, Future Evolution of the Bruce Nuclear Site • Descriptive Geosphere Site Model, NWMO DGR-TR-2011-24 R000, March 2011: – Section 1.3, Geoscientific Site Characterization Plan – Section 2.3, DGR Borehole Investigation Program	**PSR, Chapter 3, Site Evaluation and Characterization** 949 IR-EIS-09-417 **PSR Chapter 4, Geoscience** 759 IR-EIS-04-112 902 IR-EIS-08-380 949 IR-EIS-09-419 **Geosynthesis, NWMO DGR-TR-2011-11 R000, March 2011:** **Chapter 2, Geological Framework** 886 IR-EIS-08-315 902 IR-EIS-08-314 949 IR-EIS-09-427

GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS (GNSCR)			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			IR-EIS-09-415 IR-EIS-09-428 886 IR-EIS-08-319 IR-EIS-08-315 793 IR-EIS-05-167 IR-EIS-05-162 IR-EIS-05-165 363 IR-LPSC-01-16 IR-EIS-01-24 523 IR-EIS-02-39 IR-EIS-02-38 990 IR-EIS-10-484 **Chapter 3, Geomechanical Framework** 608 IR-EIS-03-68 IR-EIS-03-73 IR-EIS-03-72 IR-EIS-03-52 **Chapter 4, Hydrogeochemistry** 949 IR-EIS-09-442 IR-EIS-09-435 IR-EIS-09-444 IR-EIS-09-437 363

GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS (GNSCR)			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			IR-EIS-01-17 608 IR-EIS-03-92 IR-EIS-03-72 725 IR-EIS-04-128 **Chapter 5, Hydrogeology** 725 IR-EIS-04-125 IR-EIS-04-100 IR-EIS-04-113 IR-EIS-04-127 949 IR-EIS-09-417 IR-EIS-09-425 523 R-EIS-02-35 793 IR-EIS-05-211 704 IR-EIS-04-126 776 IR-EIS-05-163 363 IR-EIS-01-17 902 IR-EIS-08-357 608 IR-EIS-03-74 IR-EIS-03-92 **Chapter 6, Future Evolution of the Bruce Nuclear Site**

***GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS* (GNSCR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			608 IR-EIS-03-75 IR-EIS-03-52 IR-EIS-03-73 886 IR-EIS-08-319 363 IR-EIS-01-17 **Descriptive Geosphere Site Model, NWMO DGR-TR-2011-24 R000, March 2011:** **Section 1.3, Geoscientific Site Characterization Plan** *None* **Section 2.3, DGR Borehole Investigation Program** *None*
		• PSR, Section 9.4.9.2, Radiological Safety • Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011: – Section 4.2, Estimated Radon Concentration and Doses in the DGR during Construction Phase	*None*
		Since the purpose of the DGR is long-term management of L&ILW, the description of the assessments performed for the DGR during operations phase and after its closure (including the results) are presented in the licensing submissions as follows: • PSR:	**PSR Chapter 7, Preclosure Safety Assessment** 776 IR-EIS-04-112 **Section 7.4, Radiological Safety during Normal Operations** 902 IR-EIS-08-351

GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS (GNSCR)			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		– Chapter 7, Preclosure Safety Assessment ▪ Section 7.4, Radiological Safety during Normal Operations: – Section 7.4.2, Radiological Assessment of Air and Water Emissions from DGR on Public – Section 7.4.3, Radiological Assessment of Air Emissions on Workers – Section 7.4.4, Assessment of External Radiation on Workers and Public – Section 7.4.5, Assumptions and Uncertainty in Normal Operations Assessment ▪ Section 7.5, Accident Assessment – Appendix A, Preclosure Safety Assessment Calculation • Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011: – Section 4.3, Estimated Radon Concentration and Doses in the DGR during Operations Phase	989 IR-EIS-09-463 **Section 7.4.2, Radiological Assessment of Air and Water Emissions from DGR on Public** *None* **Section 7.4.3, Radiological Assessment of Air Emissions on Workers** *None* **Section 7.4.4, Assessment of External Radiation on Workers and Public** 363 IR-EIS-01-26 IR-EIS-01-27 **Section 7.4.5, Assumptions and Uncertainty in Normal Operations Assessment** *None* **Section 7.5, Accident Assessment** 606 Response to IR-LPSC-01-15 IRLPSC-01-16 IR-LPSC-01-21 IR-LPSC-01-22 759 IR-EIS-04-135 832 IR-EIS-06-270

GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS (GNSCR)			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		• Maximum Flood Hazard Assessment, NWMO DGR-TR-2011-35, March 2011	**Appendix A, Preclosure Safety Assessment Calculation** *None* **Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011** **Section 4.3, Estimated Radon Concentration and Doses in the DGR during Operations Phase** *None* **Maximum Flood Hazard Assessment, NWMO DGR-TR-2011-35, March 2011** 363 IR-EIS-01-16 843 IR-EIS-07-283 IR-EIS-07-284 IR-EIS-07-282 759 IR-EIS-04-143
		• PSR, Chapter 8, Postclosure Safety Assessment: – Section 8.6, Normal Evolution Scenario – Section 8.7, Disruptive Scenarios – Section 8.8, Assessment of Uncertainties • Postclosure Safety Assessment, NWMO DGR-TR-2011-25 R000, March 2011:	**PSR, Chapter 8, Postclosure Safety Assessment:** **Section 8.6, Normal Evolution Scenario** 363 IR-EIS-01-19 IR-EIS-01-21 704 IR-EIS-04-152 989 IR-EIS-09-404 IR-EIS-09-463 **Section 8.7, Disruptive**

GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS (GNSCR)			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		– Chapter 6, Assessment Models – Chapter 7, Results and Discussion – Appendix B, Calculation Cases	**Scenarios** 915 IR-EIS-08-335 IR-EIS-08-385 989 IR-EIS-09-460 **Section 8.8, Assessment of Uncertainties** 608 IR-EIS-03-92 **Postclosure Safety Assessment, NWMO DGR-TR-2011-25 R000, March 2011:** *None*
3 (1) (*j*)	the name, quantity, form, origin and volume of any radioactive waste or hazardous waste that may result from the activity to be licensed, including waste that may be stored, managed, processed or disposed of at the site of the activity to be licensed, and the proposed method for managing and disposing of that waste;	• PSR, Chapter 9, Site Preparation and Construction: – Section 9.2.2, Clearing and Grubbing – Section 9.2.3, Site Grading – Section 9.3.2, Stormwater Management – Section 9.3.3, Waste Rock Handling – Section 9.3.4, Conventional and Hazardous Materials Management	**PSR, Chapter 9, Site Preparation and Construction:** **Section 9.2.2, Clearing and Grubbing** *None* **Section 9.2.3, Site Grading** *None* **Section 9.3.2, Stormwater Management** 363 IR-LPSC-01-27 886 IR-EIS-08-352 **Section 9.3.3, Waste Rock**

GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS (GNSCR)			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			Handling 363 IR-LPSC-01-28 **Section 9.3.4, Conventional and Hazardous Materials Management** 363 IR-EIS-01-02 957 IR-EIS-09-403
3 (1) (*k*)	the applicant's organizational management structure insofar as it may bear on the applicant's compliance with the Act and the regulations made under the Act, including the internal allocation of functions, responsibilities and authority;	The overall management approach is described in: • OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011: – Section 1.3, Project Management • Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011: – Chapter 2, Project Management Approach OPG's organizational management structure is described in: • OPG Charter Deep Geological Repository Project Management System , 00216-	**OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011:** *None* **Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011:** **Chapter 2, Project Management Approach** 523 IR-LPSC-02-48 **OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011:** *None* **Design and Construction Phase Management System (OPG's L&ILW DGR),**

GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS (GNSCR)			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		CHAR-0001 R000, March 2011: ▪ Section 1.5.1, Organizational Arrangements ▪ Appendix C, Ontario Power Generation Roles and Responsibilities for Deep Geological Repository Project – Design & Construction Phase NWMO's organizational management structure (as Design and Construction Management company) is described in: • Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011: ▪ Chapter 3, Project Organization during the Design and Construction Phase ▪ Appendix A, Figure 1, L&ILW DGR Design and Construction Project Organization – Construction ▪ Appendix A, Figure 2, NWMO Corporate Functions Supporting DGR Project ▪ Appendix B, Roles and Responsibilities during the Design and Construction Phase	**NWMO DGR-EN-0001 R000, March 2011:** **Chapter 3, Project Organization during the Design and Construction Phase** 523 IR-LPSC-02-48 **Appendix A, Figure 1, L&ILW DGR Design and Construction Project Organization – Construction** *None* **Appendix A, Figure 2, NWMO Corporate Functions Supporting DGR Project** *None* **Appendix B, Roles and Responsibilities during the Design and Construction Phase** *None*

***GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS* (GNSCR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
3 (1) (*l*)	a description of any proposed financial guarantee relating to the activity to be licensed; and	• Deep Geologic Repository for Low and Intermediate Level Waste Financial Guarantee for Post-Construction Decommissioning, attached to OPG Letter, A. Sweetnam to Don Howard, "Submission of Information on Financial Guarantee in Support of OPG's Licence Application for Low and Intermediate Level Waste Deep Geologic Repository", CD# 00216-CORR-00531-00092, April 2011	*None*
3 (1) (*m*)	any other information required by the Act or the regulations made under the Act for the activity to be licensed and the nuclear substance, nuclear facility, prescribed equipment or prescribed information to be encompassed by the licence.	• As required	*None*
3 (1.1) (a)	The Commission or a designated officer authorized under paragraph 37(2)(c) of the Act, may require any other information that is necessary to enable the Commission or the designated	• As required	*None*

***GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS* (GNSCR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
	officer to determine whether the applicant is qualified to carry on the activity to be licensed; or		
3 (1.1) (b)	will, in carrying on that activity, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.	• As required	*None*
15 (*a*)	Every applicant for licence and every licensee shall notify the Commission of the persons who have authority to act for them in their dealings with the Commission.	• OPG Letter from Imtiaz Malek to T. E. Schaubel, D. Howard and P. A. Webster, "Persons Authorized to Act on Behalf of OPG in Dealings with the CNSC", CD# N-CORR-00531-05063, December 3, 2010.	*None*
15 (*b*)	the names and position titles of the persons who are responsible for the management and control of the licensed activity and the nuclear substance, nuclear facility, prescribed equipment or prescribed	• OPG Letter, W. Robbins to M. Leblanc, "Changes in Control and Management of Activities to be Licensed", CD# 00216-CORR-00531-00073, August 12, 2009	*None*

***GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS* (GNSCR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
	information encompassed by the licence.		
27	Every licensee shall keep a record of all information relating to the licence that is submitted by the licensee to the Commission.	• OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011: – Appendix B, Correlation of CSA N286-05 Requirements to OPG Management System	*None*
28	(1) Every person who is required to keep a record by the Act, the regulations made under the Act or a licence shall retain the record for the period specified in the applicable regulations made under the Act or, if no period is specified in the regulations, for the period ending one year after the expiry of the licence that authorizes the activity in respect of which the records are kept. (2) No person shall dispose of a record referred to in the Act, the regulations made under the Act or a licence unless the person	Same as above	*None*

***GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS* (GNSCR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
	(a) is no longer required to keep the record by the Act, the regulations made under the Act or the licence; and (b) has notified the Commission of the date of disposal and of the nature of the record at least 90 days before the date of disposal. (3) A person who notifies the Commission in accordance with subsection (2) shall file the record, or a copy of the record, with the Commission at its request.		

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
3 (*a*)	An application for a licence in respect of a Class I nuclear facility, other than a licence to abandon, shall contain the following information in addition to the information required by section 3 of the *General Nuclear Safety and Control Regulations*:		**PSR Chapter 1, Introduction** 704 IR-EIS-04-102 **Section 6.2, Surface Buildings and Infrastructure** 363 IR-LPSC-01-06 **Section 6.3, Underground Facilities** 523 IR-LPSC-02-55 608 IR-EIS-03-53
	a description of the site of the activity to be licensed, including the location of any exclusion zone and any structures within that zone;	• PSR, Chapter 1, Introduction: – Section 1.2, DGR Project Overview – Figure 1-1, Location of the DGR within the Bruce Nuclear Site – Figure 1-2, DGR Site – Figure 1-3, Schematic of the DGR • PSR, Section 2.1, Site Location and General Description: – Section 2.1.1, DGR Site Location – Section 2.1.2, DGR Site Geology – Section 2.1.3, Bruce Nuclear Site	**PSR, Chapter 1, Introduction:** 704 IR-EIS-04-102 **Section 1.2, DGR Project Overview** *None* **Figure 1-1, Location of the DGR within the Bruce Nuclear Site** *None* **Figure 1-2, DGR Site** *None* **Figure 1-3, Schematic of the DGR** *None* **PSR, Section 2.1, Site**

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		Topography – Figure 2-1, Location of DGR Site Relative to the Bruce NGSs A and B Exclusion Zones • PSR, Chapter 6, Facility Description: – Section 6.2, Surface Buildings and Infrastructure – Section 6.3, Underground Facilities	**Location and General Description:** **Section 2.1.1, DGR Site Location** *None* **Section 2.1.2, DGR Site Geology** *None* **Section 2.1.3, Bruce Nuclear Site Topography** *None* **Figure 2-1, Location of DGR Site Relative to the Bruce NGSs A and B Exclusion Zones** *None* **PSR, Chapter 6, Facility Description:** **Section 6.2, Surface Buildings and Infrastructure** 363 IR-LPSC-01-06 **Section 6.3, Underground Facilities** 523 IR-LPSC-02-55 608 IR-EIS-03-53 IR-LPSC-03-60
3 (*b*)	plans showing the location, perimeter, areas, structures and systems of the	• PSR, Chapter 1, Introduction: – Figure 1-1, Location of the DGR within the	**PSR Chapter 1, Introduction** 704

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
	nuclear facility;	Bruce Nuclear Site – Figure 1-2, DGR Site – Figure 1-3, Schematic of the DGR • PSR, Section 2.1, Site Location and General Description: – Figure 2-1, Location of DGR Site Relative to the Bruce NGSs A and B Exclusion Zones • PSR, Chapter 6, Facility Description: – Figure 6-1, DGR Surface Facilities – Figure 6-2, Layout of DGR Underground Facilities – Figure 6-6, Isometric View of the Repository Level • PSR, Chapter 17, Engineering Drawings – Operations Layout General Arrangement, DWG. No. 11T1076-C-SK1 – Waste Rock Management Area – Site Grading and Drainage, DWG. No. H333000-WP404-10-042-0001, Rev.00	IR-EIS-04-102 **Figure 1-1, Location of the DGR within the Bruce Nuclear Site** *None* **Figure 1-2, DGR Site** *None* **Figure 1-3, Schematic of the DGR** *None* **PSR, Section 2.1, Site Location and General Description:** **Figure 2-1, Location of DGR Site Relative to the Bruce NGSs A and B Exclusion Zones** *None* **PSR, Chapter 6, Facility Description:** **Figure 6-1, DGR Surface Facilities** *None* **Figure 6-2, Layout of DGR Underground Facilities** *None* **PSR, Chapter 17, Engineering Drawings** **Operations Layout General Arrangement, DWG. No. 11T1076-C-SK1** *None*

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		– Waste Rock Management Area – Base Case, DWG. No. H333000-WP404-10-042-0003, Rev.01	**Waste Rock Management Area – Site Grading and Drainage, DWG. No. H333000-WP404-10-042-0001, Rev.00** *None* **Waste Rock Management Area – Base Case, DWG. No. H333000-WP404-10-042-0003, Rev.01** *None*
3 (*c*)	evidence that the applicant is the owner of the site or has authority from the owner of the site to carry on the activity to be licensed;	• Proof of land ownership showing evidence that OPG owns the land on which the proposed DGR is to be built is attached to OPG Letter, A. Sweetnam to JRP Chair, "Submission of Information in Support of OPG's Licence Application for a Deep Geologic Repository for Low and Intermediate Level Waste", CD# 00216-CORR-00531-00090, April 2011, Attachment 2, "Proof of Land Ownership".	*None*
3 (*d*)	the proposed quality assurance program for the activity to be licensed;	• PSR, Chapter 11, Quality Assurance: – Section 11.3, Design and Construction Phase • OPG Charter - Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011	**PSR, Chapter 11, Quality Assurance:** **Section 11.3, Design and Construction Phase** 523 IR-LPSC-02-55 OPG Charter - Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		• Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011	*None* Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011 *None*
3 (*e*)	the name, form, characteristics and quantity of any hazardous substances that may be on the site while the activity to be licensed is carried on;	• PSR, Chapter 9, Site Preparation and Construction: – Section 9.3.4, Conventional and Hazardous Materials Management	**PSR, Chapter 9, Site Preparation and Construction:** **Section 9.3.4, Conventional and Hazardous Materials Management** 363 IR-EIS-01-02 957 IR-EIS-09-403
3 (*f*)	the proposed worker health and safety policies and procedures;	• Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011: ▪ Section 4.1.2.1, Health and Safety Policy, NWMO-POL-WM-0002 – Section 4.2.7.2, Health and Safety Management Plan, DGR-PLAN-08962-0001	**Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011:** **Section 4.1.2.1, Health and Safety Policy, NWMO-POL-WM-0002** *None* **Section 4.2.7.2, Health and Safety Management Plan, DGR-PLAN-08962-0001** *None*
		• PSR, Chapter 10, Operational Programs: – Section 10.1, Radiation Protection Program – Section 10.2,	**PSR, Chapter 10, Operational Programs:** **Section 10.1, Radiation Protection Program** 363

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		Conventional Occupational Health and Safety Program	IR-LPSC-01-08 IR-LPSC-01-44 **Section 10.2, Conventional Occupational Health and Safety Program** *None*
3 (*g*)	the proposed environmental protection policies and procedures;	• Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011: – Section 4.1.5.1, Environment Policy NWMO-POL-ES-0001	*None*
		• PSR, Chapter 10, Operational Programs: – Section 10.3, Environmental Protection Program	**PSR, Chapter 10, Operational Programs:** **Section 10.3, Environmental Protection Program** 608 IR-EIS-03-67
3 (*h*)	the proposed effluent and environmental monitoring programs;	• Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011: – Section 4.1.5.1, Environment Policy NWMO-POL-ES-0001 • DGR EA Follow-up Monitoring Program, NWMO DGR-TR-2011-10, March 2011	**Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011:** **Section 4.1.5.1, Environment Policy NWMO-POL-ES-0001** *None* **DGR EA Follow-up Monitoring Program, NWMO DGR-TR-2011-10, March 2011**

CLASS I NUCLEAR FACILITIES REGULATIONS **(C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		• PSR, Chapter 10, Operational Programs: – Section 10.4, Monitoring Program	795 IR-EIS-06-235 IR-EIS-06-237 608 IR-EIS-03-67 IR-EIS-03-57 886 IR-EIS-08-395 843 IR-EIS-07-301 793 IR-EIS-05-173 IR-EIS-05-172 776 IR-EIS-05-175 IR-EIS-05-174 IR-EIS-05-176 957 IR-EIS-09-411 759 IR-EIS-04-160 363 IR-LPSC-01-24 IR-LPSC-01-23 725 IR-EIS-04-134 832 IR-EIS-06-236 **PSR, Chapter 10, Operational Programs:**

CLASS I NUCLEAR FACILITIES REGULATIONS **(C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			Section 10.4, Monitoring Program 363 IR-EIS-01-32 957 IR-EIS-09-457
3 (*i*)	if the application is in respect of a nuclear facility referred to in paragraph 2(b) of the *Nuclear Security Regulations*, the information required by section 3 of those Regulations;	• Evidence not required	
3 (*j*)	the proposed program to inform persons living in the vicinity of the site of the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from the activity to be licensed; and	• PSR, Chapter 12, Public Information and Involvement Program	**PSR, Chapter 12** 363 IR-EIS-01-31 608 IR-EIS-03-70
3 (*k*)	the proposed plan for the decommissioning of the nuclear facility or of the site.	• PSR, Chapter 13, Preliminary Decommissioning Planning	**PSR, Chapter 13, Preliminary Decommissioning Planning** 776 IR-EIS-05-207

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		• Preliminary Decommissioning Plan, NWMO DGR-TR-2011-39 R000, March 2011	608 IR-EIS-03-63 IR-LPSC-03-58 725 IR-EIS-04-155 823 IR-EIS-06-268 1048 IR-EIS-10-492 793 IR-EIS-05-171 363 IR-LPSC-01-46 IR-LPSC-01-47 **Preliminary Decommissioning Plan, NWMO DGR-TR-2011-39 R000, March 2011** 608 IR-LPSC-03-58 776 IR-EIS-05-181 886 IR-EIS-08-364 363 IR-LPSC-01-46 IR-LPSC-01-47
4 (*a*)	An application for a licence to prepare a site for a Class I nuclear facility shall contain the following		

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
	information in addition to the information required by section 3:		
	a description of the site evaluation process and of the investigations and preparatory work that have been and will be done on the site and in the surrounding area;	• PSR, Chapter 3, Site Evaluation and Characterization: • Geosynthesis, NWMO DGR-TR-2011-11 R000, March 2011: – Section 1.1, Background • Descriptive Geosphere Site Model, NWMO DGR-TR-2011-24 R000, March 2011: – Section 1.3, Geoscientific Site Characterization Plan – Section 2.3, DGR Borehole Investigation Program • PSR, Section 3.4, Additional Geoscientific Investigations • Geoscientific Verification Plan, NWMO DGR-TR-2011-38 R000, March 2011	**PSR, Chapter 3, Site Evaluation and Characterization** 949 IR-EIS-09-417 **Geosynthesis, NWMO DGR-TR-2011-11 R000, March 2011:** **Section 1.1, Background** *None* **Descriptive Geosphere Site Model, NWMO DGR-TR-2011-24 R000, March 2011:** **Section 1.3, Geoscientific Site Characterization Plan** *None* **Section 2.3, DGR Borehole Investigation Program** *None* **PSR, Section 3.4, Additional Geoscientific Investigations** *None* **Geoscientific Verification Plan, NWMO DGR-TR-2011-38 R000, March 2011** 843 IR-EIS-07-312 IR-EIS-07-302 608

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			IR-LPSC-03-57 823 IR-EIS-06-266 IR-EIS-06-267 IR-EIS-06-268 523 IR-EIS-02-37
		• PSR, Chapter 2, Site Description: – Section 2.4, Environment Studies – Section 2.5, Atmospheric Environment – Section 2.6, Aquatic Environment – Section 2.7, Terrestrial Environment	**PSR, Chapter 2, Site Description:** **Section 2.4, Environment Studies** *None* **Section 2.5, Atmospheric Environment** *None* **Section 2.6, Aquatic Environment** *None* **Section 2.7, Terrestrial Environment** *None*
4 (*b*)	a description of the site's susceptibility to human activity and natural phenomena, including seismic events, tornadoes and floods;	• PSR, Chapter 2, Site Description: – Section 2.4, Environment Studies – Section 2.5, Atmospheric Environment – Section 2.5.4.8, Severe Weather – Section 2.6, Aquatic Environment – Section 2.7, Terrestrial Environment	**PSR, Chapter 2, Site Description:** **Section 2.4, Environment Studies** *None* **Section 2.5, Atmospheric Environment** *None* **Section 2.5.4.8, Severe Weather** *None* **Section 2.6, Aquatic Environment**

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		– Section 2.8, Social and Economic Environment • PSR, Chapter 4, Geoscience: – Section 4.1.1.12, Natural Resources – Section 4.1.1.7, Seismicity – Section 4.5.2, Geologic Disturbances – Section 4.5.4.3, Long-Term Cavern and Pillar Stability • Geosynthesis, NWMO DGR-TR-2011-11 R000, March 2011: – Chapter 3, Geomechanical Framework – Chapter 4, Hydrogeochemistry – Chapter 5, Hydrogeology – Chapter 6, Future Evolution of the Bruce Nuclear Site • PSR, Chapter 7, Preclosure Safety Assessment – Section 7.5.1, Hazard Identification – Bounding Scenarios	*None* **Section 2.7, Terrestrial Environment** *None* **Section 2.8, Social and Economic Environment** *None* **PSR, Chapter 4, Geoscience:** **Section 4.1.1.12, Natural Resources** *None* **Section 4.1.1.7, Seismicity** *None* **Section 4.5.2, Geologic Disturbances** 363 IR-LPSC-01-01 IR-LPSC-01-03 608 IR-EIS-03-75 **Section 4.5.4.3, Long-Term Cavern and Pillar Stability** 990 IR-EIS-10-484 **Geosynthesis, NWMO DGR-TR-2011-11 R000, March 2011:** **Chapter 3, Geomechanical Framework** 608 IR-EIS-03-68

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		• PSR, Chapter 8, Postclosure Safety Assessment: – Section 8.7, Disruptive Scenarios • Postclosure Safety Assessment, NWMO DGR-TR-2011-25 R000, March 2011 – Section 4.3, Geological Setting – Section 4.4, Surface Environment	IR-EIS-03-73 IR-EIS-03-72 IR-EIS-03-52 **Chapter 4, Hydrogeochemistry** 949 IR-EIS-09-442 IR-EIS-09-435 IR-EIS-09-444 IR-EIS-09-437 363 IR-EIS-01-17 608 IR-EIS-03-92 IR-EIS-03-72 725 IR-EIS-04-128 **Chapter 5, Hydrogeology** 725 IR-EIS-04-125 IR-EIS-04-100 IR-EIS-04-113 IR-EIS-04-127 949 IR-EIS-09-417 IR-EIS-09-425 523 R-EIS-02-35 793

CLASS I NUCLEAR FACILITIES REGULATIONS **(C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			IR-EIS-05-211 704 IR-EIS-04-126 776 IR-EIS-05-163 363 IR-EIS-01-17 902 IR-EIS-08-357 608 IR-EIS-03-74 IR-EIS-03-92 **Chapter 6, Future Evolution of the Bruce Nuclear Site** 608 IR-EIS-03-75 IR-EIS-03-52 IR-EIS-03-73 886 IR-EIS-08-319 363 IR-EIS-01-17 909 **PSR, Chapter 7, Preclosure Safety Assessment** **Section 7.5.1, Hazard Identification – Bounding Scenarios** *None* **PSR, Chapter 8, Postclosure Safety**

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			Assessment: **Section 8.7, Disruptive Scenarios** 915 IR-EIS-08-335 IR-EIS-08-385 989 IR-EIS-09-460 **Postclosure Safety Assessment, NWMO DGR-TR-2011-25 R000, March 2011** **Section 4.3, Geological Setting** *None* **Section 4.4, Surface Environment** *None*
4 (*c*)	the proposed program to determine the environmental baseline characteristics of the site and the surrounding area;	• PSR, Section 2.4, Environment Studies – Section 2.4.1, Introduction	**PSR, Section 2.4, Environment Studies** **Section 2.4.1, Introduction** *None*
4 (*d*)	the proposed quality assurance program for the design of the nuclear facility; and	• OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011: – Section 1.8.1, Design – Appendix B, Correlation of CSA N286-05 Requirements to OPG	**OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011:** **Section 1.8.1, Design** **Appendix B, Correlation of CSA N286-05 Requirements to OPG Management System**

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		Management System • Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011: – Section 4.1, NWMO Corporate Governance Applicable to the DGR Project: ▪ Section 4.1.3, Quality Assurance Governance ▪ Section 4.1.4, Engineering and Technical Governance – Section 4.2, NWMO DGR Project- Specific Governance: ▪ Section 4.2.1, Engineering Project Management Governance ▪ Section 4.2.2, DGR Project Change Control, DGR-PROC-00740-0001 • PSR, Chapter 11, Quality Assurance – Section 11.3, Design and Construction Phase	*None* **Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011:** **Section 4.1, NWMO Corporate Governance Applicable to the DGR Project:** **Section 4.1.3, Quality Assurance Governance** 523 IR-LPSC-02-51 **Section 4.1.4, Engineering and Technical Governance** *None* **Section 4.2, NWMO DGR Project- Specific Governance:** **Section 4.2.1, Engineering Project Management Governance** *None* **Section 4.2.2, DGR Project Change Control, DGR-PROC-00740-0001** *None* **PSR, Chapter 11, Quality Assurance:** **Section 11.3, Design and Construction Phase** 523 IR-LPSC-02-55

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
4 (*e*)	the effects on the environment and the health and safety of persons that may result from the activity to be licensed, and the measures that will be taken to prevent or mitigate those effects.	• PSR, Chapter 9, Site Preparation and Construction: – Section 9.4.9.1, Conventional Safety – Section 9.4.9.2, Radiological Safety • Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011: – Section 4.2, Estimated Radon Concentration and Doses in the DGR during Construction Phase • Preliminary Conventional Safety Assessment, NWMO DGR-TR-2011-37 R000, March 2011: – Section 5.1, Site Preparation – Section 5.2, Construction – Section 5.4, General Safety Management	**PSR, Chapter 9, Site Preparation and Construction:** **Section 9.4.9.1, Conventional Safety** *None* **Section 9.4.9.2, Radiological Safety** *None* **Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011:** **Section 4.2, Estimated Radon Concentration and Doses in the DGR during Construction Phase** *None* **Preliminary Conventional Safety Assessment, NWMO DGR-TR-2011-37 R000, March 2011:** *None*
		• PSR Chapter 6, Facility Description – Section 6.8, Fire and Life Safety • PSR, Chapter 9, Site Preparation and Construction: – Section 9.3.4, Conventional and Hazardous Materials Management	**PSR Chapter 6, Facility Description** **Section 6.8, Fire and Life Safety** 793 IR-EIS-05-186 363 IR-LPSC-01-43 IR-LPSC-01-20 IR-LPSC-01-22

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		– Section 9.3.3, Waste Rock Handling – Section 9.3.2, Stormwater Management – Section 9.4.5.2, Ventilation During Shaft Sinking – Section 9.4.10, Contingency Plans during Construction – Section 9.4.7.3, Ventilation during Lateral Development. – Section 9.4.7.4, Underground Services During Construction	IR-LPSC-01-15 IR-LPSC-01-21 IR-LPSC-01-09 608 IR-EIS-03-60 **PSR, Chapter 9, Site Preparation and Construction:** **Section 9.2.2, Clearing and Grubbing** *None* **Section 9.2.3, Site Grading** *None* **Section 9.3.2, Stormwater Management** 363 IR-LPSC-01-27 886 IR-EIS-08-352 **Section 9.3.3, Waste Rock Handling** 363 IR-LPSC-01-28 **Section 9.3.4, Conventional and Hazardous Materials Management** 363 IR-EIS-01-02 957 IR-EIS-09-403 **Section 9.4.5.2, Ventilation During Shaft Sinking**

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			None **Section 9.4.10, Contingency Plans during Construction** *None* **Section 9.4.7.3, Ventilation during Lateral Development.** 363 IR-LPSC-01-35 **Section 9.4.7.4, Underground Services During Construction** 759 IR-EIS-04-101 886 IR-EIS-08-392
		• OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011: – Section 1.5.2, Safety Culture – Appendix B, Correlation of CSA N286-05 Requirements to OPG Management System • Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011: - Section 4.1.2.1, Health and Safety Policy, NWMO-POL-WM-	**OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011:** **Section 1.5.2, Safety Culture** *None* **Appendix B, Correlation of CSA N286-05 Requirements to OPG Management System** *None* **Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011:** **Section 4.1.2.1, Health and Safety Policy, NWMO-**

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		0002 - Section 4.1.5, Environment Governance - Section 4.1.5.1, Environment Policy, NWMO-POL-ES-0001 - Section 4.1.5.2, Environmental Incident, Spill or Accident – Section 4.1.2.4, Emergency Response Standard, NWMO-STD-WM-0002 – Section 4.2.7.2, Health and Safety Management Plan, DGR-PLAN-08962-0001 – Section 4.2.7.3 Environment Management Plan	**POL-WM-0002** *None* **Section 4.1.5, Environment Governance** **Section 4.1.5.1, Environment Policy, NWMO-POL-ES-0001** *None* **Section 4.1.5.2, Environmental Incident, Spill or Accident** *None* **Section 4.1.2.4, Emergency Response Standard, NWMO-STD-WM-0002** *None* **Section 4.2.7.2, Health and Safety Management Plan, DGR-PLAN-08962-0001** *None* **Section 4.2.7.3 Environment Management Plan** *None*
5 (*a*)	An application for a licence to construct a Class I nuclear facility shall contain the following information in addition to the information required by section 3:		

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
	a description of the proposed design of the nuclear facility, including the manner in which the physical and environmental characteristics of the site are taken into account in the design;	• PSR, Chapter 6, Facility Description • PSR, Chapter 17, Engineering Drawings	**PSR, Chapter 6, Facility Description** 704 IR-EIS-04-102 363 IR-LPSC-01-04 IR-LPSC-01-05 IR-LPSC-01-06 IR-LPSC-01-08 IR-LPSC-01-09 IR-LPSC-01-09 IR-LPSC-01-10 IR-LPSC-01-12 IR-LPSC-01-13 IR-LPSC-01-14 IR-LPSC-01-15 IR-LPSC-01-16 IR-LPSC-01-17 IR-LPSC-01-19 IR-LPSC-01-20 IR-LPSC-01-21 IR-LPSC-01-22 IR-LPSC-01-23 IR-LPSC-01-24 IR-LPSC-01-35 IR-LPSC-01-43 606 IR-LPSC-01-05 IR-LPSC-01-15 IR-LPSC-01-16 IR-LPSC-03-17 IR-LPSC-01-21 IR-LPSC-01-22 608 IR-EIS-03-56 IR-LPSC-03-59 IR-LPSC-03-60 IR-EIS-03-61 IR-EIS-03-62 776 IR-EIS-03-53 IR-EIS-05-187 IR-EIS-05-192 IR-EIS-05-192 IR-EIS-05-200

CLASS I NUCLEAR FACILITIES REGULATIONS **(C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			IR-EIS-05-207 IR-EIS-05-217 IR-EIS-05-229 IR-EIS-05-229 843 IR-EIS-07-285 IR-EIS-07-280 886 IR-EIS-08-352 IR-EIS-08-381 949 IR-EIS-09-472 IR-LPSC-04-63 IR-EIS-09-409 759 IR-EIS-04-154 IR-EIS-04-151 IR-EIS-04-150 725 IR-EIS-04-134 990 IR-EIS-10-496 793 IR-EIS-05-186 823 IR-EIS-06-269 **PSR, Chapter 17, Engineering Drawings** *None*
5 (*b*)	a description of the environmental baseline characteristics of the site and the surrounding area;	• PSR, Section 2.4, Environment Studies – Section 2.4.1, Introduction	*None*

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
5 (*c*)	the proposed construction program, including its schedule;	• PSR, Chapter 9, Site Preparation and Construction: – Section 9.1.2, Construction Program and Schedule – Figure 9-1, DGR Project Site Preparation and Construction Schedule • OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011: – Section 1.10, Construction • Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011: – Section 4.2.7, Construction Governance	**PSR, Chapter 9, Site Preparation and Construction:** **Section 9.1.2, Construction Program and Schedule** *None* **Figure 9-1, DGR Project Site Preparation and Construction Schedule** 363 IR-LPSC-01-25 **OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011:** **Section 1.10, Construction** *None* **Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011:** **Section 4.2.7, Construction Governance** *None*
		• General schedule for the lifecycle of the DGR, attached to OPG Letter, A. Sweetnam to JRP Chair, "Submission of Information in Support of OPG's Licence Application for a Deep Geologic Repository for Low and Intermediate Level Waste", CD# 00216-CORR-00531-00090, April 2011	*None*

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
5 (*d*)	a description of the structures proposed to be built as part of the nuclear facility, including their design and their design characteristics;	• PSR, Chapter 6, Facility Description – Section 6.1.1, DGR Requirements – Section 6.1.2, Applicable Regulations, Standards and Codes – Section 6.2, Surface Buildings and Infrastructure – Section 6.3, Underground Facilities • PSR, Chapter 17, Engineering Drawings	**PSR, Chapter 6, Facility Description** **Section 6.1.1, DGR Requirements** 704 IR-EIS-04-102 **Section 6.1.2, Applicable Regulations, Standards and Codes** *None* **Section 6.2, Surface Buildings and Infrastructure** 363 IR-LPSC-01-06 **Section 6.3, Underground Facilities** 523 IR-LPSC-02-55 608 IR-EIS-03-53 IR-LPSC-03-60 **PSR, Chapter 17, Engineering Drawings** *None*
5 (*e*)	a description of the systems and equipment proposed to be installed at the nuclear facility, including their design and their design operating conditions;	• PSR, Chapter 6, Facility Description: – Section 6.1.1, DGR Requirements – Section 6.1.2, Applicable Regulations, Standards and Codes – Section 6.2, Surface Buildings and	**PSR, Chapter 6, Facility Description** **Section 6.1.1, DGR Requirements** 704 IR-EIS-04-102 **Section 6.1.2, Applicable Regulations, Standards and Codes**

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		Infrastructure – Section 6.3, Underground Facilities – Section 6.5, Transfer Equipment and Emplacement Operations – Section 6.7, Hazardous Materials and Waste – Section 6.8, Fire and Life Safety – Section 6.13, Access Tunnel Closure Walls – Section 6.14, Shaft Seal • PSR, Chapter 17, Engineering Drawings: – Shaft Hoisting Systems: Dia.6500 – Main Shaft Sinking Stage and Bucket Proposed Layout, DWG. No. H333000-WP405-20-035-0001 – Main Shaft: Headframe - Sinking Condition General Arrangement, DWG. No. H333000-WP406-20-042-0003 – Ventilation Shaft: Headframe – Sinking Condition General Arrangement, DWG. No. H333000-WP406-20-042-0008 – Ventilation System:	*None* **Section 6.2, Surface Buildings and Infrastructure** 363 IR-LPSC-01-06 **Section 6.3, Underground Facilities** 523 IR-LPSC-02-55 608 IR-EIS-03-53 IR-LPSC-03-60 **Section 6.5, Transfer Equipment and Emplacement Operations** 990 IR-EIS-10-496 363 IR-LPSC-01-16 608 IR-EIS-03-61 **Section 6.7, Hazardous Materials and Waste** 843 IR-EIS-07-280 **Section 6.8, Fire and Life Safety** 793 IR-EIS-05-186 363 IR-LPSC-01-43 IR-LPSC-01-20

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		Typical Shaft Sinking Ventilation Process Flow Diagram, DWG. No. H333000-WP410-20-030-0002, Rev.00 • Ontario Power Generation's Deep Geologic Repository for Low and Intermediate-Level Waste Project Requirements, NWMO DGR-PDR-00120-0001 R002, September 2010	IR-LPSC-01-22 IR-LPSC-01-15 IR-LPSC-01-21 IR-LPSC-01-09 608 IR-EIS-03-60 **Section 6.13, Access Tunnel Closure Walls** 608 IR-EIS-03-62 759 IR-EIS-04-150 776 IR-EIS-05-207 **Section 6.14, Shaft Seal** *None* **PSR, Chapter 17, Engineering Drawings:** **Shaft Hoisting Systems: Dia.6500 – Main Shaft Sinking Stage and Bucket Proposed Layout, DWG. No. H333000-WP405-20-035-0001** *None* **Main Shaft: Headframe - Sinking Condition General Arrangement, DWG. No. H333000-WP406-20-042-0003** *None* **Ventilation Shaft: Headframe – Sinking Condition General**

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			Arrangement, DWG. No. H333000-WP406-20-042-0008 **Ventilation System: Typical Shaft Sinking Ventilation Process Flow Diagram, DWG. No. H333000-WP410-20-030-0002, Rev.00** *None* **Ontario Power Generation's Deep Geologic Repository for Low and Intermediate-Level Waste Project Requirements, NWMO DGR-PDR-00120-0001 R002, September 2010** 759 IR-EIS-04-145 990 IR-EIS-10-494 IR-EIS-10-485 949 IR-LPSC-04-65 363 IR-LPSC-01-11 IR-LPSC-01-01 IR-LPSC-01-02 IR-LPSC-01-04
5 (*f*)	a preliminary safety analysis report demonstrating the adequacy of the design of the nuclear facility;	• PSR (all)	**PSR (all)** *Over xxx IRs*

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
5 (*g*)	the proposed quality assurance program for the design of the nuclear facility;	• OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011: – Section 1.8.1, Design – Appendix B, Correlation of CSA N286-05 Requirements to OPG Management System • Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011: – Section 4.1, NWMO Corporate Governance Applicable to the DGR Project: ▪ Section 4.1.3, Quality Assurance Governance ▪ Section 4.1.4, Engineering and Technical Governance – Section 4.2, NWMO DGR Project- Specific Governance: ▪ Section 4.2.1, Engineering Project Management Governance ▪ Section 4.2.2, DGR Project Change Control, DGR-PROC-00740-0001	**OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011:** **Section 1.8.1, Design** **Appendix B, Correlation of CSA N286-05 Requirements to OPG Management System** *None* **Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011:** **Section 4.1, NWMO Corporate Governance Applicable to the DGR Project:** **Section 4.1.3, Quality Assurance Governance** 523 IR-LPSC-02-51 **Section 4.1.4, Engineering and Technical Governance** *None* **Section 4.2, NWMO DGR Project- Specific Governance:** **Section 4.2.1, Engineering Project Management Governance** *None* **Section 4.2.2, DGR Project Change Control, DGR-PROC-00740-0001** *None*

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		• PSR, Chapter 11, Quality Assurance – Section 11.3, Design and Construction Phase	**PSR, Chapter 11, Quality Assurance:** **Section 11.3, Design and Construction Phase** 523 IR-LPSC-02-55
5 (*h*)	the proposed measures to facilitate Canada's compliance with any applicable safeguards agreement;	• Evidence not required	*None*
5 (*i*)	the effects on the environment and the health and safety of persons that may result from the construction, operation and decommissioning of the nuclear facility, and the measures that will be taken to prevent or mitigate those effects;	• PSR, Chapter 9, Site Preparation and Construction: – Section 9.4.9.1, Conventional Safety – Section 9.4.9.2, Radiological Safety • Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011: – Section 4.2, Estimated Radon Concentration and Doses in the DGR during Construction Phase	**PSR, Chapter 9, Site Preparation and Construction:** **Section 9.4.9.1, Conventional Safety** *None* **PSR, Section 9.4.9.2, Radiological Safety** *None* **Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011:** **Section 4.2, Estimated Radon Concentration and Doses in the DGR during Construction Phase** *None*
		• Preliminary Conventional Safety Assessment, NWMO DGR-TR-2011-37 R000, March 2011: – Section 5.1, Site	**Preliminary Conventional Safety Assessment, NWMO DGR-TR-2011-37 R000, March 2011:** *None*

CLASS I NUCLEAR FACILITIES REGULATIONS (C1NFR)			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		Preparation – Section 5.2, Construction – Section 5.4, General Safety Management	
		• PSR: – Chapter 7, Preclosure Safety Assessment: ▪ Section 7.4.2, Radiological Assessment of Air and Water Emissions from DGR on Public: ∗ Section 7.4.2.3, Public Dose Results – Air and Water Emissions ▪ Section 7.4.3, Radiological Assessment of Air and Water Emissions on Workers: ∗ Section 7.4.3.3, Estimated Worker Inhalation Dose ▪ Section 7.4.4, Assessment of External Radiation on Workers and Public: ∗ Section 7.4.4.2, External Dose Results ▪ Section 7.4.5, Assumptions and	**PSR Chapter 7, Preclosure Safety Assessment** 776 IR-EIS-04-112 **Section 7.4.2, Radiological Assessment of Air and Water Emissions from DGR on Public** *None* **Section 7.4.2.3, Public Dose Results – Air and Water Emissions** 832 IR-EIS-06-243 IR-EIS-06-245 **Section 7.4.3, Radiological Assessment of Air Emissions on Workers** *None* **Section 7.4.3.3, Estimated Worker Inhalation Dose** *None* **Section 7.4.4, Assessment of External Radiation on Workers and Public** 363 IR-EIS-01-26 IR-EIS-01-27 **Section 7.4.4.2, External Dose Results**

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		Uncertainty in Normal Operations Assessment ▪ Section 7.5, Accident Assessment: * Section 7.5.4, Accident Consequence Assessment Results – Appendix A, Preclosure Safety Assessment Calculation • Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011: – Section 4.3, Estimated Radon Concentration and Doses in the DGR during Operations Phase • Maximum Flood Hazard Assessment, NWMO DGR-TR-2011-35, March 2011	*None* **Section 7.4.5, Assumptions and Uncertainty in Normal Operations Assessment** *None* **Section 7.5, Accident Assessment** 606 Response to IR-LPSC-01-15 IRLPSC-01-16 IR-LPSC-01-21 IR-LPSC-01-22 759 IR-EIS-04-135 832 IR-EIS-06-270 **Section 7.5.4, Accident Consequence Assessment Results** *None* **Appendix A, Preclosure Safety Assessment Calculation** *None* **Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011:** **Section 4.3, Estimated Radon Concentration and Doses in the DGR during Operations Phase** *None* **Maximum Flood Hazard Assessment, NWMO DGR-TR-2011-35, March 2011** *None*

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		• Preliminary ALARA Assessment, NWMO DGR-TR-2011-36 R000, March 2011	363 IR-LPSC-01-07 IR-LPSC-01-39 IR-EIS-01-26 IR-EIS-01-28 IR-LPSC-01-44
		• Preliminary Conventional Safety Assessment, NWMO DGR-TR-2011-37 R000, March 2011 – Section 5.3, Operations – Section 5.4, General Safety Management	*None*
		• PSR, Chapter 9, Site Preparation and Construction: – Section 9.3.4, Conventional and Hazardous Materials Management – Section 9.3.3, Waste Rock Handling – Section 9.3.2, Stormwater Management – Section 9.4.5.2, Ventilation During Shaft Sinking – Section 9.4.10, Contingency Plans during Construction	**PSR, Chapter 9, Site Preparation and Construction:** **Section 9.3.2, Stormwater Management** 363 IR-LPSC-01-27 886 IR-EIS-08-352 **Section 9.3.3, Waste Rock Handling** 363 IR-LPSC-01-28 **Section 9.3.4, Conventional and Hazardous Materials Management** 363 IR-EIS-01-02 957

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			IR-EIS-09-403 **Section 9.4.5.2, Ventilation During Shaft Sinking** *None* **Section 9.4.10, Contingency Plans during Construction** *None*
		• OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011: – Section 1.5.2, Safety Culture – Appendix B, Correlation of CSA N286-05 Requirements to OPG Management System • Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011: - Section 4.1.2.1, Health and Safety Policy, NWMO-POL-WM-0002 – Section 4.1.2.4, Emergency Response Standard, NWMO-STD-WM-0002 - Section 4.1.5, Environment Governance - Section 4.1.5.1, Environment Policy, NWMO-POL-ES-	**OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011:** *None* **Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011:** **Section 4.1.2.1, Health and Safety Policy, NWMO-POL-WM-0002** *None* **Section 4.1.2.4, Emergency Response Standard, NWMO-STD-WM-0002** *None* **Section 4.1.5, Environment Governance** **Section 4.1.5.1, Environment Policy, NWMO-POL-ES-0001** *None* **Section 4.1.5.2, Environmental Incident, Spill or Accident** *None*

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		0001 - Section 4.1.5.2, Environmental Incident, Spill or Accident - Section 4.2.7.2, Health and Safety Management Plan, DGR-PLAN-08962-0001	**Section 4.2.7.2, Health and Safety Management Plan, DGR-PLAN-08962-0001** *None*
		• PSR, Chapter 6, Facility Description: – Section 6.2, Surface Buildings and Infrastructure: ▪ Section 6.2.2, Ventilation Shaft Area ▪ Section 6.2.3, Waste Rock Management Area ▪ Section 6.2.4.8, Stormwater Management System – Section 6.3, Underground Facilities: ▪ Section 6.3.2, Ventilation Shaft ▪ Section 6.3.8, Underground Ventilation – Section 6.7, Hazardous Materials and Waste – Section 6.8, Fire and Life Safety – Section 6.9,	**PSR, Chapter 6, Facility Description:** **Section 6.2, Surface Buildings and Infrastructure:** **Section 6.2.2, Ventilation Shaft Area** 608 IR-LPSC-03-60 **Section 6.2.3, Waste Rock Management Area** *None* **Section 6.2.4.8, Stormwater Management System** 363 IR-LPSC-01-12 IR-LPSC-01-13 608 IR-EIS-03-56 776 IR-EIS-05-192 IR-EIS-05-229 843 IR-EIS-07-285 886

CLASS I NUCLEAR FACILITIES REGULATIONS **(C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		Emergency Response – Section 6.10, Zoning – Section 6.14, Shaft Seal • Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011: – Section 4.1.2.1, Health and Safety Policy, NWMO-POL-WM-0002 – Section 4.1.5, Environment Governance ▪ Section 4.1.5.1, Environment Policy, NWMO-POL-ES-0001 – Section 4.1.2.4, Emergency Response Standard, NWMO-STD-WM-0002 – Section 4.2.7.2, Health and Safety Management Plan, DGR-PLAN-08962-0001 • PSR, Chapter 7, Preclosure Safety Assessment – Section 7.5.6, Preventative and Mitigation Measures – Section 7.6, Contingency Planning	IR-EIS-08-352 949 IR-EIS-09-472 IR-LPSC-04-63 **Section 6.3, Underground Facilities:** **Section 6.3.2, Ventilation Shaft** *None* **Section 6.3.8, Underground Ventilation** 759 IR-EIS-04-154 **Section 6.7, Hazardous Materials and Waste** 843 IR-EIS-07-280 **Section 6.8, Fire and Life Safety** 793 IR-EIS-05-186 363 IR-LPSC-01-43 IR-LPSC-01-20 IR-LPSC-01-22 IR-LPSC-01-15 IR-LPSC-01-21 IR-LPSC-01-09 608 IR-EIS-03-60 **Section 6.9, Emergency Response** 363

CLASS I NUCLEAR FACILITIES REGULATIONS **(C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			IR-LPSC-01-15 608 IR-LPSC-03-61 793 IR-EIS-05-186 823 IR-EIS-06-269 **Section 6.10, Zoning** 363 IR-LPSC-01-08 **Section 6.14, Shaft Seal** *None* **Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011:** **Section 4.1.2.1, Health and Safety Policy, NWMO-POL-WM-0002** *None* **Section 4.1.5, Environment Governance** **Section 4.1.5.1, Environment Policy, NWMO-POL-ES-0001** *None* **Section 4.1.2.4, Emergency Response Standard, NWMO-STD-WM-0002** *None* **Section 4.2.7.2, Health and Safety Management Plan, DGR-PLAN-08962-0001**

CLASS I NUCLEAR FACILITIES REGULATIONS **(C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			None **PSR, Chapter 7, Preclosure Safety Assessment** **Section 7.5.6, Preventative and Mitigation Measures** **Section 7.6, Contingency Planning**
		• PSR, Chapter 10, Operational Programs: – Section 10.1, Radiation Protection Program – Section 10.2, Conventional Occupational Health and Safety Program – Section 10.3, Environmental Protection Program – Section 10.6, Fire Protection Program – Section 10.7, Emergency Preparedness and Emergency Response Program	**PSR, Chapter 10, Operational Programs:** **Section 10.1, Radiation Protection Program** 363 IR-LPSC-01-08 IR-LPSC-01-44 **Section 10.2, Conventional Occupational Health and Safety Program** *None* **Section 10.3, Environmental Protection Program** 608 IR-EIS-03-67 **Section 10.6, Fire Protection Program** *None* **Section 10.7, Emergency Preparedness and Emergency Response Program** 823 IR-EIS-06-269

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
5 (*j*)	the proposed location of points of release, the proposed maximum quantities and concentrations, and the anticipated volume and flow rate of releases of nuclear substances and hazardous substances into the environment, including their physical, chemical and radiological characteristics;	• PSR, Chapter 9, Site Preparation and Construction: – Section 9.3.4, Conventional and Hazardous Materials Management – Section 9.3.3, Waste Rock Handling	**PSR, Chapter 9, Site Preparation and Construction:** **Section 9.3.4, Conventional and Hazardous Materials Management** 363 IR-EIS-01-02 957 IR-EIS-09-403 **Section 9.3.3, Waste Rock Handling** 363 IR-LPSC-01-28
		• PSR, Chapter 7, Preclosure Safety Assessment: – Section 7.4, Radiological Safety during Normal Operations: ▪ Section 7.4.2.1, Source Terms - Air and Water Release Rates	**PSR Chapter 7, Preclosure Safety Assessment** 776 IR-EIS-04-112 **Section 7.4, Radiological Safety during Normal Operations** 902 IR-EIS-08-351 989 IR-EIS-09-463 **Section 7.4.2.1, Source Terms - Air and Water Release Rates** 363 IR-EIS-01-08

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
5 (*k*)	the proposed measures to control releases of nuclear substances and hazardous substances into the environment;	• PSR, Chapter 9, Site Preparation and Construction: – Section 9.3.4, Conventional and Hazardous Materials Management – Section 9.3.3, Waste Rock Handling • Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011: – Section 4.1.5.1, Environment Policy, NWMO-POL-ES-0001	**PSR, Chapter 9, Site Preparation and Construction:** **Section 9.3.4, Conventional and Hazardous Materials Management** 363 IR-EIS-01-02 957 IR-EIS-09-403 **Section 9.3.3, Waste Rock Handling** 363 IR-LPSC-01-28 **Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011:** **Section 4.1.5.1, Environment Policy, NWMO-POL-ES-0001** *None*
		• PSR, Chapter 6, Facility Description: – Section 6.2, Surface Buildings and Infrastructure: ▪ Section 6.2.2, Ventilation Shaft Area ▪ Section 6.2.3, Waste Rock Management Area ▪ Section 6.2.4.8, Stormwater	**PSR, Chapter 6, Facility Description:** **Section 6.2, Surface Buildings and Infrastructure:** **Section 6.2.2, Ventilation Shaft Area** 608 IR-LPSC-03-60 **Section 6.2.3, Waste Rock Management Area** *None*

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		Management System – Section 6.3, Underground Facilities: ▪ Section 6.3.2, Ventilation Shaft ▪ Section 6.3.8, Underground Ventilation – Section 6.7, Hazardous Materials and Waste • PSR, Chapter 17, Engineering Drawings: – Ventilation System: Typical Shaft Sinking Ventilation Process Flow Diagram, DWG. No. H333000-WP410-20-030-0002, Rev.00 • PSR, Chapter 10, Operational Programs: – Section 10.3, Environmental Protection Program	**Section 6.2.4.8, Stormwater Management System** 363 IR-LPSC-01-12 IR-LPSC-01-13 608 IR-EIS-03-56 776 IR-EIS-05-192 IR-EIS-05-229 843 IR-EIS-07-285 886 IR-EIS-08-352 949 IR-EIS-09-472 IR-LPSC-04-63 **Section 6.3, Underground Facilities:** **Section 6.3.2, Ventilation Shaft** *None* **Section 6.3.8, Underground Ventilation** 759 IR-EIS-04-154 **Section 6.7, Hazardous Materials and Waste** 843 IR-EIS-07-280 **PSR, Chapter 17, Engineering Drawings:** **Ventilation System: Typical**

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
			Shaft Sinking Ventilation Process Flow Diagram, DWG. No. H333000-WP410-20-030-0002, Rev.00 *None* **PSR, Chapter 10, Operational Programs:** **Section 10.3, Environmental Protection Program** 608 IR-EIS-03-67
5 (*l*)	the proposed program and schedule for recruiting, training and qualifying workers in respect of the operation and maintenance of the nuclear facility;	• Design and Construction Phase Management System (OPG's L&ILW DGR), NWMO DGR-EN-0001 R000, March 2011: – Section 4.1.1, Competency, Performance and Training Governance – Section 4.2.6.1, Training Management Plan, DGR-PLAN-08920-0001 – Section 4.2.8.2, Commissioning Management Plan	*None*

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		• PSR, Chapter 10, Operational Programs: – Section 10.5, Staffing and Training Program	*None*
5 (*m*)	a description of any proposed full-scope training simulator for the nuclear facility.	• Evidence not required	*None*
14 (1)	Every licensee shall keep a record of the results of the effluent and environmental monitoring programs referred to in the licence.	• OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011: – Appendix B, Correlation of CSA N286-05 Requirements to OPG Management System	*None*
14 (2)	Every licensee who operates a Class I nuclear facility shall keep a record of (a) operating and maintenance procedures; (b) the results of the commissioning program referred to in the licence; (c) the results of the inspection and maintenance programs referred to in the licence; (d) the nature and	• OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011: – Appendix B, Correlation of CSA N286-05 Requirements to OPG Management System • PSR, Section 10.9, Records and Document Control	*None*

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
	amount of radiation, nuclear substances and hazardous substances within the nuclear facility; and (e) the status of each worker's qualifications, requalification and training, including the results of all tests and examinations completed in accordance with the licence.		
14 (3)	Every licensee who decommissions a Class I nuclear facility shall keep a record of […]	• Evidence not required	
14 (4)	Every person who is required by this section to keep a record referred to in paragraph (2)(a) to (d) or (3)(a) to (d) shall retain the record for 10 years after the expiry date of the licence to abandon issued in respect of the Class I nuclear facility.	• OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011: – Appendix B, Correlation of CSA N286-05 Requirements to OPG Management System • Preliminary Decommissioning Plan, , NWMO DGR-TR-2011-39 R000, March 2011: – Chapter 13, Documentation	**OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011:** **Appendix B, Correlation of CSA N286-05 Requirements to OPG Management System** *None* **Preliminary Decommissioning Plan, , NWMO DGR-TR-2011-39 R000, March 2011:** **Chapter 13, Documentation (Records)** *None*

***CLASS I NUCLEAR FACILITIES REGULATIONS* (C1NFR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		(Records)	
14 (5)	Every person who is required by this section to keep a record referred to in paragraph (2)(e) or (3)(e) shall retain the record for the period that the worker is employed by the licensee and for five years after the worker ceases to be so employed.	• OPG Charter Deep Geological Repository Project Management System , 00216-CHAR-0001 R000, March 2011: – Appendix B, Correlation of CSA N286-05 Requirements to OPG Management System	*None*

***RADIATION PROTECTION REGULATIONS* (RPR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
4 (*a*)	Every licensee shall implement a radiation protection program and shall, as part of that program, keep the amount of exposure to radon progeny and the effective dose and equivalent dose received by and committed to persons as low as is reasonable achievable, social and economic factors being taken into account, through implementation of (i) management control over work practices, (ii) personnel qualification and training, (iii) control of occupational and public exposure to radiation, and (iv) planning for unusual situations; and	• PSR, Chapter 9, Site Preparation and Construction: – Section 9.4.9.2, Radiological Safety • Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011: – Section 4.2, Estimated Radon Concentration and Doses in the DGR during Construction Phase	**PSR, Section 9.4.9.2, Radiological Safety** *None* **Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011:** **Section 4.2, Estimated Radon Concentration and Doses in the DGR during Construction Phase** *None*

***RADIATION PROTECTION REGULATIONS* (RPR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
		• PSR, Chapter 10, Operational Programs: – Section 10.1, Radiation Protection Program	**PSR, Chapter 10, Operational Programs:** **Section 10.1, Radiation Protection Program** 363 IR-LPSC-01-08 IR-LPSC-01-44
4 (*b*)	ascertain the quantity and concentration of any nuclear substance released as result of the licensed activity (i) by direct measurement as a result of monitoring, or (ii) if the time and resources required for direct measurement as a result of monitoring outweigh the usefulness of ascertaining the quantity and concentration using that method, by estimating them.	• PSR, Chapter 9, Site Preparation and Construction: – Section 9.4.9.2, Radiological Safety • Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011: – Section 4.2, Estimated Radon Concentration and Doses in the DGR during Construction Phase • PSR, Section 6.11, Radiation Monitoring • DGR EA Follow Up Monitoring Program – Section 14, Baseline Studies and Pre-Construction Follow Up	**PSR, Section 9.4.9.2, Radiological Safety** *None* **Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011:** **Section 4.2, Estimated Radon Concentration and Doses in the DGR during Construction Phase** *None* **PSR, Section 6.11, Radiation Monitoring** 363 IR-LPSC-01-23 **DGR EA Follow Up Monitoring Program** **Section 14, Baseline Studies and Pre- Construction Follow Up** *None*
5 (1)	For the purpose of keeping a record of doses of radiation in accordance with section 27 of the Act, every licensee shall	• All records pertaining to DGR will be managed in accordance with OPG's records and document control procedures N-PROG-AS-0006 and N-PROC-AS-0042.	**PSR, Section 9.4.9.2, Radiological Safety** *None* **Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011:**

***RADIATION PROTECTION REGULATIONS* (RPR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
	ascertain and record the magnitude of exposure to radon progeny of each person referred to in that section, as well as the effective dose and equivalent dose received by and committed to that person.	• PSR, Section 9.4.9.2, Radiological Safety • Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011: – Section 4.2, Estimated Radon Concentration and Doses in the DGR during Construction Phase	**Section 4.2, Estimated Radon Concentration and Doses in the DGR during Construction Phase** *None*
5 (2)	A licensee shall ascertain the magnitude of exposure to radon progeny and the effective dose and equivalent dose (a) by direct measurement as a result of monitoring; or (b) if the time and resources required for direct measurement as a result of monitoring outweigh the usefulness of ascertaining the amount of exposure and doses using that method, by estimating them.	• PSR, Section 9.4.9.2, Radiological Safety • Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011: – Section 4.2, Estimated Radon Concentration and Doses in the DGR during Construction Phase	**PSR, Section 9.4.9.2, Radiological Safety** *None* **Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011:** **Section 4.2, Estimated Radon Concentration and Doses in the DGR during Construction Phase** *None*

***RADIATION PROTECTION REGULATIONS* (RPR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
6 (1)	In this section, "action level" means a specific dose of radiation or other parameter that, if reached, may indicate a loss of control of part of a licensee's radiation protection program and triggers a requirement for specific action to be taken.	• Evidence not required	*None*
6 (2)	When a licensee becomes aware that an action level referred to in the licence for the purpose of this subsection has been reached, the licensee shall (a) conduct an investigation to establish the cause for reaching the action level; (b) identify and take action to restore the effectiveness of the radiation protection program implemented in accordance with section 4; and	• PSR, Section 9.4.9.2, Radiological Safety • Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011: – Section 4.2, Estimated Radon Concentration and Doses in the DGR during Construction Phase	**PSR, Section 9.4.9.2, Radiological Safety** *None* **Radon Assessment, NWMO DGR-TR-2011-34 R000, March 2011:** **Section 4.2, Estimated Radon Concentration and Doses in the DGR during Construction Phase** *None*

***RADIATION PROTECTION REGULATIONS* (RPR)**			
Paragraph	**Regulatory Requirement**	**OPG Submissions Addressing the Regulatory Requirement**	**Information Supplementing OPG Submissions (JRP IRs & CEAR #)**
	(c) notify the Commission within the period specified in the licence.		

PART TWO

Part Two provides all relevant information pertaining directly to the licence, including:

1. The proposed licence; and
2. The proposed Licence Conditions Handbook (LCH).

PROPOSED LICENCE

Refer to E-DOCS# 3794710 Word

E-DOCS# 4165491 PDF

Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

PDF Ref.: E-DOC 4165491
Word Ref.: E-DOC 3794710
File / Dossier: 2.05

DRAFT WASTE FACILITY CONSTRUCTION LICENCE

ONTARIO POWER GENERATION DEEP GEOLOGIC REPOSITORY FOR LOW AND INTERMEDIATE LEVEL RADIOACTIVE WASTE

I) LICENCE NUMBER: **WFCL-W6-3900.00/2024 (Effective Date:_____)**

II) **LICENSEE:** Pursuant to section 24 of the *Nuclear Safety and Control Act* this licence is issued to:

Ontario Power Generation Inc. (OPG)
700 University Avenue
Toronto, Ontario
M5G 1X6

III) LICENCE PERIOD: This licence is valid from Month day, 201X to Month day, 202X, unless suspended, amended, revoked, replaced or transferred.

IV) LICENSED ACTIVITIES:

This licence authorizes the licensee to:

(i) Prepare a site for, and construct a nuclear facility for the disposal of nuclear substances.

The authorized 'nuclear facility' is specified as a deep geologic repository (hereinafter the "DGR Facility") for the disposal of nuclear substances, namely low- and intermediate-level radioactive waste produced by OPG-owned or operated nuclear power reactors. The DGR Facility is located on OPG-retained lands within the Bruce nuclear site, on the eastern shore of Lake Huron, in the Municipality of Kincardine, Bruce County, Province of Ontario.

(ii) Possess and use prescribed information that is required for, associated with, or arises from the activities described in (i).

V) EXPLANATORY NOTES:

(i) Nothing in this licence shall be construed or interpreted to authorize non-compliance with any other applicable legal obligation or restriction.

(ii) Nothing in this licence shall be construed or interpreted to authorize the DGR Facility to operate, as denoted by the possession, storage, or disposal of low and intermediate level radioactive waste during the period of this licence.

(iii) Unless otherwise provided for in this licence, words and expressions used in this licence have the same meaning as in the *Nuclear Safety and Control Act* (NSCA) and associated Regulations.

(iv) The WFCL-W6-3900.00/2024 Licence Conditions Handbook (LCH) identifies the criteria that will be used by Canadian Nuclear Safety Commission staff (CNSC staff) to assess licensee compliance with the conditions listed in this licence. The LCH also provides information regarding delegation of authority and version control of documents.

VI) CONDITIONS:

1. General

1.1 The licensee shall conduct the activities described in Section IV of this licence in accordance with the licensing basis, as defined in CNSC document INFO-0795 LICENSING BASIS OBJECTIVE AND DEFINITION, unless otherwise approved in writing by the Canadian Nuclear Safety Commission (hereinafter "the Commission") or a person authorized by the Commission.

1.2 The licensee shall give written notification to the Commission or a person authorized by the Commission of any changes made to the documents needed to support the licence application.

1.3 The licensee shall report to the Commission or a person authorized by the Commission any apparent material non-compliance to applicable laws at the federal, provincial or municipal level that pertains to the licensed activities under this licence.

1.4 The licensee shall, in the event of any apparent conflict or inconsistency between licence conditions, codes, standards or regulatory documents referenced in this licence, direct the conflict or inconsistency to the Commission or a person authorized by the Commission for resolution.

1.5 The licensee shall implement and maintain a public information and disclosure program.

1.6 The licensee shall provide a financial guarantee that remains valid, in effect and adequate to fund the future decommissioning of the facility as described in condition 11.2 of this licence that shall be reviewed and updated every five years, or when requested by the Commission or a person authorized by the Commission.

2. Management System

2.1 The licensee shall implement and maintain a management system.

2.2 The licensee shall ensure that all work and contractors working for the DGR Facility comply with this licence and requirements of the NSCA and associated Regulations.

3. Human Performance

3.1 The licensee shall implement and maintain a human performance program.

4. Operating Performance

4.1 The licensee shall ensure that licensed activities are conducted in accordance with DGR Facility plans for site preparation and construction.

4.2 The licensee shall implement and maintain a program for reporting, including the reporting of events required by the NSCA and associated Regulations.

4.3 The licensee shall, within 90 days of the end of the calendar year, submit an annual report summarizing licensed activities for the year.

5. Safety Analysis

5.1 The licensee shall maintain the DGR Facility Safety Case.

6. Physical Design

6.1 The licensee shall implement and maintain a physical design program.

6.2 The licensee shall implement and maintain a pressure boundary program and maintain a formal agreement with an Authorized Inspection Agency deemed acceptable to the Commission or a person authorized by the Commission.

7. Fitness for Service

7.1 The licensee shall implement and maintain safety and control measures for the commissioning and maintenance of the temporary and permanent structures, systems and components.

8. Conventional Health and Safety

8.1 The licensee shall implement and maintain a conventional health and safety program.

8.2 The licensee shall provide to the Commission or a person authorized by the Commission confirmation of compliance with requirements of the Ontario Occupational Health and Safety Act and Regulations relevant to the DGR Facility.

9. Environmental Protection

9.1 The licensee shall implement and maintain an environmental protection program.

9.2 The licensee shall provide to the Commission or a person authorized by the Commission confirmation of compliance with environmental compliance approval requirements of the Ontario Environmental Protection Act and Regulations and Ontario Water Resources Act and Regulations relevant to the DGR Facility.

10. Emergency Management and Fire Protection

10.1 The licensee shall implement and maintain an emergency preparedness and response program.

10.2 The licensee shall implement and maintain a fire protection program.

11. Waste Management

11.1 The licensee shall implement and maintain a waste management program.

11.2 The licensee shall maintain a preliminary decommissioning plan that shall be reviewed and updated every five years, or when requested by the Commission or a person authorized by the Commission.

12. Security

12.1 The licensee shall implement and maintain a security program for the DGR Facility site.

13. Facility Specific

13.1 The licensee shall implement commitments made during the DGR Joint Review Panel process that are applicable to this licence.

13.2 The licensee shall implement the Environmental Assessment decision outcomes that are applicable to this licence.

SIGNED at OTTAWA, this _____of _____, 201X

_____

Stella Swanson
Chair, Joint Review Panel
Deep Geologic Repository for Low- and Intermediate-Level Radioactive Waste Project
On behalf of the Canadian Nuclear Safety Commission

PROPOSED LICENCE CONDITIONS HANDBOOK

Refer to E-DOCS# 3794714 Word

E-DOCS# 4165735 PDF

Canada's Nuclear Regulator

e-DOC 3794714 (Word)
e-DOC 4165735 (PDF)

DRAFT
LICENCE CONDITIONS HANDBOOK

ONTARIO POWER GENERATION (OPG)
DEEP GEOLOGIC REPOSITORY (DGR)

WASTE FACILITY CONSTRUCTION LICENCE (WFCL)

WFCL-W6-3900.00/2024

Revision 0

Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire
Canada

Licence Conditions Handbook **Effective: MONTH DATE, YEAR**

Ontario Power Generation (OPG)
Deep Geologic Repository (DGR)

Waste Facility Construction Licence (WFCL)
WFCL-W6-3900.00/2024

Approved by: **Date**

_____ _____

Peter Elder, Director General
Directorate of Nuclear Cycle and Facilities Regulation (DNCFR)
Canadian Nuclear Safety Commission (CNSC)

Revision History:

Effective Date	Revision	Sections Changed	Description of the Changes	e-DOC
MONTH DAY YR	000-DRAFT	N/A	DRAFT document prepared for public hearing	3794714

TABLE OF CONTENTS

This document is the Licence Conditions Handbook (LCH) for Waste Facility Construction Licence (WFCL) WFCL-W6-3900.00/2024, a licence that authorizes site preparation for and construction of OPG's Deep Geologic Repository (DGR) for Low- and Intermediate-Level Radioactive Waste (L&ILW).

PART A: LCH OVERVIEW

Part A of this LCH for WFCL-W6-3900.00/2024 provides an introduction to the LCH, its purpose, details regarding the delegation of authority by the Canadian Nuclear Safety Commission (Commission), the LCH administrative control process, a description of the sections in the WFCL, and a description of the additional material found in this LCH in support of the licence.

1. BACKGROUND

The licensing philosophy of the Canadian Nuclear Safety Commission (CNSC) requires that licensees be provided with both a licence and an associated LCH. The licence for this facility, a WFCL, contains clear and concise licence conditions, grouped by Safety and Control Area (SCA) which identify programs that shall be implemented and maintained by the licensee to the satisfaction of the Commission. These are based on information submitted in the licence application to demonstrate to the Commission that the applicant has adequate measures in place to fulfill all licensing requirements stipulated under paragraphs 24(4)(a) and (b) of the *Nuclear Safety and Control Act*[1] (NSCA):

- *NSCA* 24(4)(a) "No licence may be issued, renewed, amended or replaced unless, in the opinion of the Commission, the applicant is qualified to carry on the activity that the licence will authorize the licensee to carry on; and…

- *NSCA* 24(4)(b) …will, in carrying on that activity, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed."

The LCH associated with WFCL-W6-3900.00/2024 contains compliance verification criteria, information on delegation of authority to CNSC staff, references to standards and CNSC regulatory documents, references to documents submitted by the licensee in support of the licence application and ongoing licensing requirements that are referenced within the LCH, as well as any commitments made by the licensee to ensure compliance with regulatory expectations.

[1] S.C. 1997, c.9

2. INTRODUCTION

2.1 Purpose

The purpose of this LCH is to provide compliance verification criteria that will be used by CNSC staff to verify compliance with the licence. Its purpose is to establish and consolidate in one document the compliance framework associated with the WFCL. The LCH also clarifies CNSC staff expectations which include defining the licensing basis, explaining the regulatory context related to each licence condition, defining procedures for modifying documents and identifying verification criteria for each licence condition.

This LCH contains:

- a description of each section of the WFCL;
- background information and compliance verification criteria for each licence condition;
- details regarding delegation of authority (see LCH Part A, Section 3);
- references to standards or regulatory documents to be used for compliance verification purposes; and,
- references to documents submitted by the licensee to be used for compliance verification purposes.

The LCH is intended for use by both the licensee and CNSC staff and should be read in conjunction with WFCL-W6-3900.00/2024. The LCH is not intended to introduce new requirements but simply to elaborate upon the requirements in the NSCA, its associated regulations, and the licence.

2.2 Licensee/EPCM Relationship

The licensee has contracted to an Engineering, Procurement, and Construction Management (EPCM) company the activities of designing, procuring items and services, site preparation, construction, and commissioning of the DGR Facility. The contracted company is Nuclear Waste Management Organization (NWMO). As owner and licensee, OPG remains responsible for meeting CNSC regulatory requirements and is accountable and responsible to ensure the health, safety and security of persons and the environment are protected. This responsibility cannot be delegated through contractual arrangements. OPG shall exercise responsibility and accountability through oversight of their EPCM company as it pertains to DGR Facility licensed activities.

OPG's responsibilities are further elaborated under the LCH preamble for Licence Condition 2.1 and Licence Condition 2.2 which outline management system requirements during site preparation and construction.

2.3 Documents Referenced in the LCH

Documents associated with site preparation and construction licensed activities are referenced individually under each licence condition. These documents include licensee programs or other supporting documents as well as standards and regulatory documents. References within these documents (e.g., sub-tier documents to programs, such as implementing documents) may also be used for compliance verification purposes as appropriate as determined by CNSC staff.

In some cases, documents listed may have been developed for use in Nuclear Power Plants (NPP). OPG has selected to use these documents for corporate consistency. These documents may be applied to other nuclear facilities as appropriate with due consideration of the differences in hazard potential and complexity of affected systems compared to those of a NPP.

2.4 Delegation of Authority

The Commission can delegate authority to CNSC staff as long as this authority is delegated under the licence and is within the licensing basis. There are licence conditions within WFCL-W6-3900.00/2024 that use the phrase “a person authorized by the Commission” in order to delegate that authority.

Delegation of this authority has been granted by the Commission to the following CNSC staff:

- Director, Wastes and Decommissioning Division (WDD);
- Director General (DG), Directorate of Nuclear Cycle and Facilities Regulation (DNCFR); and,
- Executive Vice-President (EVP) and Chief Regulatory Operations Officer, Regulatory Operations Branch (ROB).

3. LCH CHANGE CONTROL PROCESS

This section describes the administrative process used to control changes to this LCH.

CNSC staff granted authority by the Commission to approve changes to this LCH include:

- Director, WDD;
- DG, DNCFR; and,
- EVP and Chief Regulatory Operations Officer, ROB.

A request to change this LCH can be initiated by either CNSC staff or the licensee.

Proposed changes to this LCH will be assessed by CNSC staff as follows:

1. The change request will be documented using the Change Request Form (LCH Part F);
2. The review will be coordinated by the senior project officer and appropriate specialists will be consulted for concurrence;
3. For changes proposed by CNSC staff, approval to proceed to the next step will be obtained from the Director WDD, the DG DNCFR or the EVP ROB, as appropriate;
4. The proposed changes will be formally communicated to the licensee;
5. If a dispute related to the proposed changes exists between the licensee and CNSC staff, the following process will be followed:
    - 5.1. A meeting will be scheduled between the parties;
    - 5.2. A decision as to whether to proceed with the LCH changes, including supporting rationale, will be discussed at the meeting and documented by CNSC staff; and
    - 5.3. If either party is not satisfied with the decision noted in 5.2 above, the next stage of the process will be initiated as follows;
        - 5.3.1. A decision will be made by the Director WDD. If the decision is not satisfactory, it will be submitted to the DG DNCFR for resolution.
        - 5.3.2. A decision will be made by the DG DNCFR. If the decision is not satisfactory, it will be submitted to the EVP ROB for resolution.
        - 5.3.3. A decision will be made by the EVP and Chief Regulatory Operations Officer, ROB. If the decision is not satisfactory, it will be submitted to the Commission for resolution during a Commission Meeting. A final decision will be made by the Commission.
6. The LCH will be revised and formally approved by the Director WDD, the DG DNCFR or the EVP ROB, as appropriate;
7. All changes to the LCH and any supporting information will be archived in the CNSC Records Office;
8. The document revision history will be revised in the Revision History section of the LCH;
9. A copy of the amended version of the LCH will be provided to the licensee and made available to CNSC staff.

CNSC staff will report on any changes made to the LCH as part of ongoing reporting to the Commission.

4. COMPLIANCE VERIFICATION FRAMEWORK

CNSC staff will ensure that the licensee complies with the conditions set out in the licence in accordance with CNSC Regulatory Policy Document P-211, *Compliance* (CNSC 2001).

Compliance verification will be conducted against written notification documents referenced within this LCH and as listed in Table 3, Part G of this LCH. Current versions of written notification documents are tracked and can be accessed through the document *OPG – Deep Geologic Repository WFCL Written Notification Documents in LCH* (E-Doc#4101395). This document is controlled by the Wastes and Decommissioning Division (WDD).

Data collection mechanisms for compliance verification include, but are not limited to:

- Conduct of inspections;
- Discussions and interviews with staff associated with the DGR Facility;
- Any reportable events made pursuant to sections 29 and 30 of the *General Nuclear Safety and Control Regulations*[2] (GNSCR);
- Any non-reportable event communicated to the CNSC;
- Any follow-up root cause analyses and resulting corrective action plans;
- Any reports submitted pursuant to a licence condition; and,
- Technical assessments and other information that may be provided to the CNSC.

The compliance verification criteria for each licence condition which are provided in the LCH define the key documents and programs by which compliance with the licence will be assessed. These criteria do not replicate the requirements of the NSCA and the regulations made under the NSCA, although they also apply in all situations. Data collection mechanisms are not replicated in the following sections of this LCH however, they do apply to all aspects of compliance verification for this licence.

In assessing compliance with the licence conditions, CNSC staff apply a risk-informed approach that is focused on the facilities, activities and supporting programs that can impact the safe operation or conduct of activities associated with the DGR Facility, the health and safety of persons, the protection of the environment, and maintenance of site security. The frequency and depth of CNSC verification activities and any subsequent regulatory enforcement will be commensurate with the overall risk.

[2] SOR/2000-202

5. DESCRIPTION OF LICENCE SECTIONS

5.1 SECTION I – LICENCE NUMBER

Section I of the WFCL provides the licence number for the DGR Facility.

The licence number WFCL-W6-3900.00/2024 was developed from the CNSC convention for identifying licences. The following table provides a description of each identifier used in the expression:

Identifier	Description
WFCL	Waste Facility Construction Licence (CMD 01-M17, *Establishing Classes of Licences*)
W6	Describing the waste facility group, as used by WDD (W6 = nuclear facility for the disposal of radioactive waste)
XX	Corresponding to the DGR Facility
00	Licence version number (00 = initial licence; 01 = 1st amendment, etc…)
202X	Expiration year

The DGR Facility has a class code designation associates with a radioactive waste facility that is a Class 1B Nuclear Facility. In the case of the DGR Facility where both site preparation and construction license activities are authorized under the licence, both of these activities are considered under the WFCL class code designation. Note that if there is an amendment to the WFCL, the effective date of the amendment appears on the first page of the WFCL to the right of the Licence Number.

5.2 SECTION II – LICENSEE

Section II of the WFCL provides the name and the address of the person or the corporate entity that holds the licence, hereinafter referred to as “the licensee”. In this case it refers to:

Ontario Power Generation Inc. (OPG)
700 University Avenue
Toronto, Ontario
M5G 1X6

5.3 SECTION III – LICENCE PERIOD

Section III of the WFCL identifies the duration for which the licence is valid, which in this case a ten (10) year period from MONTH DATE, 201X to MONTH DATE, 202X, unless suspended, amended, revoked, replaced or transferred.

5.4 SECTION IV – LICENSED ACTIVITIES

Section IV of the WFCL identifies the activities that are being licensed. This licence authorizes the licensee to prepare a site for, and construct a 'nuclear facility' for the disposal of nuclear substances. The authorized 'nuclear facility' is specified as a deep geologic repository (hereinafter the "DGR Facility") for the disposal of nuclear substances, namely L&ILW produced by OPG-owned or operated nuclear power reactors. The licence application and its supporting documents identifies a total emplaced volume of approximately 200,000 cubic metres (m^3) and that repository emplacement rooms will be constructed at a depth of approximately 680 metres (m) below ground surface (BGS) within the lower member of the Cobourg Formation (low permeability argillaceous limestone).

DGR Facility Location: The location of the DGR Facility and its site preparation and construction activities authorized under WFCL-W6-3900.00/2024 is on licensee-retained lands within the Bruce nuclear site, on the eastern shore of Lake Huron, in the Municipality of Kincardine, Bruce County, Province of Ontario. It is located at a longitude of 81°30' west and latitude 44°20' north. The general arrangement of the DGR Facility site and its surrounding area is provided in drawing 00216-DRAW-00120-10001.

The licence WFCL-W6-3900.00/2024 also authorizes to possess and use prescribed information that is required for, associated with, or arises from the activities described before.

5.5 SECTION V – EXPLANATORY NOTES

Section V of the WFCL provides guidance such as compliance verification criteria for each licence condition and CNSC technical expectations. The LCH is associated with the WFCL without making it a specific licence condition.

The first entry under this section states that nothing in this licence shall be construed or interpreted to authorize non-compliance with any other applicable legal obligation or restriction.

The second entry under this section states that nothing in this licence shall be construed or interpreted to authorize the DGR Facility to operate, as denoted by the possession, storage, or disposal of L&ILW during the period of this licence.

The third entry under this section states that unless otherwise provided for in this licence, words and expressions used in this licence have the same meaning as in the NSCA and associated Regulations. The fourth entry under this section states that the WFCL-W6-3900.00/2024 Licence

Conditions Handbook (LCH) identifies the criteria that will be used by Canadian Nuclear Safety Commission staff (CNSC staff) to assess licensee compliance with the conditions listed in this licence. The LCH also provides information regarding delegation of authority and version control of documents.

5.6 SECTION VI – LICENCE CONDITIONS

Section VI of the WFCL lists the licence conditions that the licensee shall follow. In the licence, conditions have been grouped by general licence conditions, SCA licence conditions, and facility-specific licence conditions.

In this LCH, WFCL-W6-3900.00/2024 licence conditions have been grouped as follows:

- LCH - Part B: General Licence Conditions
- LCH - Part C: SCA Licence Conditions; and,
- LCH - Part D: Facility-Specific Licence Conditions.

For each licence condition noted in LCH Parts B-D, a direct copy of WFCL-W6-3900.00/2024 licence condition wording is provided. This is followed by the following subsections that provide regulatory context, compliance verification criteria, and further guidance and recommendations as further described below:

Preamble: Provides regulatory context related to the licence condition and provides where applicable, reference to related information including the related regulatory requirements contained in the NSCA and associated Regulations.

Compliance Verification Criteria: This section provides information on how to determine compliance against the licence condition. Implementation of programs will be assessed through the CNSC's compliance program and will be measured against performance objectives and regulatory expectations. Any issues or non-compliances that are identified through compliance activities will be managed through the CNSC's compliance program.

Recommendations and Guidance: While recommendations and guidance are non-mandatory, this section refers to industry best practices, CNSC documents and other documents that provide recommendations and guidance associated with protection of the environment, health and safety, and other conditions of the NSCA and its associated Regulations. As these recommendations and guidance are non-mandatory licensees may propose alternate ways to meet the licence condition.

PART B: GENERAL LICENCE CONDITIONS

Part B of this LCH associated with WFCL-W6-3900.00/2024 provides a list of General Licence Conditions with associated compliance verification criteria.

1. GENERAL LICENCE CONDITIONS

1.1 Licensing Basis

Licence Condition 1.1

The licensee shall conduct the activities described in Section IV of this licence in accordance with the licensing basis, as defined in CNSC document INFO-0795 LICENSING BASIS OBJECTIVE AND DEFINITION, unless otherwise approved in writing by the Canadian Nuclear Safety Commission (hereinafter "the Commission") or a person authorized by the Commission.

[WFCL-W6-3900.00/2024, Section IV, 1.1]

Preamble

The Licensing Basis is defined in CNSC Information Document INFO-0795, *Licensing Basis Objective and Definition* (CNSC INFO-0795). The Licensing Basis sets the boundary conditions for acceptable performance at a regulated facility or for a regulated activity and thus establishes the basis for the CNSC's compliance program in respect of that regulated facility or activity.

As defined in CNSC INFO-0795, the licensing basis for a regulatory facility or activity is a set of documents or requirements comprising of:

(i) the regulatory requirements set out in the applicable laws and regulations;

(ii) the conditions and safety and control measures described in the facility's or activity's licence and the documents directly referenced in that licence; and

(iii) the safety and control measures described in the licence application and the documents needed to support that licence application.

Compliance Verification Criteria

Licensed activities shall be conducted in accordance with items (i), (ii), and (iii) of the licensing basis as defined in the above preamble. It is the licensing basis that sets boundary conditions for acceptable performance at a regulated facility or activity, and thus establishes the basis for the CNSC's compliance program in respect of that regulated facility or activity. The licensing basis for a regulated facility or activity is a set of requirements and documents comprising of the requirements set out in the applicable laws and regulations, the conditions and safety and control measures described in the facility's or activity's licence, and the safety and control measures described in the licence application and its supporting documents.

The licensing basis shall align with the following standards and regulatory documents:

Source	Document Title	Document Number	Effective Date
CNSC	Licensing Basis Objective and Definition	INFO-0795	January 2010

The following documents form item (iii) of the licensing basis:

Document Title	Date	Document Number
OPG Correspondence: Licence Application to Prepare Site and Construct a DGR for L&ILW	August 13, 2007	00216-CORR-00531-00033
OPG Correspondence: OPG Submission of Information in Support of OPG's Licence Application for a DGR for L&ILW	April 14, 2011	00216-CORR-00531-00090
OPG Correspondence: Submission of Information on Financial Guarantee in Support of OPG's Licence Application for Low and Intermediate Level Waste Deep Geologic Repository	April 14, 2011	00216-CORR-00531-00092
OPG Correspondence: Updated Information in Support of OPG's Licence Application for a DGR for L&ILW	February 10, 2012	00216-CORR-00531-00101
OPG Correspondence: Corrections to the Information Submitted in Support of OPG's Licence Application for a DGR for L&ILW	February 10, 2012	00216-CORR-00531-00100
Project Requirements	September 2010	NWMO DGR-PDR-00120-0001
Preliminary Safety Report	March 2011	00216-SR-01320-00001
Reference L&ILW Inventory for the DGR	December 2010	00216-REP-03902-00003
Deep Geologic Repository Management System Charter	March 2011 (revised February 2013)	00216-CHAR-0001
L&ILW DGR Project - Project Execution Plan (redacted)	February 2013	00216-PEP-00120-00002

Document Title	Date	Document Number
Design and Construction Phase Project Quality Plan for OPG's DGR for L&ILW	March 17, 2011	NWMO DGR-PLAN-00120-0006
Preliminary Decommissioning Plan	March 2011	NWMO DGR-TR-2011-39
Design and Construction Phase Management System	March 2011 (revised July 2013)	NWMO DGR-PD-EN-0001
OPG Correspondence: Ontario Power Generation's Submission for the Joint Review Panel – DGR Technical Information Session on July 18, 2012.	July 12, 2012	00216-CORR-00531-00123
OPG Correspondence: Revised Ontario Power Generation's Submission for the Joint Review Panel's Modelling Technical Information Session on October 11, 2012.	October 3, 2012	00216-CORR-00531-00142
DGR Project – Commitments Report	It is anticipated that this document will be submitted during the JRP process	NWMO DGR-TR-2013-01
Drawing - General Arrangement of DGR Site and Surrounding Area	July 2013	00216-DRAW-00120-10001

Recommendations and Guidance

Documents needed to support the licence application are those documents which demonstrate that the applicant is qualified to carry out the licensed activity, and that appropriate provisions are in place for the protection of worker and public health and safety, for the protection of the environment, and maintenance of site security.

These documents would include: regulatory documents (such as P-290, G-320, plus others), industry codes and standards (such as CSA standards, National Fire Code of Canada and National Building Code of Canada, plus others); documents submitted by the licensee in support of the licence application and ongoing licensing requirements that are referenced within the LCH; and, any subsequent changes made to these documents in accordance with a CNSC-approved change control process.

1.2 Changes to the documents in support of the licence application

Licence Condition 1.2

The licensee shall give written notification to the Commission or a person authorized by the Commission of any changes made to the documents needed to support the licence application.

[WFCL-W6-3900.00/2024, Section VI, 1.2]

Preamble

During the course of the licensed activities, it is expected that the licensee will periodically make changes to safety and control measures initially described in the licence application and management system documents.

While provisions have been made under this licence condition to allow the licensee to make changes to the safety and control measures, CNSC staff needs to verify that changes remain within the licensing basis. This licence condition requires written notification for any changes to the documents that were submitted in support to the application to meet licensing requirements and to demonstrate the existence of adequate measures in place to carry out the licensed activities.

Compliance Verification Criteria

The licensee shall ensure that adequate oversight of document changes is taking place such that it is clear that requirements of this licence condition are being met.

A list of documents referenced in this LCH is provided in Table 3, Part G of this LCH. Should OPG make any changes to these documents, CNSC written notification is required as follows:

Definition	Description
"N"	written notification is required as the revised document comes into effect.
"P"	written notification prior to implementation and CNSC staff acceptance is required at least 30 days before the revised document comes into effect.

For documents identified as requiring prior written notification and CNSC acceptance, this written notification shall be provided 30 days prior to projected implementation and shall be accompanied by sufficient information to demonstrate that changes remain within the licensing basis. This submission shall include the following information with regards to the propose changes or actions at an appropriate level of information to the extent relevant:

- a summary description of the proposed changes or actions;
- an indication of the duration (temporary or permanent);
- a justification for the proposed changes or actions;
- any relevant documentation in support to the proposed changes or actions;
- an evaluation of the impact on health, safety, security, and the environment; and,
- an evaluation to determine if the effects of the proposed changes or action remain within the licensing basis;

CNSC staff will review and respond to the licensee, using the following criteria to determine if the proposed change against the safety and design envelope is acceptable:

- the proposed change or changes remain within the licensing basis;
- the proposed change or action will be made in accordance with applicable change control processes as noted in Part A, Section 3 of this LCH;
- as a result of the proposed changes, the licensee remains in compliance with the requirements set out in the applicable laws, regulations and licence conditions; and
- in consideration of the proposed changes or action, the licensee remains qualified to carry out the licensed activity; and
- in consideration of the proposed changes or action, the licensee continues to demonstrate adequate provision for the protection of the health and safety of persons, security, and protection of the environment.

Any concerns regarding the document revision for the “P” documents will be brought to the attention of OPG for resolution prior to the document coming into effect.

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
Information Management	NK054-PROG-0016
Standards for Controlled Documents	NWMO-STD-AD-0001

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

1.3 Laws of general application

Licence Condition 1.3

The licensee shall report to the Commission or a person authorized by the Commission any apparent material non-compliance to applicable laws at the federal, provincial or municipal level that pertains to the licensed activities under this licence.

[WFCL-W6-3900.00/2024, Section VI, 1.3]

Preamble

Apparent material non-compliances to applicable federal, provincial and municipal laws shall be reported to ensure potential effects of such non-compliances on safety and environmental protection can be evaluated.

This licence condition is not intended to establish or reiterate reporting requirements as related to the NSCA and its associated regulations, statutes and requirements. See licence condition 4.3 for reporting requirements related to the NSCA.

Compliance Verification Criteria

The licensee shall ensure that adequate oversight of licensed activities is taking place such that it is clear that requirements of this licence condition are being met.

In addition to the NSCA and its associated Regulations, all licensees are subject to other federal, provincial and municipal laws and regulations, including but not limited to the following, where relevant:

- *Fisheries Act*[3] administered by the Department of Fisheries and Oceans Canada and Environment Canada

[3] R.S.C., 1985, c. F-14

- *Canadian Environmental Protection Act, 1999*[4] administered by Environment Canada
- *Explosives Act*[5] administered by Natural Resources Canada
- *Occupational Health and Safety Act*[6] administered by the Ontario Ministry of Labour
- *Ontario Water Resources Act*[7] and *Environmental Protection Act*[8] administered by the Ontario Ministry of Environment
- *Public Lands Act, Endangered Species Act, Lakes and Rivers Improvement Act,* administered by the Ontario Ministry of Natural Resources
- Bruce County Permits and By-Laws
- Municipality of Kincardine By-Laws

Where an apparent material non-compliance occurs, the licensee shall submit to the CNSC copies of the report(s) or notification(s) prepared for other governing regulatory bodies.

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

1.4 Conflicts or inconsistencies with CNSC requirements

Licence Condition 1.4

The licensee shall, in the event of any apparent conflict or inconsistency between licence conditions, codes, standards or regulatory documents referenced in this licence, direct the conflict or inconsistency to the Commission or a person authorized by the Commission for resolution.

[WFCL-W6-3900.00/2024, Section VI, 1.4]

Preamble

In the event of any conflict or inconsistency between licence conditions or any documents referenced in the LCH, the licensee shall direct the conflict or inconsistency to the CNSC for resolution. This includes any apparent conflict or inconsistency with permits or authorizations obtained from other (non-CNSC) regulatory agencies required by applicable laws at the federal, provincial, or municipal level that pertain to site preparation and construction licensed activities.

[4] S.C. 1999, c. 33
[5] R.S.C., 1985, c. E-17
[6] R.S.O. 1990, CHAPTER O.1
[7] R.S.O. 1990, CHAPTER O.40
[8] R.S.O. 1990, CHAPTER E.19

CNSC will communicate with the CSA in the case of any identified conflicts with CSA standards.

The licensee and CNSC staff will discuss any identified conflicts and inconsistencies to ensure a common understanding of CNSC expectations. The resolution of these conflicts and inconsistencies will be documented by CNSC staff and acknowledged by the licensee. A list of resolutions made pursuant to this licence condition will be recorded in Part H of this LCH. This table will be used to record the subject of the conflict or inconsistency and will give the reference to the electronic record of the resolution.

Compliance Verification Criteria

Any conflict or inconsistency identified will be discussed between the licensee and CNSC staff and the outcome of such discussions will be documented within this handbook as described in Part H of this LCH. The LCH will then be revised accordingly and reissued following the administrative control process for LCH revisions as described in Part A of this LCH. CNSC staff will ensure that the licensee is complying with the resolution through compliance activities.

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

1.5 Public information and disclosure program

Licence Condition 1.5

The licensee shall implement and maintain a public information and disclosure program. [WFCL-W6-3900.00/2024, Section VI, 1.5]

Preamble

The primary goal of the public information program, as it relates to the licensed activities, is to ensure that information related to the health, safety and security of persons and the environment, and other issues associated with the lifecycle of nuclear facilities are effectively communicated to the public.

The *General Nuclear Safety and Control Regulations* and the *Class I Nuclear Facilities Regulations*[9] (C1NFR) contain provisions relevant to this SCA. Paragraph 3(j) of the Class I Regs stipulate that an application for a licence, other than a licence to abandon, shall contain, in addition to other information, "the proposed program to inform persons living in the vicinity of the site of the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from the activity to be licensed."

[9] SOR/2000-204

CNSC regulatory document RD/GD-99.3 *Public Information and Disclosure* sets out the regulatory requirements of the CNSC for public information and disclosure program for licensees and applicants. The document also provides guidance on the development and implementation of CNSC requirements for public information programs and disclosure protocols.

The primary goal of this program is to ensure that information related to the health and safety of persons and the environment and other issues associated with the lifecycle of the nuclear facility is effectively communicated to the public.

The licensee shall ensure that adequate oversight is taking place such that it is clear that licence condition requirements for public information and disclosure are being met.

Compliance Verification Criteria

The public information and disclosure program for the DGR Project will be assessed against RD/GD-99.3 *Public Information and Disclosure.*

This program shall also include a commitment to a disclosure protocol in regard to information and reports of interest to the public. The disclosure program shall include timely communication of items of interest to the public such as include routine and non-routine situations, unplanned events and other incidents and activities related to the licensed facility that may be of interest to the public.

Annual updates on the public information and disclosure program for the DGR Project is expected to be included in the annual report of the licensed activities as described in LCH Part A, Section 4.3.

The public information and disclosure program shall comply with the following documents:

Source	Document Title	Document Number	Effective Date
CNSC	Regulatory Document / Guidance Document: Public Information and Disclosure	RD/GD 99.3	March 2012

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
Information Management	NK054-PROG-0016
Internal and External Communication Management	NK054-PROC-0065
Communication Plan	NWMO DGR-PLAN-08510-0004

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

1.6 Financial guarantee

Licence Condition 1.6

The licensee shall provide a financial guarantee that remains valid, in effect and adequate to fund the future decommissioning of the facility as described in condition 11.2 of this licence that shall be reviewed and updated every five years, or when requested by the Commission or a person authorized by the Commission.

[WFCL-W6-3900.00/2024, Section VI, 1.6]

Preamble

Paragraph 3(1)(1) of the GNSCR stipulate that a licence application contains, in addition to other information, “a description of any proposed financial guarantee relating to the activity to be licensed”.

The acceptance process for the financial guarantee is independent of the licence renewal process, and is subject to a separate decision of the Commission.

OPG maintains a consolidated financial guarantee for decommissioning all of its Ontario based nuclear assets. However, OPG’s financial guarantee for the DGR Facility for decommissioning during or after construction is a letter of credit through a third party financial institution. The value of the financial guarantee changes on a sliding scale basis that escalates, as the financial guarantee obligation increases as construction progresses.

CNSC staff will conduct compliance verification activities to verify that requirements of this licence condition are being met.

Compliance Verification Criteria

OPG's plans for providing a decommissioning financial guarantee associated with the licensed activities of site preparation and construction are described in an April 14, 2011 letter from OPG titled *Submission of Information on Financial Guarantee in Support of OPG's Licence Application for Low and Intermediate Level Waste Deep Geologic Repository* (00216-CORR-00531-00092).

Prior to the commencement of licensed activities OPG shall provide a letter of credit that pertains to a constructed facility that would be decommissioned prior to the start of DGR operations.

The financial guarantee for decommissioning is to be reviewed and revised by OPG every five years, when the Commission requires, or following a revision of the preliminary decommissioning plan if it significantly impacts the financial guarantee.

CNSC Regulatory Document G-206, *Financial Guarantees for the Decommissioning of Licensed Activities* (CNSC G-206), sets out guidance on the development of financial guarantees for licensed facilities and activities. OPG's financial guarantee is expected to be compliant with the criteria set out in G-206.

CNSC Regulatory Document G-219, *Decommissioning Planning for Licensed Activities* (CNSC G-219), provides CNSC staff expectations regarding the preparation of decommissioning plans for activities licensed by the CNSC. G-219 also provides the basis for calculating financial guarantees as discussed G-206.

The financial guarantee shall comply with, where relevant, the following standards and regulatory documents:

Source	Document Title	Document Number	Effective Date
CNSC	Regulatory Guidance Document: Financial Guarantees for the Decommissioning of Licensed Activities	G-206	June 2000

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	**Document Number**
OPG Financial Guarantee Letter of Credit	Not Yet Submitted

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

PART C: SAFETY AND CONTROL AREA (SCA) LICENCE CONDITIONS

Part C of this LCH associated with WFCL-W6-3900.00/2024 provides a list of Licence Conditions organized by SCA with associated compliance verification criteria.

2. SCA – MANAGEMENT SYSTEM

The SCA "Management System" covers the framework which establishes the processes and programs required to ensure an organization achieves its safety objectives, continuously monitors its performance against these objectives, as well as, fostering a healthy safety culture.

2.1 Management system requirements for site preparation and construction

Licence Condition 2.1

The licensee shall implement and maintain a management system.

[WFCL-W6-3900.00/2024, Section VI, 2.1]

Preamble

Paragraph 3(d) of the CINFR stipulates that an application for a licence shall contain, in addition to other information, "the proposed quality assurance program for the activity to be licensed".

A management system brings together in a planned, systematic and integrated manner the processes for managing the business and the actions necessary to satisfy those requirements the business shall meet. OPG has developed a project-specific management system integrating the requirements from management system standards for health and safety, environmental protection, security, economic and quality concerns.

The licensee has contracted to an EPCM company (already defined) the activities of designing, procuring items and services, constructing, and commissioning of the DGR Facility. As previously indicated, the contracted company is Nuclear Waste Management Organization (NWMO). The licensee and their EPCM company shall ensure that their management of the DGR Facility under this licence supports the safe conduct of site preparation and construction activities.

The licensee's management system is documented in *Deep Geologic Repository Management System Charter* (0216-CHAR-0001). OPG's EPCM company has documented their management system in *Design and Construction Phase Management System* (NWMO DGR-PD-EN-0001). These two documents as well as the *Project Execution Plan* and *Project Quality Plans* apply across DGR Facility licensed activities and as such have a relevant compliance verification function under licence conditions associated with WFCL-W6-3900.00/2024.

As the owner and the licensee, OPG remains responsible for meeting CNSC regulatory requirements and oversight of their EPCM company as it pertains to DGR licensed activities. OPG remains responsible and accountable to the CNSC to ensure the health, safety and security of persons and the environment are protected, and this responsibility to the CNSC cannot be delegated through contractual arrangements. Licensee oversight activities of their EPCM company may include: audits and assessments, field surveillance, witnessing activities, monitoring, review of plans and deliverables for design, procurement, construction, commissioning, management system, and quality plans.

CNSC staff will conduct compliance verification activities to verify that requirements of this licence condition are being met.

Compliance Verification Criteria

The licensee shall ensure that adequate oversight of licensed activities is taking place such that it is clear that requirements of this licence condition are being met.

CNSC staff considers that an acceptable management system is the implementation of such a system complying with the requirements of the CSA Standard N286-05, *Management System Requirements for Nuclear Power Plants* (CSA N286-05). The licensee and its EPCM shall use CSA N286-05 as basis for their management systems.

CSA N286-05 contains the requirements for a management system to support the conduct of design, site preparation and construction activities associated with the DGR Facility.

Management system compliance verification criteria relevant to the DGR Facility include the following clauses of CSA N286-05:

- Clause 1: Scope
- Clause 2: Management system documents
- Clause 3: Management statement of commitment
- Clause 4: Management assessment of effectiveness
- Clause 5: Management system-generic requirements,
- Clause 6.1: Design including the requirements stated in Annex A of CSA N286-05
- Clause 6.2: Safety Analysis
- Clause 6.4: Purchasing and material management including the requirements stated in Annex B of CSA N286-05
- Clause 6.5: Identification and labelling of systems and components

- Clause 6.7: Construction and Installation including the requirements stated in Annex C of CSA N286-05
- Clause 6.8: Commissioning including the requirements stated in Annex D of CSA N286-05
- Clause 6.9: Turnover
- Clause 6.10: Completion assurance.
- Clause 6.18: Maintenance
- Clause 6.20: Calibration of measuring and monitoring devices
- Clause 6.24: Fire protection
- Clause 6.27: Workplace safety
- Annex G: Supplementary requirements for vendors who no longer use CSA Z299 programs

The management system will also be evaluated against the following:

- The management system shall integrate elements of management so that safety is not compromised.
- Measures shall be established to ensure that licensed activities are correctly performed and provide a consistent basis for making decisions.
- For items and services purchased by the licensee, the licensee's contractors, and their suppliers and sub-suppliers, the licensee shall ensure that its contractual arrangements include the ability upon written request for CNSC staff to access the premises of these vendors and service providers to conduct compliance verification activities.
- The critical characteristics of items and services used in support of a safety function shall be factually assured.
- Processes shall be implemented for the prevention of counterfeit, fraudulent and suspect items (CFSI) entering the supply chain, including the use of standardized CFSI prevention language in procurement documents.
- Design documentation shall be completed with sufficient time and sufficient details in advance to assure quality of instructions, procedures and drawings prior to the commencement of construction.
- Processes, including audit, witnessing, surveillance, and inspections, are established to oversee licensed activities, and the specific oversight plan shall be documented. This includes oversight by the licensee of the EPCM and the oversight by the EPCM of its workers and sub-contractors.

- The licensee shall have suitable and sufficient technical and managerial competencies to ensure that the safety case for the installation is understood and maintained, and that the EPCM activities of designing, procuring items and services, constructing and commissioning of the DGR Facility meet regulatory requirements.
- The management system is applied to ensure that the results of the site characterization are accurate, complete, reproducible, traceable and verifiable.
- The licensee and EPCM shall ensure that adequate and appropriate resources including manpower and equipment are allocated to each activity based on its significance and complexity and on its possible consequence if it is carried out incorrectly.
- Measures shall be established for the promotion and maintenance of a healthy safety culture.

The management system shall comply with the following standards and regulatory documents:

Source	Document Title	Document Number	Effective Date
CSA	Management System Requirements for Nuclear Power Plants	N286-05, Update No. 1	2007-10-01

The management system shall comply with the following documents and their sub-tier documents. These documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	**Document Number**
Deep Geologic Repository Management System Charter	00216-CHAR-0001
L&ILW DGR Project - Project Execution Plan (redacted)	00216-PEP-00120-00002
Design and Construction Phase Management System	NWMO DGR-PD-EN-0001
Design and Construction Phase Project Quality Plan for OPG's DGR for L&ILW	NWMO DGR-PLAN-00120-0006

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

2.2 Management of contractors

Licence Condition 2.2

The licensee shall ensure that all work and contractors working for the DGR Facility comply with this licence and requirements of the NSCA and associated Regulations.

[WFCL-W6-3900.00/2024, Section VI, 2.2]

Preamble

This licence condition requires that the licensee verify that contractors comply with the applicable conditions of this licence and requirements of the NSCA and associated Regulations.

The licensee has contracted to an EPCM company the activities of designing, procuring items and services, site preparation, construction, and commissioning of the DGR Facility. As previously indicated, the contracted company is NWMO.

Although contractors will perform licensed activities it is the licensee, OPG, that retains responsibility as licensee under the NSCA and associated Regulations. As such, the licensee, OPG, is responsible and accountable to the CNSC to provide the required assurances that the health, safety and security of the public and workers, and the environment are protected. This responsibility to the CNSC cannot be delegated elsewhere through contractual arrangements.

CNSC staff will conduct compliance verification activities to verify that commitments made by OPG during the JRP process regarding the management of contractors are being met.

Compliance Verification Criteria

The licensee shall ensure that adequate oversight of licensed activities is taking place such that it is clear that requirements of this licence condition are being met.

The management of contractors shall be evaluated against the following:

- Oversight is maintained of contractors working for the DGR Facility.
- The licensee shall ensure that work carried out by contractor personnel at the DGR Facility site is approved and monitored under qualified and competent supervision.
- Measures are established to ensure that the activities of suppliers, consultants and contractors, and their quality assurance programs, meet CNSC requirements and expectations
- Contractors are aware and are engaged in arrangements to report incidents
- Contractors have given adequate instructions about hazardous and emergency arrangements.

- The management of contractors shall be evaluated against contractor management programs of the licensee and their EPCM company.

Management of contractors shall comply with the following standards and regulatory documents:

Source	Document Title	Document Number	Effective Date
CSA	Management System Requirements for Nuclear Power Plants	N286-05, Update No. 1	2007-10-01

Management of contractors shall comply with the following documents and their sub-tier documents. These documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
Deep Geologic Repository Management System Charter	00216-CHAR-0001
L&ILW DGR Project - Project Execution Plan (redacted)	00216-PEP-00120-00002
Supply Chain	NK054-PROG-0004
Project Management	NK054-PROG-0009
Continual Improvement	NK054-PROG-0003
Design and Construction Phase Management System	NWMO DGR-PD-EN-0001
Design and Construction Phase Project Quality Plan for OPG's DGR for L&ILW	NWMO DGR-PLAN-00120-0006

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

3. SCA – HUMAN PERFORMANCE MANAGEMENT

The SCA "Human Performance Management" covers activities that enable effective human performance through the development and implementation of processes to ensure that licensee staff members are sufficient in numbers in relevant job areas and have the necessary knowledge, skills, and tools in place to safely carry out their duties.

3.1 Human performance program for site preparation and construction

Licence Condition 3.1

The licensee shall implement and maintain a human performance program.

[WFCL-W6-3900.00/2024, Section VI, 3.1]

Preamble

Human performance refers to the outcome of human behaviour, functions and actions in a specified environment, reflecting the ability of workers and management to meet the system's defined performance under the conditions in which the system will be employed. The licensee is expected to use an integrated approach to the management of human performance. This includes monitoring human performance, taking steps to identify weaknesses in human performance, and implementing corrective actions to address the factors that influence human performance so as to reduce the likelihood of adverse events or situations with human performance as a root cause.

The GNSCR and CINFR require various elements related to human performance:

- GNSCR Paragraph 12(1)(*a*) states that every licensee shall "ensure the presence of a sufficient number of qualified workers to carry on the licensed activity safely and in accordance with the Act, the regulations made under the Act and the licence."
- GNSCR Paragraph 12(1)(*b*) states that every licensee shall "train the workers to carry on the licensed activity in accordance with the Act, the regulations made under the Act and the licence."
- CINFR Paragraph 5(l) states that an application for a licence to construct a Class I nuclear facility shall contain "the proposed program and schedule for recruiting, training and qualifying workers in respect of the operation and maintenance of the nuclear facility."
- CINFR Paragraph 5(*m*) states that an application for a licence to construct a Class I nuclear facility shall contain "the proposed responsibilities of and qualification requirements and training program for workers, including the procedures for the requalification of workers."
- CINFR Paragraph 5(*n*) states that an application for a licence to construct a Class I nuclear facility shall contain "the results that have been achieved in implementing the program for recruiting, training and qualifying workers in respect of the operation and maintenance of the nuclear facility."

CNSC staff will conduct compliance verification activities to verify that requirements of this licence including commitments made by OPG during the JRP process regarding human performance and training are being met.

Compliance Verification Criteria

The licensee shall ensure that adequate oversight of licensed activities is taking place such that it is clear that requirements of this licence condition are being met.

The human performance program is expected to use an integrated approach to implement, maintain and document the following: provision of qualified staff; training and staffing requirements; sufficient number of qualified staff for normal activities and to respond to accident and emergency conditions.

The licensee shall implement, maintain and document a training program to ensure there are sufficient, knowledgeable, qualified, and competent personnel to perform licensed activities and to ensure that personnel are qualified and competent to perform assigned work. This expectation applies to licensee staff as well as contractors working at the DGR Facility site. Training of workers and contractors for site preparation and construction activities shall comply with Clause 5.3 of CSA N286-05, which identifies the requirement for systematically developed training. The human performance program includes the requirement for training to be analyzed, designed, developed, delivered and evaluated in order to establish and meet the qualification and competency requirements for workers associated with site preparation and construction activities for the DGR Facility. Requirements also include establishing and maintaining personnel records in support of training qualification and competency.

The human performance program shall comply with the following standards and regulatory documents:

Source	Document Title	Document Number	Effective Date
CSA	Management System Requirements for Nuclear Power Plants	N286-05, Update No. 1	2007-10-01

Human performance shall comply with the following documents and their sub-tier documents. These documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
Human Resource Management	NK054-PROG-0013
Continual Improvement	NK054-PROG-0003
Project Management	NK054-PROG-0009
Training Management Plan	NWMO DGR-PLAN-08920-1001

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

4. SCA – OPERATING PERFORMANCE

The SCA "Operating Performance" has been modified for this licence which does not include any authorizations for operation. This SCA includes an overall review of the conduct of the licensed activities and the activities that enable effective performance.

4.1 Operating Performance (Conduct of Licensed Activities)

Licence Condition 4.1

The licensee shall ensure that licensed activities are conducted in accordance with DGR Facility plans for site preparation and construction.

[WFCL-W6-3900.00/2024, Section VI, 4.1]

Preamble

Paragraph 3(1)(*b*) of the GNSCR stipulates that an application for a licence shall contain, in addition to other information, "the activity to be licensed and its purpose".

As described in Section IV of the WFCL, the licence authorizes the licensee to prepare the site for and construct the DGR Facility for the future operation of the DGR Facility for L&ILW.

The general arrangement of the DGR Facility site and its surrounding area is provided in drawing 00216-DRAW-00120-10001.

Key elements of DGR Facility site preparation include: grubbing, grading, and fencing; installation of site services and temporary utilities; having in place components of the water management system relevant to site preparation; and, preparation of waste rock management areas.

Key elements of DGR Facility construction include: having fully in place remaining components of the water management system; ground treatment at shaft locations; construction of headframes; installation of temporary shaft sinking hoist houses and temporary winch equipment; installation of temporary main and installation of temporary ventilation shaft ventilation; sinking of main and ventilation shafts; lateral (underground) development; dismantling of temporary structures and equipment; construction of the amenities building (control room), waste package receiving building, and compressor building; establishment of the permanent ventilation system and associated structures; final site grading; road and parking area; radiological zone fencing; the establishment of a connection to Western Waste Management Facility (WWMF); and commissioning and turnover.

CNSC staff will conduct compliance verification activities to verify that requirements of this licence condition are being met.

Compliance Verification Criteria

The licensee shall ensure that adequate oversight of licensed activities is taking place such that it is clear that requirements of this licence condition are being met.

Site preparation and construction activities shall be evaluated against the following:

- The process for constructing structures, systems and components follows accepted construction and project management practices, as well as relevant requirements of CSA N286-05.
- Construction activities are carried out in accordance with drawings and specifications and related work instructions.
- Installation procedures and work instructions are documented, reviewed, and approved.
- Equipment and systems are commissioned in accordance with documentation prepared prior to commissioning.
- Work is carried out according to specified requirements. Controls are implemented to assure that work is carried out under controlled conditions. Preventative and protective measures are implemented to address identified hazards and risks.

Conduct of licensed activities shall comply with the following standards and regulatory documents:

Source	Document Title	Document Number	Effective Date
CSA	Management System Requirements for Nuclear Power Plants	N286-05, Update No. 1	2007-10-01

The following documents describe DGR Facility plans for site preparation and construction. These documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
Preliminary Safety Report	00216-SR-01320-00001
Deep Geologic Repository Management System Charter	00216-CHAR-0001
L&ILW DGR Project - Project Execution Plan (redacted)	00216-PEP-00120-00002
Site Approvals and Engineering	NK054-PROG-0001
Continual Improvement	NK054-PROG-0003
Supply Chain	NK054-PROG-0004
Construction	NK054-PROG-0005
Project Management	NK054-PROG-0009
Human Resource Management	NK054-PROG-0013
Information Management	NK054-PROG-0016
Project Requirements	NWMO DGR-PDR-00120-0001
Design and Construction Phase Management System	NWMO DGR-PD-EN-001
Design and Construction Phase Project Quality Plan for OPG's DGR for L&ILW	NWMO DGR-PLAN-00120-0006
Drawing - General Arrangement of DGR Site and Surrounding Area	00216-DRAW-00120-10001

The following describe DGR Facility plans for site preparation and construction that were not submitted as part of the licence application. They are documents that build upon that submission by providing implementation details required to be in place prior to proceeding with licensed activities. The scope of each document listed in the table below is provided in Table 4 of Part G of this LCH.

Document Title	**Document Number**
DGR Project – Commitments Report	NWMO DGR-TR-2013-01
Commissioning Management Plan	NWMO DGR-PLAN-00920-1001
Construction Management Plan	NWMO DGR-PLAN-00180-1001
Construction Quality Assurance Plan	NWMO DGR-PLAN-01916-1001
Configuration Management Plan	NWMO-PLAN-00160-0001
Procurement Plan	NWMO DGR-PLAN-00800-1001
Training Management Plan	NWMO DGR-PLAN-08920-1001
Emergency Response Plan	NWMO DGR-PLAN-08962-1002
Fire Protection Program	NWMO DGR-PROC-ES-0001-R000
Site Security Plan	NWMO TBD
Repository Development Plan	NWMO TBD
Geotechnical Design Basis	NWMO DGR-REP-01130-31123
Geotechnical Investigation and Rock Monitoring During Construction	NWMO DGR-REP-01130-xxxxx

The licensee shall not carry out the activities referred to in paragraphs (i) and (ii) of Part IV of this licence until these documents are accepted by CNSC staff.

Each document shall be provided to the CNSC no later than 30 days prior to the commencement of licensed activities pertaining to the scope of each document. EPCM company documents also require evidence of OPG review following a documented process. CNSC staff will formally acknowledge receipt of each document submission and will provide comments, as appropriate, in a timely fashion.

CNSC staff will review the above-noted documents in consideration of the following criteria:

- information presented is within the licensing basis as noted in LCH Part B, licence condition 1.1;
- the licensee remains in compliance with the requirements set out in the applicable laws, regulations and licence conditions;
- the licensee remains qualified to carry out the licensed activity;
- the licensee continues to demonstrate adequate provision for the protection of the health and safety of persons, security, and protection of the environment; and,
- subsequent document version control follows the applicable change control processes as noted in Part A, Section 3 of this LCH.

CNSC staff will report document acceptance to the licensee. Once accepted, these documents require written notification of further changes made (see e-Doc 4101395 for the current version of written notification documents).

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

4.2 Event Reporting

Licence Condition 4.2

The licensee shall implement and maintain a program for reporting, including the reporting of events required by the NSCA and associated Regulations.

[WFCL-W6-3900.00/2024, Section VI, 4.2]

Preamble

Section 29 of the GNSCR establishes reporting requirements including the filing of preliminary and detailed reports for situations or events including those described in paragraphs 29(1)(*a*) to 29(1)(*j*).

NK054-PROC-0065 *Internal and External Communications Management* and NK054-PROC-0012 *Corrective and Preventive Action* describe the licensee's controls for managing regulatory reporting to ensure the CNSC, and other regulatory agencies as appropriate, are made aware of adverse situations or events that may occur during the site preparation and construction phase

00216-CHAR-*0001 Deep Geologic Repository Management System Charter* describes the requirement to collect and use industry experiences to critically assess the effectiveness of the management system and for the correction and reporting of problems.

There may arise situations where the licensee becomes aware of a non-compliance with the licence. This section of the LCH provides clarification on how the licensee may meet regulatory expectations for addressing these situations.

Compliance Verification Criteria

Safety and control measures for reporting shall be in compliance with subsections 29(1) and 29(2) of the GNSCR.

As soon as the licensee becomes aware that the situation or event is reportable they shall immediately make a preliminary report to the Commission of the location and circumstances of the situation and of any action that the licensee or their EPCM company has taken or proposes to take with respect to it.

Adverse events or situations are to be investigated to determine the causes and/or root causes and actions will be taken to correct the problem and to prevent or minimize recurrence.

Within twenty-one (21) days of becoming aware of the situation or event, a full report shall be submitted containing the following information:

- Date, time and location of becoming aware of the situation;
- Description of the situation and the circumstances;
- Probable cause of the situation;
- Known or possible effects on the environment, the health and safety of persons and the maintenance of security that have resulted or may result from the situation;
- Actions that the licensee has taken or proposes to take with respect to the situation.

Upon identification of a non-compliance with the licence, when applicable and/or requested by the CNSC, the licensee is expected to submit a corrective action plan (CAP) to address the issue.

The CAP should provide the following information:

- Corrective actions to resolve the non-compliance,
- Corrective actions to prevent reoccurrence of the non-compliance as applicable,
- Estimated completion date,
- The person (job title) responsible for the implementation of the corrective action, and
- Interim compensatory measures (that will provide an equivalent level of safety to the identified non-compliance) to be implemented until the corrective action(s) is fully implemented.
- Estimated completion dates based on the risk to the safety of persons and the protection environment associated with the deficiencies.

Reportable events are expected to be included in the annual report of the licensed activities as described in LCH Part A, Section 4.3. Implementation of the CAP does not release the licensee of its' obligations to report situations as required by the NSCA, the regulations or this licence.

The licensee's EPCM company will also develop its own reporting protocol to the licensee.

Event reporting shall comply with the following standards and regulatory documents:

Source	Document Title	Document Number	Effective Date
CSA	Management System Requirements for Nuclear Power Plants	N286-05, Update No. 1	2007-10-01

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	**Document Number**
Deep Geologic Repository Management System Charter	00216-CHAR-0001
Project Management	NK054-PROG-0009
Continual Improvement	NK054-PROG-0003
Information Management	NK054-PROG-0016
Corrective and Preventive Action	NK054-PROC-0012
Design and Construction Phase Management System	NWMO DGR-PD-EN-0001
Non-Conformance and Corrective and Preventive Action	NWMO-PROC-QA-0001

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

4.3 Annual report for site preparation and construction

Licence Condition 4.3

The licensee shall, within 90 days of the end of the calendar year, submit an annual report summarizing licensed activities for the year.

[WFCL-W6-3900.00/2024, Section VI, 4.3]

Preamble

The purpose of this licence condition is to require the licensee to report on site preparation and construction activities that are being conducted in a manner that protects the health and safety of persons and the environment.

The deadline to submit the annual report will be March 31st of each calendar year during the licence period. The licensee will develop an annotated Table of Contents for the annual report in advance of this submission for CNSC staff review and concurrence.

Compliance Verification Criteria

The annual report on the licensed activities shall include information from the previous calendar year and shall include, but not be limited to, the following information:

- Principal site preparation and construction activities and other relevant supporting activities completed.
- A high-level summary update of the following:
  - Environmental monitoring program (as noted in licence condition 9.1);
  - Environmental Assessment (EA) follow-up program (as noted in licence condition 13.2);
  - Geotechnical investigation and rock program (as noted in licence condition 5.1);
  - Geotechnical Verification Program (as noted in licence condition 5.1);
  - OPG's waste characterization program (as noted in licence condition 5.1);
  - Public information and disclosure program for the DGR Project (as noted in licence condition 1.5);
- Summary of reportable events (as further described under licence condition 4.2), including those reported to other regulatory agencies and actions taken to prevent recurrence;
- Summary of changes to organization, programs, procedures and associated documents;
- Approved changes to the Licence or LCH;

- Revision changes to licensee programs or other supporting documents referenced in the LCH;
- Updated project schedule;
- Summary of permits or authorizations obtained from other (non-CNSC) regulatory agencies required by applicable laws at the federal, provincial, or municipal level that pertain to site preparation and construction licensed activities, including a list of permits and approvals that were obtained for the preceding calendar period; and those anticipated to be applied for and/or obtained during the subsequent calendar period. Note that further requirements exist, under licence condition 9.2, specific to permits or authorizations of the Ontario Ministry of the Environment (MOE).

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

5. SCA – SAFETY ANALYSIS

The SCA "Safety Analysis" is a systematic evaluation of the potential hazards associated with the conduct of a proposed activity or facility and considers the effectiveness of preventative measures and strategies in reducing the effects of such hazards. This includes the maintenance of the safety analysis that supports that overall safety case for the facility. For the purposes of the DGR Facility, this is captured as a requirement to maintain a process to identify and assess hazards and risks on an ongoing basis so as to ensure the validity of the DGR Facility Safety Case. Provisions made by the licensee to ensure public and worker health and safety during the site preparation and construction phase are primarily addressed under SCA "Conventional Health and Safety". Similarly, provisions for the protection of the environment are primarily addressed under SCA "Environmental Protection".

5.1 Safety Case

Licence Condition 5.1

The licensee shall maintain the DGR Facility Safety Case. [WFCL-W6-3900.00/2024, Section VI, 5.1]

Preamble

The safety case for a deep geologic repository is defined in International Atomic Energy Agency (IAEA) Specific Safety Guide 23: *Safety Case and Safety Assessment for the Disposal of Radioactive Waste* (IAEA SSG-23) as "the collection of scientific, technical, administrative and managerial arguments and evidence in support of the safety of a disposal facility, covering the suitability of the site and the design, construction and operation of the facility, the assessment of radiation risks and assurance of the adequacy and quality of safety-related work associated with the disposal facility".

This licence condition requires that the licensee maintains a process to identify and assess hazards and risks on an ongoing basis so as to ensure the validity of the DGR Facility Safety Case, as presented in the Preliminary Safety Report. This would include identifying and evaluating any new or unforeseen risks that were not considered at the planning and design stages. The licensee will also take into consideration results of verification and monitoring activities to validate parameters used in the DGR Facility Safety Case. Relevant to this licence condition is CSA standard N292.3, *Managing Low and Intermediate Level Radioactive Waste* (CSA N292.3), which specifies requirements for the management of L&ILW.

Class I Nuclear Facilities Regulations Paragraph 3(*e*) states that that an application for a licence shall contain, in addition to other information the effects on the environment and the health and safety of persons that may result from the activity to be licensed, and the measures that will be taken to prevent or mitigate those effects.

One element of the SCA Safety Analysis is environmental risk assessment (ERA), which is a process for identifying potential adverse biological effects and for predicting the magnitude, probability, and significance of the identified effects associated with nuclear facilities. The ERA provides assessment of environmental risks associated with contaminants and physical stressors in the environment relevant to the DGR Project, and to the short-term and long-term safety of human health and the environment. ERA is addressed under the long-term DGR Facility Safety Case for the DGR Facility.

The DGR Facility Safety Case will also take into consideration inputs from the following:

Environmental Assessment (EA): The EA characterizes baseline environmental conditions, and assessment of alternative ways of carrying out the project, credible accident scenarios and the prediction of potential effects of the project on ecological and human health due to both radiological and hazardous substances. It can result in a follow up monitoring program to verify EA predictions.

DGR Facility Design: Prior to implementing any significant changes or modifications to the DGR Facility design, the licensee shall provide the CNSC an assessment of the proposed changes or modifications and confirmation that the DGR Facility Safety Case is not compromised by the change or modification.

Verification and Monitoring Activities: Further geological and geotechnical verification and monitoring activities are also planned during construction to confirm parameter values used in design and construction safety considerations, and permit verification of long-term performance assessments. This is addressed in the following documents: *Geotechnical Investigation and Rock Monitoring During Construction*, NWMO DGR-REP-01130-xxxxx), and *Geoscientific Verification Plan* (*NWMO DGR-TR-2011-38*). Geological and geotechnical verification and monitoring activities are will be assessed by CNSC compliance verification activities.

OPG's Waste Characterization Program: The licensee's ongoing waste characterization program will further improve the completeness and accuracy of the inventories in the various waste streams to support the DGR design and the DGR Facility Safety Case.

The licensee is expected to communicate progress of above ongoing activities associated with the DGR Facility Safety Case.

CNSC staff will conduct compliance verification activities to verify that requirements of this licence condition are being met.

Compliance Verification Criteria

The licensee shall ensure that adequate oversight of licensed activities is taking place such that it is clear that requirements of this licence condition are being met.

CSA N286-05 contains the requirements for a management system to support the conduct of design, site preparation and construction activities associated with the DGR Facility. Relevant to this licence condition is Clause 6.2 (Safety Analysis) of CSA N286-05.

The DGR Facility Safety Case shall be evaluated against the following:

- A process has been implemented to identify and assess existing and new hazards and risks that can affect the DGR Facility Safety Case. Appropriate methodologies are used to identify potential hazards and consider the effectiveness of preventative measures and strategies in reducing the effects of such hazards on the DGR Facility Safety Case.

- Geoscientific verification and geotechnical investigation activities are carried out to confirm/verify sub-surface conditions and gather further information to support the DGR design and the DGR Facility Safety Case. Expectations include the monitoring of shaft concrete structures as well as changes in underground rock/excavation conditions (e.g., rock movement, stress) to confirm design function over time.

- A waste characterization program has been implemented to: (i) confirm/verify waste characteristics of L&ILW to be accepted by the DGR Facility; and (ii) to gather further information to support the DGR design and the DGR Facility Safety Case.

Safety and control measures for safety analysis shall comply with the following standards and regulatory documents:

Source	Document Title	Document Number	Effective Date
CSA	Managing Low and Intermediate Level Radioactive Waste	N292.3	March 2008
CSA	Management System Requirements for Nuclear Power Plants	N286-05, Update No. 1	2007-10-01

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
Continual Improvement	NK054-PROG-0003
Project Management	NK054-PROG-0009
Site Approvals and Engineering	NK054-PROG-0001
Preliminary Safety Report	00216-SR-01320-00001
Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository	00216-REP-03902-00003
Postclosure Safety Assessment	NWMO DGR-TR-2011-25
Safety Assessment Procedure	NWMO-PROC-EN-0003
Geotechnical Investigation and Rock Monitoring During Construction	NWMO DGR-REP-01130-xxxxx
Geoscientific Verification Plan	NWMO DGR-TR-2011-38

Recommendations and Guidance

Guidance for assessment of long-term safety of the DGR facility include CNSC regulatory guidance document G-320, *Assessing the Long-term Safety of Radioactive Waste Management*, (CNSC G-320) and the International Atomic Energy Agency (IAEA) Specific Safety Guide 23: *Safety Case and Safety Assessment for the Disposal of Radioactive Waste* (IAEA 2012).

Canadian Standard Association (CSA) standard entitled CSA 288.6-12: *Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills* (N288.6-12) recommends methods for the assessment of the risk posed by radiological contaminants, hazardous contaminants and physical stressors in the environment on humans and non-human biota.

6. SCA – PHYSICAL DESIGN

The SCA "Physical Design" includes activities that impact on the ability of systems, structures, and components to meet and maintain their design basis given new information arising over time, and taking changes in the external environment into account.

6.1 Design Program

Licence Condition 6.1

The licensee shall implement and maintain a physical design program. [WFCL-W6-3900.00/2024, Section VI, 6.1]

Preamble

This licence condition requires that the licensee follow a design process that ensures that the design intent of the DGR Facility engineered structures is met as design proceeds to an Approved for Construction (AFC) level of design development under OPG oversight. CNSC staff will conduct compliance verification activities to verify this requirement has been met and has been clearly documented.

This licence condition also requires that the licensee implement and maintain a design process that ensures that when changes are proposed during construction (after the AFC stage), the design intent is maintained so that changes considered under OPG oversight are introduced only if in alignment with the licensing basis. CNSC staff will conduct compliance verification activities to verify this requirement has been met and has been clearly documented.

Section 6.1 of CSA standard N286-05 requires that design activities be controlled and include, among other things, establishment of design inputs, a definition of design requirements, evaluation and selection of a design concept, preparation of the detailed design, and identification of commissioning and other requirements.

DGR Facility design inputs shall include consideration of human factors that influence human performance as it relates to the safety of a nuclear facility or activity. The consideration of human factors is expected in areas such as interface design, training, procedures, and organization and job design. The licensee is expected to communicate progress the DGR Facility design process, including confirmation that the design progression aligns with the design as presented under the licence application, as well as updates of monitoring conducted as part of design verification.

Further geological and geotechnical verification and monitoring activities are also planned during construction to confirm design and constructions safety and permit verification of long term performance assessments, and will be assessed by CNSC compliance verification activities. CNSC staff will also conduct compliance verification activities to verify that commitments made by OPG during the JRP process regarding the physical design program are being met. This includes but is not limited to assurances that the DGR Facility design progression aligns with the design as presented during the JRP process.

CSA standard N286 provides requirements related to the development, modification, maintenance and use of computer programs used in analytical, scientific and design.

CNSC staff will conduct compliance verification activities to verify that requirements of this licence condition are being met.

Compliance Verification Criteria

The licensee shall ensure that adequate oversight of licensed activities is taking place such that it is clear that requirements of this licence condition are being met.

This licence condition requires that the licensee follow a design process as the design proceeds to an Approved for Construction (AFC) level of design development under OPG oversight. This licence condition also requires that the licensee implement and maintain a design process for proposed changes that during construction (after the AFC stage).

Design requirements and design-related commitments made during the Joint Review Panel (JRP) process shall be carried forward into drawings, specifications and other design information used to procure materials and equipment and to construct the DGR Facility. CNSC staff will conduct compliance verification activities to verify these requirements have been met and have been clearly documented.

CNSC staff will verify the design process against the requirements of Clause 6.1 (Design) of CSA N286-05.

The licensee shall ensure that design and analysis computer codes and software used to support the design and construction of the DGR facility are in accordance with relevant elements of CSA standard N286.7: *Quality Assurance of Analytical, Scientific and Design Computer Programs for Nuclear Power Plants* (CSA N286.7).

Aspects of the physical design program will be evaluated against the following:

- The design process is planned, documented and controlled.
- The design control process is defined and communicated.
- The design is reviewed by considering established design inputs, requirements, experience with similar designs, and the results of investigation and monitoring activities.

- The design is supported by modeling results from verified and validated codes and the use of a design safety factor to address input parameter uncertainties.
- Design documents are maintained so the design can be related to the design requirements and used by organizations responsible for construction, commissioning, operation, and decommissioning.
- The DGR Facility design and status documents are accurate and accessible to facility personnel.
- Operational specifications and restrictions imposed by the design, including risk analyses, are appropriately communicated to the operators and incorporated into operating programs, procedures, practices, and training.
- Procedures have been implemented to ensure that design output information (document and/or data) appropriately and accurately reflect the approved design.
- The DGR Facility's as-built physical configuration reflects the approved design.
- The tasks and functions of the design authority shall be established in formal documentation.

The physical design program shall comply with the following standards and regulatory documents:

Source	Document Title	Document Number	Effective Date
CSA	Management System Requirements for Nuclear Power Plants	N286-05, Update No. 1	2007-10-01
CSA	Quality Assurance of Analytical, Scientific and Design Computer Programs for Nuclear Power Plants	N286.7	2012

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
Project Management	NK054-PROG-0009
Preliminary Safety Report	00216-SR-01320-00001
Site Approvals and Engineering	NK054-PROG-0001

Document Title	Document Number
Design Management	NWMO-PROC-EN-0001
Commissioning Management Plan	NWMO DGR-PLAN-00920-1001
Configuration Management Plan	NWMO-PLAN-00160-0001
Construction Quality Assurance Plan	DGR-PLAN-01916-1001
Repository Development Plan	NWMO TBD
Geotechnical Design Basis	NWMO DGR-REP-01130-31123
Human Factors Verification and Validation Plan	NWMO DGR-PLAN-01170-27989
Technical Computing Software Procedure	NWMO-PROC-EN-00002

Recommendations and Guidance

Guidance on human factors aspects of the physical design program is provided in the form of CNSC Regulatory Guide G-278, *Human Factors Verification and Validation Plans* (June 2003). CNSC also provides guidance on design authority expectations in Section 5.1 of CNSC Regulatory Document RD-337, *Design of New Nuclear Power Plants* (November 2008).

6.2 Pressure Boundary Program

Licence Condition 6.2

The licensee shall implement and maintain a pressure boundary program and maintain a formal agreement with an Authorized Inspection Agency deemed acceptable to the Commission or a person authorized by the Commission.

[WFCL-W6-3900.00/2024, Section VI, 6.2]

Preamble

This licence condition holds the licensee responsible for aspects of pressure boundary registration and inspections and provides regulatory oversight with regards to the licensee's implementation of a pressure boundary program.

A pressure boundary program is comprised of the many programs, processes and procedures and associated controls that are required to ensure compliance with, where relevant:

- CSA standard N285.0, *General Requirements for Pressure Retaining Systems and Components in CANDU Nuclear Power Plants* (CSA N285.0)
- CSA standard B51-09, *Boiler, Pressure Vessel, and Pressure Piping Code* (CSA N285.0)

This licence condition also ensures that the Authorized Inspection Agency (AIA) will be subcontracted directly by the licensee with CNSC approval or staff consent. An AIA is an organization recognized by the CNSC as authorized to register designs and procedures, perform inspections, and other functions and activities as defined by the above-noted CSA standards and its applicable referenced publications. In order for the licensee to fulfill its obligations, it shall obtain the services of an AIA to perform activities as defined by the relevant standards.

CNSC staff will conduct compliance verification activities to verify that requirements of this licence condition are being met.

Compliance Verification Criteria

The licensee shall ensure that adequate oversight of licensed activities is taking place such that it is clear that requirements of this licence condition are being met.

The licensee shall design, manufacture, fabricate, procure, install, modify, repair, test, examine, inspect or otherwise perform work related to vessels, boilers, systems, piping, fittings, parts, components and supports in accordance with the relevant applicable requirements in CSA standard N285.0 and CSA standard B51-09.

CSA N285.0 defines the technical requirements for the design, procurement, fabrication, installation, modification, repair, replacement, testing, examination and inspection of pressure-retaining and containment systems, including their components and supports. The licensee shall ensure that the applicable requirements of CSA N285.0 are being met. This includes safe operation of vessels, boilers, systems, piping, fittings, parts, components, and supports safely and a requirement to keep them in a safe condition.

The pressure boundary program shall comply with the following standards and regulatory documents where deemed relevant to the DGR Facility:

Source	Document Title	Document Number	Effective Date
CSA	General requirements for pressure-retaining systems and components in CANDU nuclear power plants/Material Standards for reactor components for CANDU nuclear power plants	N285.0-08, Update Number 2.	2010
CSA	Boiler, pressure vessel, and pressure piping code	B51-09	2009

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
Site Approvals and Engineering	NK054-PROG-0001
Project Management	NK054-PROG-0009
Construction	NK054-PROG-0005
Design Management	NWMO-PROC-EN-0001

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

7. SCA – FITNESS FOR SERVICE

The SCA "Fitness for Service" covers activities that impact on the physical condition of systems, components and structures to ensure that they remain effective over time. This includes programs that ensure equipment is available to perform its intended design function when called upon to do so.

7.1 Commissioning and maintenance during site preparation and construction

Licence Condition 7.1

The licensee shall implement and maintain safety and control measures for the commissioning and maintenance of the temporary and permanent structures, systems and components.

[WFCL-W6-3900.00/2024, Section VI, 7.1]

Preamble

This licence condition requires that the licensee implement and maintain safety and control measures, including periodic inspections and testing, for the commissioning and maintenance of the temporary and permanent systems, equipment and components that are in use during the conduct of site preparation and construction activities.

This licence condition ensures that the operating condition of systems, equipment and devices is preserved so that they can perform their function reliably. This licence condition requires that components of the DGR Facility under construction are commissioned and maintained in a manner consistent with their design and the licensing basis and accuracy is maintained by planning and carrying out periodic adjustments, calibrations, repairs, and replacement where necessary.

CNSC staff will conduct compliance verification activities to verify that the commissioning and maintenance of temporary and permanent systems, equipment and components that are in use during the conduct of site preparation and construction activities aligns with compliance verification criteria noted below. CNSC staff will also conduct compliance verification activities to verify that requirements of this licence condition are being met.

Compliance Verification Criteria

The licensee shall ensure that adequate oversight of licensed activities is taking place such that it is clear that requirements of this licence condition are being met.

Commissioning - The licensee is required to commission temporary and permanent systems, equipment and components that are in use during the conduct of site preparation and construction activities. This licence condition ensures that the commissioning of systems, equipment and devices is sufficient so that they can perform their function reliably. Commissioning expectations includes a defined process flow for commissioning activities and related activities and their sequence: commissioning management structure and responsibilities are identified; planning and scheduling of commissioning tests and related activities is documented; commissioning documentation is reviewed for conformity to the design; and that commissioning reports clearly identify the acceptability of the commissioning results.

Maintenance - The licensee is required to maintain temporary and permanent systems, equipment and components that are in use during the conduct of site preparation and construction activities. This licence condition ensures that the operating condition of systems, equipment and devices is preserved so that they can perform their function reliably. This requirement ensures that accuracy is maintained by planning and carrying out periodic adjustments, calibrations, repairs, and replacement where necessary. Maintenance expectations include: the calibration and maintenance of systems, equipment, and devices such that they can perform their design function; the requirement for inspection and testing of equipment; and the implementation and maintenance of preventative and corrective measures.

Safety and control measures for commissioning and maintenance shall comply with the following standards and regulatory documents:

Source	Document Title	Document Number	Effective Date
CSA	Management System Requirements for Nuclear Power Plants	N286-05, Update No. 1	2007-10-01

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
Continual Improvement	NK054-PROG-0003
Project Management	NK054-PROG-0009
Commissioning Management Plan	NWMO DGR-PLAN-00920-1001

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

8. SCA – CONVENTIONAL HEALTH AND SAFETY

The SCA "Conventional Health and Safety" covers the implementation of a program to manage workplace safety hazards and to protect personnel and equipment.

8.1 Conventional health and safety requirements for site preparation and construction

Licence Condition 8.1

The licensee shall implement and maintain a conventional health and safety program.

[WFCL-W6-3900.00/2024, Section VI, 8.1]

Preamble

Paragraph 3(*f*) of the CINFR stipulates that an application for a licence shall contain, in addition to other information, "the proposed worker health and safety policies and procedures."

CSA Standard N286-05, *Management System Requirements for Nuclear Power Plants* (CSA N286-05) incorporates occupational health and safety management.

The conventional health and safety program shall comply with Government of Ontario provincial legislative requirements of *Occupational Health and Safety Act* (OHSA) and its associated regulations. This requirement is clarified under a separate licence condition of this licence (see licence condition 8.2).

With respect to the accountabilities and responsibilities under OHSA, OPG assumes the role and responsibilities of "Project Owner" (*s.30*), and the selected EPCM company, NWMO, assumes the role and responsibilities of "Constructor" (*s.23*) and "Employer" (*s. 25 and 26*). The EPCM, as "Constructor" and "Employer" is to prepare an occupational health and safety plan to ensure that workers will be protected against health and safety hazards encountered during site preparation activities. The licensee will review the Constructor's occupational health and safety plan prior to the commencement of site preparation and construction activities, and perform independent assessments and witnessing and surveillance of the Constructor's work activities to ensure that the requirements for occupational health and safety are met. CNSC staff will conduct compliance verification activities to verify that requirements of this licence condition are being met.

Compliance Verification Criteria

The conventional health and safety program will be assessed against the following:

- The necessary people, materials, equipment, programs and procedures to effectively manage, control and minimize health and safety risks have been provided.
- Housekeeping standards have been identified and are enforced to ensure that work areas are kept clean and organized.
- Facilities, processes and procedures have been implemented to ensure the safe management of hazardous materials.
- Employees and contractors actively participate in the management of conventional health and safety.
- Management verifies that employees and contractors actively participate in the management of health and safety in their workplace.
- Procedures have been established and are maintained to communicate information about conventional health and safety.
- A process has been established and maintained to monitor, measure and record conventional health and safety performance and the effectiveness of the Occupational Health and Safety Program on a regular basis.
- Routine inspections are performed to identify any potential safety issues.
- Processes and procedures are established and maintained to investigate accidents and incidents, to identify root causes, to implement corrective actions and to verify that corrective actions have been completed and will effectively prevent recurrence.
- Procedures have been implemented and maintained for reporting work-related injuries, illnesses, fatalities and conventional health and safety incidents including near misses.

- The causes of injuries are investigated, corrective actions implemented, and the effectiveness of corrective actions verified.
- A preventative and corrective action procedure has been established and maintained to address non-conformances and inadequately controlled risks.
- Monitor radon concentrations and implement measures to keep the amount of worker exposure to radon and airborne radon progeny during construction activities As Low As Reasonably Achievable (ALARA), social and economic factors being taken into account.

The conventional health and safety program shall comply with the following standards and regulatory documents:

Source	Document Title	Document Number	Effective Date
CSA	Management System Requirements for Nuclear Power Plants	N286-05, Update No. 1	2007-10-01

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
Continual Improvement	NK054-PROG-0003
Project Management	NK054-PROG-0009
Health and Safety Management Plan	NWMO DGR-PLAN-08962-1001

Recommendations and Guidance

Radon guidance is provided in CNSC Regulatory Guide G-4, *Measuring Airborne Radon Progeny at Uranium Mines and Mills* (June 2003). CSA standard Z1000-06, *Occupational Health and Safety Management* (2006) specifies requirements for occupational health and safety management and provides direction to enable an organization to improve its occupational health and safety performance. Guidance for selection, use and care of respirators is provided in CSA Standard Z94.4-11 *Selection, Use and Care of Respirators* (2011).

8.2 Provincial legislative *Occupational Health and Safety Act* (OHSA) requirements for site preparation and construction

Licence Condition 8.2

The licensee shall provide to the Commission or a person authorized by the Commission confirmation of compliance with requirements of the Ontario Occupational Health and Safety Act and Regulations relevant to the DGR Facility.

[WFCL-W6-3900.00/2024, Section VI, 8.2]

Preamble

By regulations made under the *Canada Labour Code* (CLC) in 1998, Ontario Hydro nuclear facilities were excluded from the application of the CLC and made subject to provincial legislative requirements of the Ontario *Occupational Health and Safety Act* (OHSA) including any regulations made under that Act. OHSA and its associated regulations are administered by the Ontario Ministry of Labour. Therefore, provincial legislative requirements of OHSA apply to the licensee's conventional health and safety program for the DGR Facility.

With respect to the accountabilities and responsibilities under OHSA, OPG assumes the role and responsibilities of "Project Owner" (*s.30*), and the selected EPCM company, NWMO, assumes the role and responsibilities of "Constructor" (*s.23*) and "Employer" (*s. 25 and 26*). The EPCM, as "Constructor" and "Employer" is to prepare an occupational health and safety plan to ensure that workers will be protected against health and safety hazards encountered during site preparation activities. The licensee will review the Constructor's occupational health and safety plan prior to the commencement of site preparation and construction activities, and perform independent assessments and witnessing and surveillance of the Constructor's work activities to ensure that the requirements for occupational health and safety are met.

CNSC staff will conduct compliance verification activities to verify that requirements of this licence condition are being met. Compliance verification activities may include but are not limited to: CNSC staff correspondence and communication with MOL throughout the site preparation and construction phase; and communication with OPG regarding relevant interactions between MOL and OPG or their EPCM company, NWMO, that pertain specifically to provincial legislative requirements of OHSA and its associated regulations as applied to the DGR Facility.

Compliance Verification Criteria

The licensee shall ensure that adequate oversight of licensed activities is taking place such that it is clear that requirements of this licence condition are being met.

The conventional health and safety program shall comply with the following provincial legislative requirements of OHSA and its associated regulations as applied to the DGR Facility construction work, surface facilities and underground facilities:

- *Ontario Regulation 213/91, Construction Projects (1990); and*
- *Ontario Regulation 854/90, Mines and Mining Plants (1990).*

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

9. SCA – ENVIRONMENTAL PROTECTION

The Safety and Control Area "Environmental Protection" covers programs that identify, control, and monitor releases of radioactive and hazardous substances to the environment from facilities or as the result of licensed activities.

9.1 Environmental protection for site preparation and construction

Licence Condition 9.1

The licensee shall implement and maintain an environmental protection program. [WFCL-W6-3900.00/2024, Section VI, 9.1]

Preamble

This licence condition requires the licensee to implement and maintain an environmental protection program.

Paragraph 3 of the CINFR states that that an application for a licence shall contain, in addition to other information

- s.3(*e*) the name, form, characteristics and quantity of any hazardous substances that may be on the site while the activity to be licensed is carried on;
- s.3(*g*) the proposed environmental protection policies and procedures;
- s.3(*h*) the proposed effluent and environmental monitoring programs; and

CNSC Regulatory Standard S-296, *Environmental Protection Policies, Programs and Procedures at Class I Nuclear Facilities and Uranium Mines and Mills*, requires licensees to establish, implement and maintain an Environmental Management System that satisfies the requirements set by the Canadian Standards Association's (CSA) ISO 14001: 2004, *Environmental Management Systems – Requirements with Guidance for Use*.

CNSC staff will conduct compliance verification activities to verify that requirements of this licence condition are being met.

Compliance Verification Criteria

The licensee shall ensure that adequate oversight of licensed activities is taking place such that it is clear that requirements of this licence condition are being met.

Expectations of the licensee's environmental protection program include the control, monitoring and recording of releases to the natural environment from site preparation and construction activities. This requirement includes adequate monitoring and control of airborne releases from the DGR surface infrastructure area and underground ventilation into the natural environment. This requirement also includes adequate monitoring and control of stormwater run-off from the DGR surface infrastructure area, the waste rock management area as well as any water pumped to surface during shaft sinking and underground development prior to discharge into the existing Bruce nuclear site drainage ditch network for release to MacPherson Bay (Lake Huron). Prior to the commencement of site preparation and construction activities CNSC staff will review and accept the detailed sampling plans associated with the licensee's environmental protection program. CNSC staff will report acceptance of the submission before authorization to implement is granted.

The environmental protection program shall comply with the following standards and regulatory documents:

Source	Document Title	Document Number	Effective Date
CSA	Environmental Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills	N288.4-10	May 2010
CSA	Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills	N288.5-11	April 2011
CSA	Environmental management systems – requirements with guidance for use	CSA-ISO 14001/04	2004
CNSC	CNSC Regulatory Policy: Protection of the Environment	P-223	February 2001
CNSC	Regulatory Standard: Environmental Protection Policies, Programs and Procedures at Class I Nuclear Facilities and Uranium Mines and Mills	S-296	March 2006

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
Continual Improvement	NK054-PROG-0003
Project Management	NK054-PROG-0009
DGR Project - Environment Management Plan	NWMO DGR-PLAN-07002-1001
DGR Project - EA Follow-Up Monitoring Program	NWMO DGR-TR-2011-10

Recommendations and Guidance

CNSC Regulatory Guide G-296, *Developing Environmental Protection Policies, Programs and Procedures at Class 1 Nuclear Facilities and Uranium Mines and Mills* (CNSC G-296) provides guidance on the development of environmental protection policies, programs and procedures, in accordance with the NSCA and Regulations.

9.2 Releases to the environment during site preparation and construction

Licence Condition 9.2

The licensee shall provide to the Commission or a person authorized by the Commission confirmation of compliance with environmental compliance approval requirements of the Ontario Environmental Protection Act and Regulations and Ontario Water Resources Act and Regulations relevant to the DGR Facility.

[WFCL-W6-3900.00/2024, Section VI, 9.2]

Preamble

This licence condition requires the licensee to control, monitor and record releases to the environment.

Activities that may impact the natural environment require approval from the Ontario Ministry of the Environment (MOE) to operate legally in Ontario. The Ontario Environmental Protection Act (EPA) and the Ontario Water Resources Act (OWRA) require the obtaining of an Environmental Compliance Approval (ECA) from Ontario MOE. The ECA sets out legally enforceable rules of operation aim to protect the natural environment against emissions and discharges.

CNSC staff will conduct compliance verification activities to verify that requirements of this licence condition are being met. Compliance verification activities may include but are not limited to: CNSC staff correspondence and communication with MOE throughout the site preparation and construction phase; and communication with OPG regarding relevant interactions between MOE and OPG or their EPCM company, NWMO, that pertain specifically to ECA requirements of the Ontario Environmental Protection Act and Regulations and Ontario Water Resources Act and Regulations relevant to the DGR Facility.

Compliance Verification Criteria

The licensee shall ensure that adequate oversight of licensed activities is taking place such that it is clear that requirements of this licence condition are being met.

The licensee shall control, monitor and record air and liquid effluent discharges to the natural environment in accordance with Environmental Compliance Approval (ECA) requirements of the Government of Ontario Environmental Protection Act (EPA) and the Ontario Water Resources Act (OWRA). The MOE ECA applications and their supporting technical documentation shall align with details as presented in the CNSC licence application including any commitments made during the JRP process. The licensee will notify CNSC at the time of application and, once obtained, provide confirmation of MOE ECA approval.

With respect to the monitoring and control of liquid effluent discharges to the natural environment, any releases from the water treatment system and/or any required contingency water treatment system(s) must comply with the limits for final treated effluent quality as stipulated in the MOE ECA. To verify adequate provision for the protection of the environment CNSC staff may request aquatic toxicity testing of final treated effluent quality using appropriate and validated biological test methods. Where the effluent concentration reaches or exceeds limits for final treated effluent quality as stipulated in the MOE ECA, the licensee shall inform both the MOE and CNSC and immediately investigate and take corrective action.

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
Continual Improvement	NK054-PROG-0003
Project Management	NK054-PROG-0009
DGR Project - Environment Management Plan	NWMO DGR-PLAN-07002-1001
DGR Project - EA Follow-Up Monitoring Program	NWMO DGR-TR-2011-10

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

10. SCA – EMERGENCY MANAGEMENT AND FIRE PROTECTION

The SCA "Emergency Management and Fire Protection" covers emergency plans and emergency preparedness programs which exist for emergencies and for non-routine conditions. This also includes any results of exercise participation.

10.1 Emergency preparedness for site preparation and construction

Licence Condition 10.1

The licensee shall implement and maintain an emergency preparedness and response program.

[WFCL-W6-3900.00/2024, Section VI, 10.1]

Preamble

This licence condition requires the licensee to implement and maintain an emergency preparedness and response program.

Paragraph 12(1)(*f*) of the GNSCR states that every licensee shall "take all reasonable precautions to control the release of radioactive nuclear substances or hazardous substances within the site of the licensed activity and into the environment of the licensed activity."

Paragraph 12(1)(*c*) of the GNSCR states that every licensee shall "take all reasonable precautions to protect the environment and the health and safety of persons and to maintain security."

Expectations for this program include adequate inter-relation of emergency preparedness and response provisions with other CNSC licensed facilities at the Bruce Site including OPG's Western Waste Management Facility (WWMF) and Bruce Power's Bruce Nuclear Generating Station.

CNSC staff will conduct compliance verification activities to verify that requirements of this licence condition are being met.

Compliance Verification Criteria

The licensee shall ensure that adequate oversight of licensed activities is taking place such that it is clear that requirements of this licence condition are being met.

The emergency preparedness and response program will be assessed against the following:

- Organization and responsibilities are identified.
- Potential emergency situations are identified.
- Resources, including facilities and equipment required to respond to emergencies are identified and maintained.
- Workers are trained to fulfill duties and responsibilities with respect to emergency management and fire plans and procedures.
- Emergency preparedness and response procedures are prepared, implemented and maintained to prevent, prepare for, and respond to emergencies.
- Emergency communication protocols are established, practiced and understood.
- Pre-incident plans for response to emergencies are developed and maintained in accordance with the Emergency Response Plan.
- Emergency response exercises are conducted and response plans are tested periodically in accordance with the Emergency Response Plan.

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
Continual Improvement	NK054-PROG-0003
Project Management	NK054-PROG-0009
Health and Safety Management Plan	NWMO DGR-PLAN-08962-1001
Emergency Response Plan	NWMO DGR-PLAN-08962-1002

Recommendations and Guidance

Guidance on elements to be included in the emergency preparedness and response program is provided in CNSC Regulatory Guide G-225, *Emergency Planning at Class 1 Nuclear Facilities and Uranium Mines and Mills* (August 2001) and CNSC Regulatory Document RD-353, *Testing the Implementation of Emergency Measures* (October 2008).

10.2 Fire protection for site preparation and construction

Licence Condition 10.2

The licensee shall implement and maintain a fire protection program.

[WFCL-W6-3900.00/2024, Section VI, 10.2]

Preamble

This licence condition requires the licensee to implement and maintain a fire protection program. The fire protection program shall be implemented in this and subsequent licensing phases in order to reduce the occurrence of fires and limit their consequences and severity.

Paragraph 12(1)(*f*) of the GNSCR states that every licensee shall "take all reasonable precautions to control the release of radioactive nuclear substances or hazardous substances within the site of the licensed activity and into the environment of the licensed activity."

Paragraph 12(1)(*c*) of the GNSCR states that every licensee shall "take all reasonable precautions to protect the environment and the health and safety of persons and to maintain security."

The fire protection program shall comply with:

- National Building Code of Canada 2010 (NBCC) requirements as applied to the DGR Facility construction work, surface facilities and where applicable underground facilities;
- National Fire Code of Canada 2010 (NFCC) as applied to the DGR Facility construction work, surface facilities and underground facilities.

The fire protection program shall comply with the following Government of Ontario Occupational Health and Safety Act regulations:

- *Ontario Regulation 213/91, Construction Projects (1990); and*
- *Ontario Regulation 854/90, Mines and Mining Plants (1990).*

With this licence condition, CNSC staff will conduct compliance verification activities to verify that commitments made by OPG during the JRP process (see licence condition 13.1) are being met, in particular:

- A Fire Protection Program specific to the DGR will be developed;

- A Fire Hazard Assessment (FHA) will be developed based on the guidance of National Fire Protection Association (NFPA) Standard 122, *Standard for Fire Prevention and Control in Metal/Nonmetal Mining and Metal Mineral Processing Facilities* (NFPA 122) and NFPA Standard 801, *Standard for Fire Protection for Facilities Handling Radioactive Materials* (NFPA 801); and
- An independent third party review of the code compliance review and FHA will be conducted.

Compliance Verification Criteria

The licensee shall ensure that adequate oversight of licensed activities is taking place such that it is clear that requirements of this licence condition are being met

The Fire Protection Program will be assessed against the requirements of the National Fire Code 2010, National Building Code 2010, good engineering practices, and the following:

- The fire protection organization and their responsibilities are identified;
- Potential hazards/risks from fire have been identified;
- Pre-fire plans and fire safety plans have been developed and are maintained;
- Provision of staff and training to carry out fire protection responsibilities;
- Specific features such as administration controls and personnel requirements are described for:
  - preparing and maintaining documentation related to fire protection (e.g. - design of the DGR Facility, fire safety plan, FHA);
  - managing changes that affect fire protection;
  - managing the storage and handling of flammable liquids, combustible liquids, compressed gases, and radioactive materials;
  - housekeeping;
  - inspection, testing, and maintenance of fire protection design features and equipment;
  - controlling transient combustible material and non-combustible material;
  - managing fire safety during work activities;
  - fire reporting;
  - controlling sources of ignition;
  - controlling planned and unplanned fire protection impairments;
  - fire emergency response;

- conducting drills;
- performance monitoring; and
- providing quality assurance for the activities specified in the Fire Protection Program.

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
Continual Improvement	NK054-PROG-0003
Project Management	NK054-PROG-0009
Construction	NK054-PROG-0005
Health and Safety Management Plan	NWMO DGR-PLAN-08962-1001
Fire Protection Program	NWMO DGR-PROC-ES-0001-R000

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

11. SCA – WASTE MANAGEMENT

The SCA "Waste Management" covers internal waste-related programs which form part of the DGR Facility's licensed activities up to the point where the construction waste leaves the site and is transported to a separate waste management facility. This also covers the planning for decommissioning during this site preparation and construction phase of the DGR Project.

11.1 Waste management for site preparation and construction

Licence Condition 11.1

The licensee shall implement and maintain a waste management program.

[WFCL-W6-3900.00/2024, Section VI, 11.1]

Preamble

GNSCR Paragraph 3(1)(*j*) stipulates that an application for a licence shall contain "the name, quantity, form, origin and volume of any radioactive waste or hazardous waste that may result from the activity to be licensed, including waste that may be stored, managed, processed or disposed of at the site of the activity to be licensed, and the proposed method for managing and disposing of that waste."

Hazardous wastes generated as a result of site preparation and construction activities will be limited to those used for standard construction projects and will be addressed under requirements for conventional and hazardous waste transport and disposal. The activities encompassed under the WFCL will not involve the handling of any radioactive materials or the generation of any radioactive wastes.

CNSC staff will conduct compliance verification activities to verify that requirements of this licence condition are being met.

Compliance Verification Criteria

The licensee shall ensure that adequate oversight of licensed activities associated with conventional and hazardous waste management is taking place such that it is clear that requirements of this licence condition are being met.

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
Continual Improvement	NK054-PROG-0003
Project Management	NK054-PROG-0009
Health and Safety Management Plan	NWMO DGR-PLAN-08962-1001
DGR Project - Environment Management Plan	NWMO DGR-PLAN-07002-1001

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

11.2 Decommissioning plan for site preparation and construction

Licence Condition 11.2

The licensee shall maintain a preliminary decommissioning plan that shall be reviewed and updated every five years, or when requested by the Commission or a person authorized by the Commission.

[WFCL-W6-3900.00/2024, Section VI, 11.2]

Preamble

Paragraph 3(*k*) of the CINFR stipulates that that an application for any licence in respect of a Class I nuclear facility, other than a licence to abandon, shall contain, in addition to other information, the "*proposed plan for decommissioning of the nuclear facility or of the site*".

For the current phase of the DGR project, this pertains to solely to the decommissioning of a constructed facility that would be decommissioned prior to the start of DGR operations.

CNSC staff will conduct compliance verification activities to verify that requirements of this licence condition are being met.

Compliance Verification Criteria

OPG submitted NWMO DGR-TR-2011-39, Revision R000, *OPG's Deep Geological Repository for Low and Intermediate Level Waste: Preliminary Decommissioning Plan* to describe the decommissioning activities to restore the site to a brownfield in the event the project is cancelled after the site has been constructed for the future operation of the DGR. The Preliminary Decommissioning Plan is to be kept current to reflect any changes in the site or nuclear facility.

CNSC staff will confirm that OPG's preliminary decommissioning plan for the DGR is in compliance with the requirements set out in CSA Standard N294-09 *Decommissioning of Facilities Containing Nuclear Substances* (CSA N294-09). This standard also provides direction on the decommissioning of licensed facilities and specifies requirements for the planning, preparation, execution and completion of decommissioning and incorporates current best practices and existing regulatory requirements.

The preliminary decommissioning plan shall comply with, where relevant, the following standards and regulatory documents:

Source	Document Title	Document Number	Effective Date
CSA	Decommissioning of Facilities Containing Nuclear Substances, issued July 2009	N294	2009

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	**Document Number**
Continual Improvement	NK054-PROG-0003
Project Management	NK054-PROG-0009

Document Title	Document Number
Construction	NK054-PROG-0005
Preliminary Decommissioning Plan	NWMO DGR-TR-2011-39

Recommendations and Guidance

CNSC Regulatory Guidance Document G-219, *Decommissioning Planning for Licensed Activities*, provides CNSC staff expectations regarding the preparation of decommissioning plans for activities licensed by the CNSC.

12. SCA – SECURITY

The SCA "Security" covers the programs required to implement and support the security requirements stipulated in the regulations, in their licence, in orders, or in expectations for their facility or activity.

12.1 Security for site preparation and construction

Licence Condition 12.1

The licensee shall implement and maintain a security program for the DGR Facility site.

[WFCL-W6-3900.00/2024, Section VI, 12.1]

Preamble

Pursuant to Section 3(1) (*g*) (*h*) of the GNSCR, the license application shall contain:

- *the proposed measures to control access to the site of the activity to be licensed and the nuclear substance, prescribed equipment or prescribed information; and*
- *the proposed measures to prevent loss or illegal use, possession or removal of the nuclear substance*, prescribed equipment or prescribed information

Pursuant to GNSCR paragraphs 12(*c*), (*g*), (*h*) (*j*), the licensee shall demonstrate that measures will be in place to:

- *take all reasonable precautions to protect the environment and the health and safety of persons and to maintain the security of nuclear facilities and of nuclear substances;*
- *implement measures for alerting the licensee to the illegal use or removal of a nuclear substance, prescribed equipment or prescribed information, or the illegal use of a nuclear facility;*

- *implement measures for alerting the licensee to acts of sabotage or attempted sabotage anywhere at the site of the licensed activity; and*

- *instruct the workers on the physical security program at the site of the licensed activity and on their obligations* under that program

The DGR Project does not have unique site security requirements except for the storage, use and transportation of explosives which affects the risks to the site. Bruce Power security provides the same level of security service to the project as it currently does to WWMF through the Bruce Site Services Agreement. Security at the DGR Facility site is for the protection of equipment, but must also include measures to effectively ensure security of the explosives on site.

Compliance Verification Criteria

Safety and control measures for site security shall be in compliance with the GNSCR.

Explosives will be required for shaft and underground facility excavation activities. Security measures for explosives will comply with the following federal guidelines:

- *Blasting Explosives and Initiation Systems – Storage, Possession, Transportation, Destruction and Sale*, Natural Resources Canada, March 2008.

The Site Security Plan will include security requirements for site access. It will also address details regarding how explosives used during underground construction will be securely managed, taking into account the potential impacts to other facilities

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
Continual Improvement	NK054-PROG-0003
Project Management	NK054-PROG-0009
Construction	NK054-PROG-0005
Construction Management Plan	NWMO DGR-PLAN-00180-1001
Site Security Plan	TBD

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

PART D: SITE-SPECIFIC LICENCE CONDITIONS

Part D of this LCH associated with WFCL-W6-3900.00/2024 provides a list of DGR Facility-Specific Licence Conditions with associated compliance verification criteria.

13. SITE-SPECIFIC LICENCE CONDITIONS

13.1 Commitments during site preparation and construction

Licence Condition 13.1

The licensee shall implement commitments made during the DGR Joint Review Panel process that are applicable to this licence.

[WFCL-W6-3900.00/2024, Section VI, 13.1]

Note: This portion of the LCH will be revised upon the conclusion of the JRP process.

Preamble

The licensee's Commitments Report describes commitments made by OPG during the JRP process. CNSC staff will conduct compliance verification activities to verify that commitments made by OPG during the JRP process associated with licence conditions and other requirements of this licence condition are being met.

Compliance Verification Criteria

The licensee shall implement commitments made during the JRP process in accordance with the document DGR Project - Commitments Report, *NWMO DGR-TR-2013-01*.

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
DGR Project - Commitments Report	NWMO DGR-TR-2013-01
Continual Improvement	NK054-PROG-0003
Project Management	NK054-PROG-0009

Recommendations and Guidance

There are no recommendations and guidance associated with this licence condition.

13.2 Environmental Assessment Decision Outcomes

Licence Condition 13.2

The licensee shall implement the Environmental Assessment decision outcomes that are applicable to this licence.

[WFCL-W6-3900.00/2024, Section VI, 13.2]

Note: This portion of the LCH will be revised upon the conclusion of the JRP process.

Preamble

The federal Minister of the Environment and the President of the CNSC established a Joint Review Panel (JRP) to assess the environmental effects of this project under the *Canadian Environmental Assessment Act* (CEAA) and to review OPG's licence application under the NSCA. Taking into consideration the JRP Report recommendations and the implementation of proposed mitigation measures, the Minister of the Environment will make a determination whether the DGR project is or is not likely to cause significant adverse environmental effects.

Subsection 19(1)(3) of the *Canadian Environmental Assessment Act*, 2012 (CEAA 2012) stipulates that the environmental assessment process includes, the requirements of the follow-up program in respect of the designated project. CEAA 2012 defines "follow-up program" as a program for verifying the accuracy of the environmental assessment of a *designated* project and determining the effectiveness of any *mitigation* measures. The DGR EA Follow-up Monitoring Program document, *NWMO DGR-TR-2011-10*, identifies the proposed follow-up monitoring program to address not only the site preparation and construction but also later phases of the project. Once finalized, this document will be used to verify the accuracy of the environmental assessment and in the determination of the effectiveness of any measures taken to mitigate adverse environmental effects. The final scope of the EA follow-up program will be developed by the licensee through a consultative process involving the CNSC and, where relevant, other stakeholders. After the EA follow-up program is finalized, it will be submitted to the CNSC. The licensee shall then be responsible for ensuring the elements as described in the final follow-up program are implemented. CNSC will also provide oversight for the implementation of the follow-up program to ensure it meets its objectives and scope.

The DGR JRP Report includes recommendations applicable to site preparation and construction activities as well as subsequent licensing phases. The conclusion whether or not the project will cause significant adverse environmental effects takes into consideration proposed mitigation measures proposed, commitments made by OPG as well as the implementation of DGR JRP Report recommendations.

Compliance Verification Criteria

The licensee shall implement an EA follow-up program. The EA follow-up program shall:

- identify adequate baseline characterization data for use in follow up monitoring;
- verify predictions of environmental effects identified in the environmental assessment;
- determine the effectiveness of mitigation measures in order to modify or implement new measures where required;
- support the implementation of adaptive management measures to address previously unanticipated adverse environmental effects;
- provide information on environmental effects and mitigation that can be used to improve and/or support future environmental assessments including cumulative environmental effects assessments; and
- support environmental management systems used to manage the environmental effects of projects.

The licensee shall implement JRP Report recommendations directed at OPG and applicable to site preparation and construction activities. Other OPG-directed recommendations not applicable to site preparation and construction activities will be addressed in subsequent licensing phases.

DGR JRP Report recommendations that are applicable to this licence for site preparation and construction are summarized in the following table:

Note: The following table will be developed upon the conclusion of the JRP process.

Phase	Recommendation #	Topic
Prior to Site Preparation and Construction Licensed Activities	▪	▪
	▪	▪
	▪	▪
	▪	▪
During Site Preparation and Construction Licensed Activities	▪	▪
	▪	▪
	▪	▪
	▪	▪

Phase	Recommendation #	Topic
Over the Life of the Project	▪	▪
	▪	▪
	▪	▪
	▪	▪

The following documents require written notification of changes made (see e-Doc 4101395 for the current version of written notification documents):

Document Title	Document Number
DGR Project - EA Follow-Up Monitoring Program	NWMO DGR-TR-2011-10

Recommendations and Guidance

Canadian Environmental Assessment Agency Operational Policy Statement (December 2011) provides guidance on EA follow-up programs.

PART E: LCH TERMINOLOGY

Part E of this LCH associated with WFCL-W6-3900.00/2024 provides a list of LCH terminology, including definitions and acronyms used in the licence and its associated compliance verification criteria.

DEFINITIONS

Accept/ed/able/ance

Meets regulatory requirements, which means it is in compliance with regulatory and technical documents referenced in the licence.

Apparent Non-Compliance

A non-compliance that appears to impact the ability of a licensee to carry out activities licensed under the NSCA in a way that protects the environment, health and safety of persons, maintains national security and complies with international obligations to which Canada has agreed.

Compliance Verification Criteria

Are measures of conformity to the regulatory requirements. CNSC staff use these criteria to confirm that the licensee is meeting the corresponding licence condition.

Licensing Basis

The Licensing Basis for the DGR Facility is a set of requirements and documents comprising:

- the regulatory requirements set out in the applicable laws and regulations,
- the conditions and safety and control measures described in the DGR Facility's licence and the documents directly referenced in that licence, and
- the safety and control measures described in the licence application and the documents needed to support that licence application.

Person authorized by the Commission

For the purpose of the WFCL and LCH, it means CNSC staff fulfilling the following positions:

- the Director, Wastes and Decommissioning Division (WDD);
- the Director General, Directorate of Nuclear Cycle and Facilities Regulation (DNCFR); and
- the Executive Vice-President and Chief Regulatory Operations Officer, Regulatory Operations Branch (ROB).

Program(s)

A documented group of planned activities, procedures, processes, standards and instructions coordinated to meet a specific purpose.

Shall

Used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard.

Version-controlled documents

Refers to documents which require a certain type of CNSC control and are identified in the LCH. Such documents include regulatory/industry standards as referenced in the licence (may include regulatory/industry standards which require transition).

Worker

Any person conducting activities under the WFCL for the DGR Facility.

Written notification

A physical or electronic communication between a CNSC delegated authority and a person authorized to act on behalf of the licensee.

ACRONYMS

CMD	Commission Member Document
CNSC	Canadian Nuclear Safety Commission
CSA	Canadian Standards Association
C1NFR	*Class I Nuclear Facilities Regulations*
CEAA	*Canadian Environmental Assessment Act*
DG	Director General
DGR	Deep Geologic Repository
DNCFR	Directorate of Nuclear Cycle and Facilities Regulation
EA	Environmental Assessment
EPCM	Engineering, Procurement, and Construction Management
LCH	Licence Conditions Handbook
L&ILW	Low- and Intermediate-Level Radioactive Waste
LPSC	Licence to Prepare Site and Construct
N/A	Not Applicable
NSCA	*Nuclear Safety and Control Act*
NWMO	Nuclear Waste Management Organization
OHSA	Occupational Health and Safety Act of Ontario
OPG	Ontario Power Generation Inc.
PDP	Preliminary Decommissioning Plan
SCA	Safety and Control Area
TBD	To Be Determined
WDD	Wastes and Decommissioning Division
WFCL	Waste Facility Construction Licence
WWMF	Western Waste Management Facility

PART F: LCH CHANGE REQUEST FORM

Part F of this LCH associated with WFCL-W6-3900.00/2024 provides the LCH Change Request Form.

Ontario Power Generation (OPG) Deep Geologic Repository (DGR) WFCL-W6-3900.00/2024 Licence Conditions Handbook (LCH) Change Request Form		
Document Title	**Current Rev No.**	**Document's E-Docs No.**
REVISION REQUEST INFORMATION		
Requestor	**Division**	**Date of Request: MM / DD / YY**
Line Manager	☐ **Concur with request** ☐ **Do Not Concur**	
Description of Problem to be Resolved: (additional space on reverse of form)		
Proposed Changes: (additional space on reverse of form)		
Other Documents Potentially Affected by Proposed Changes		
SUBJECT MATTER EXPERT (SME) ASSESSMENT OF DCR		
SME	☐ **Concur with request** ☐ **Do Not Concur**	**Date: MM / DD / YY**
Assessment Comments:		
Revisions to be Reviewed by: (Check off all applicable divisions)		
Director General – Directorate of Nuclear Cycle and Facilities Regulation		

Name	**Change Request Approved** ☐ YES ☐ NO	**Date: MM / DD / YY**	**Signature**

PART G: DOCUMENTS REFERENCED IN THE LCH

Part G of this LCH associated with WFCL-W6-3900.00/2024 provides a list of documents referenced in this LCH.

Table 1. Standards and codes referenced in the LCH.

Document Title	Document Number	Effective Date	Licence Condition
Management System Requirements for Nuclear Power Plants	N286-05, Update No. 1	2007-10-01	2.1, 2.2, 3.1, 4.1, 4.2, 5.1, 6.1, 7.1
Management of Low and Intermediate Level Radioactive Waste.	N292.3-08	2008	5.1
Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills	N288.6-12	2012	5.1
Quality Assurance of Analytical, Scientific and Design Computer Programs for Nuclear Power Plants	N286.7	2012	6.1
General requirements for pressure-retaining systems and components in CANDU nuclear power plants/Material Standards for reactor components for CANDU nuclear power plants	N285.0-08, Update Number 2	2010	6.2
Boiler, pressure vessel, and pressure piping code	B51-09	2009	6.2
Occupational Health and Safety Management	Z1000-06	October 2006	8.1
Environmental Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills	N288.4-10	May 2010	9.1

Document Title	Document Number	Effective Date	Licence Condition
Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills	N288.5-11	April 2011	9.1
Environmental management systems – requirements with guidance for use	CSA-ISO 14001/04	2004	9.1
Decommissioning of Facilities Containing Nuclear Substances	N294	July 2009	11.2

Table 2. Regulatory documents referenced in the LCH.

Document Title	Document Number	Effective Date	Licence Condition
CNSC Regulatory Policy Document: *Compliance*	P-211	May 2001	LCH Part A
CNSC Information Document: *Licensing Basis Objective and Definition*	INFO-0795	January 2010	1.1
CNSC Regulatory Document / Guidance Document: *Public Information and Disclosure*	RD/GD 99.3	March 2012	1.5
CNSC Regulatory Guide: *Financial Guarantees for the Decommissioning of Licensed Activities.*	G-206	June 2000	1.6
CNSC Regulatory Guide: *Assessing the Long-term Safety of Radioactive Waste Management*	G-320	Dec 2006	5.1
International Atomic Energy Agency (IAEA) Safety Guide: *Safety Case and Safety Assessment for the Disposal of Radioactive Waste*	SSG-23	Sept 2012	5.1
CNSC Regulatory Guide: *Human Factors Verification and Validation Plans*	G-278	June 2003	6.1
CNSC Regulatory Document: *Design of New Nuclear Power Plants*	RD-337	November 2008	6.1
CNSC Regulatory Guide: *Measuring Airborne Radon Progeny at Uranium Mines and Mills*	G-4	June 2003	8.1
CNSC Regulatory Policy: *Protection of the Environment*	P-223	February 2001	9.1

Document Title	Document Number	Effective Date	Licence Condition
CNSC Regulatory Standard: *Environmental Protection Policies, Programs and Procedures at Class I Nuclear Facilities and Uranium Mines and Mills*	S-296	March 2006	9.1
CNSC Regulatory Guide: *Developing Environmental Protection Policies, Programs and Procedures at Class 1 Nuclear Facilities and Uranium Mines and Mills*	G-296	March 2006	9.1
CNSC Regulatory Guide: *Emergency Planning at Class 1 Nuclear Facilities and Uranium Mines and Mills*	G-225	August 2001	10.1
CNSC Regulatory Document: *Testing the Implementation of Emergency Measures*	RD-353	October 2008	10.1
CNSC Regulatory Guide: *Decommissioning Planning for Licensed Activities*	G-219	2000	11.2
Canadian Environmental Assessment Agency Operational Policy Statement: Follow-Up Programs Under the Canadian Environmental Assessment Act (CEAA)	N/A	December 2011	13.2

Table 3. Documents submitted by the licensee in support of the licence application and ongoing licensing requirements that are referenced within the LCH.

Notes:

N = written notification is required as the revised document comes into effect (see licence condition 1.2).

P = written notification prior to implementation and CNSC staff acceptance is required at least 30 days before the revised document comes into effect (see licence condition 1.2).

E-Doc 4101395 maintains document version control of the documents referenced below.

Document Title	Document Number	Written Notification Requirement	Related Licence Condition(s)
Project Requirements	DGR-PDR-00120-0001	P	1.1, 4.1
Preliminary Safety Report	00216-SR-01320-00001	P	1.1, 4.1, 5.1, 6.1
Deep Geologic Repository Management System Charter	00216-CHAR-0001	P	1.1, 2.1, 2.2, 4.1, 4.2
DGR Project - Project Execution Plan (redacted)	00216-PEP-00120-00002	N	1.1, 2.1, 2.2, 4.1
DGR Project - Commitments Report	NWMO DGR-TR-2013-01	P	1.1, 4.1, 13.1
Design and Construction Phase Management System	NWMO DGR-PD-EN-0001	P	1.1, 2.1, 2.2, 4.1, 4.2
Preliminary Decommissioning Plan	DGR-TR-2011-39	N	1.1, 11.2
Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository	00216-REP-03902-00003	N	1.1, 5.1
Drawing - General Arrangement of DGR Site and Surrounding Area	00216-DRAW-00120-10001	N	1.1, 4.1
Information Management	NK054-PROG-0016	N	1.2, 1.5, 4.1, 4.2
Records and Document Control	NK054-PROC-0063	N	1.2

Document Title	Document Number	Written Notification Requirement	Related Licence Condition(s)
Standards for Controlled Documents	NWMO-STD-AD-0001	N	1.2
Records Management	NWMO-PROC-AD-0002	N	1.2
Internal and External Communication Management.	NK054-PROC-0065	N	1.2, 1.5, 4.2
Communication Plan	NWMO DGR-PLAN-08510-0004	N	1.5
OPG Financial Guarantee Letter of Credit	Not Yet Submitted	N	1.6
Training Management Plan	DGR-PLAN-08920-1001	N	3.1, 4.1
Design and Construction Phase Project Quality Plan for OPG's DGR for L&ILW	NWMO DGR-PLAN-00120-0006	N	1.1, 2.1, 2.2, 4.1
Procurement Plan	NWMO DGR-PLAN-00800-1001	N	4.1
Geotechnical Investigation and Rock Monitoring During Construction	NWMO DGR-REP-01130-xxxxx	N	4.1, 5.1
Construction Quality Assurance Plan	NWMO DGR-PLAN-01916-1001	N	4.1, 6.1
Configuration Management Plan	NWMO-PLAN-00160-0001	N	4.1, 6.1
Repository Development Plan	NWMO TBD	N	4.1, 6.1
Geotechnical Design Basis	NWMO DGR-REP-01130-31123	N	4.1, 6.1
Commissioning Management Plan	NWMO DGR-PLAN-00920-1001	N	4.1, 6.1, 7.1
Construction Management Plan	NWMO DGR-PLAN-00180 -1001	N	4.1, 12.1

Document Title	Document Number	Written Notification Requirement	Related Licence Condition(s)
Project Management	NK054-PROG-0009	N	2.2, 3.1, 4.1, 4.2, 5.1, 6.1, 6.2, 7.1, 8.1, 9.1, 9.2, 10.1, 10.2, 11.1, 11.2, 12.1, 13.1
Continual Improvement	NK054-PROG-0003	N	2.2, 3.1, 4.1, 4.2, 5.1, 6.1, 7.1, 8.1, 9.1, 9.2, 10.1, 10.2, 11.1, 11.2, 12.1, 13.1
Human Resource Management	NK054-PROG-0013	N	3.1, 4.1
Site Approvals and Engineering	NK054-PROG-0001	N	4.1, 5.1, 6.1, 6.2
Construction	NK054-PROG-0005	N	4.1, 6.2, 10.2, 11.2, 12.1
Supply Chain	NK054-PROG-0004	N	2.2, 4.1
Non-Conformance and Corrective and Preventive Action	NWMO-PROC-QA-0001	N	4.2
Corrective and Preventive Action	NK054-PROC-0012	N	4.2
Safety Assessment Procedure	NWMO-PROC-EN-0003	N	5.1
Postclosure Safety Assessment	NWMO DGR-TR-2011-25	N	5.1
Geoscientific Verification Plan	NWMO DGR-TR-2011-38	N	5.1
Human Factors Verification and Validation Plan	DGR-PLAN-01170-27989	N	6.1

Document Title	Document Number	Written Notification Requirement	Related Licence Condition(s)
Technical Computing Software Procedure	NWMO-PROC-EN-00002	N	6.1
Design Management	NWMO-PROC-EN-0001	N	6.1, 6.2
Health and Safety Management Plan	NWMO DGR-PLAN-08962-1001	N	8.1, 10.1, 10.2, 11.1
DGR Project - Environment Management Plan	NWMO DGR-PLAN-07002-1001	N	9.1, 9.2, 11.1
Emergency Response Plan	NWMO DGR-PLAN-08962-1002	N	4.1, 10.1
Fire Protection Program	NWMO DGR-PROC-ES-0001-R000	N	4.1, 10.2
Site Security Plan	TBD	N	4.1, 12.1
DGR Project - EA Follow-Up Monitoring Program	NWMO DGR-TR-2011-10	P	9.1, 9.2, 13.2

Table 4. Scope of documents referenced in the LCH that were not submitted as part of the licence application (see licence condition 4.1).

Notes:

All documents listed in this table require written notification prior to implementation and CNSC staff acceptance at least 30 days before the revised document comes into effect (see licence condition 1.2).

E-Doc 4101395 maintains document version control of the documents referenced below

Document Title	Document Number	Scope
Commissioning Management Plan	NWMO DGR-PLAN-00920-1001	Defines the commissioning process with detailed activities and schedule for the commissioning of the DGR components that are to be operational during construction, and for commissioning of the facility prior to turnover to demonstrate that the installed facility meets the design and licensing basis. The Commissioning Management Plan will also describe the required performance values, detailed operational acceptance criteria or requirements as well as the various roles to ensure the objectives of the commissioning phase are achieved. The plan will also describe verification associated with commissioning technical computing and real time process control software. The acceptance specifications will refer to drawings, schedules and the relevant parts of codes, manuals, guides and standards. The requirements for vendor participation are also included along with the arrangements for interface with the facility's operating manager and organization.
Construction Management Plan	NWMO DGR-PLAN-00180-1001	Defines the responsibilities of the Construction Manager and construction management staff as well as the strategies and policies to manage the construction of the facilities at the DGR construction site. It is supported by project-specific procedures and standards, such as the Health and Safety Management Plan that also directs performance of the construction management activities. The Construction Management Plan describes the construction project and the facilities to be constructed as well as the processes that will be used to execute and complete the work and accomplish the construction objectives and requirements including

Document Title	Document Number	Scope
		schedule. The Construction Management Plan also includes the contingency plan and procedures to ensure a managed safe response to unplanned events such as flooding that could occur during construction. The contingency plan will be revised and tested as the construction proceeds through phases from surface construction to shaft sinking to underground development.
Construction Quality Assurance Plan	NWMO DGR-PLAN-01916-1001	Defines the sequence, schedule and various systematic actions that will be taken in the field by NWMO staff and contractors to provide assurance that the DGR facility is being constructed to meet the design specifications. In particular the Construction Quality Assurance Plan defines the requirements for performance of field tests and inspections to confirm the DGR facility is being built in accordance with the approved engineering drawings and specifications. The Construction Quality Assurance Plan receives authority from the D&C Phase Project Quality Plan for OPG's L&ILW DGR (DGR-PLAN-00120-0006). The Construction Quality Assurance Plan will define the following: ▪ Roles and responsibilities of personnel overseeing and executing the field quality assurance program; ▪ Qualification and training required by personnel executing various field quality assurance activities; ▪ Requirements for any work-specific quality management procedures that may be prepared by contractors performing construction work; ▪ Requirements for monitoring, testing, inspection and review activities that will be performed in the field to ensure that goods and services are supplied and installed as per approved plans, drawings and/or specifications. (procedures for performing various monitoring, inspection and review activities will be documented in a Field Inspection Manual(s));

Document Title	Document Number	Scope
		▪ Requirements for calibration or verification of measuring equipment against standards traceable to national or international measure standards; ▪ Requirements for the engineering organization to accept certain specialized testing and work procedures (e.g. pressure boundary work); ▪ Requirements for notification in the event there are deficiencies in goods and services; ▪ Requirements for corrective action plans that would describe execution of corrective measures, and subsequent confirmation and reporting of results of corrective measures to an NWMO representative; ▪ Requirements for written reports that summarize monitoring, inspection and review of activities performed in the field; and ▪ Requirements for the management of quality assurance records arising from field inspections and tests. A key aspect of the construction quality assurance program during DGR site preparation and construction will be field test quality control. Field test quality control data will be used to confirm that materials (e.g. backfill, concrete, rock bolts) are installed during construction of the DGR facility in accordance with design specifications. The Construction Quality Assurance Plan will describe the use of a Field Quality Inspection Manual (DGR-MAN-01916-0002) which will provide detailed requirements for various in-the-field quality control activities.
Configuration Management Plan	NWMO-PLAN-00160-0001	The configuration management plan is a corporate NWMO plan to ensure that the design, construction, commissioning, operation and maintenance of a facility is in accordance with the design requirements as defined in the design documents and the licensing basis documentation. The configuration management plan describes the various aspects that require consideration during development and implementation of a

Document Title	Document Number	Scope
		systematic *configuration management* system. The aspects to be considered include design process, procurement, commissioning, operations and maintenance, process/tools, human factors, cost/benefit ratio and implementation. The plan also references or includes requirements for technical drawings numbering and equipment labelling systems. When implemented the plan will ensure the facility is designed, constructed, commissioned and operated consistent with the design and licensing basis. It will provide traceability for design documents through to operations and ensure changes made are documented to maintain consistency with the facility design and licensing basis. This plan will apply to all aspects of the DGR project in the design and construction phase, including detailed design, construction, commissioning and turnover to operations.
Procurement Plan	NWMO DGR-PLAN-00800-1001	The D&C Phase Management System document is being updated and will have separate Procurement and Contract Management plans. As such, the LCH should only include the Procurement Plan as the Contract Management Plan describes how NWMO will manage the commercial aspects of contracts. The key aspects of Procurement, as they relate to CSA N286-05 or 12 are addressed in the Procurement Plan. The Procurement Plan will be compliant with the requirements of the NWMO Procurement Procedure and be available prior to the start of procurement of materials and equipment for the DGR. The plan will establish the detailed purchasing requirements to be followed for the DGR Project including defining specific roles and responsibilities, requisitioning and purchasing process, requirements for vendor pre-qualification, quality requirements, requirements for acceptance testing and inspection of materials and equipment. The control, handling and storage of purchased materials and equipment will be a part of this plan. The plan will also describe requirements for dealing with equipment nonconformities to technical specifications, contract monitoring, contract closeout evaluation and

Document Title	Document Number	Scope
		requirements for subcontractor control as well as records retention and maintenance.
Training Management Plan	NWMO DGR-PLAN-08920-1001	Will be consistent with the requirements of the NWMO human resources policies and with the principles of a systematic approach to training. The plan will include roles and responsibilities and minimum qualifications of individuals preparing training materials and delivering training. Training programs will be designed and developed based on an assessment of job requirements and appropriate training objectives and will be assessed and approved prior to implementation. Training will include, for example, project orientation training and training for personnel having responsibilities for contractor oversight. Persons receiving training will be evaluated to ensure they have developed the necessary skills and knowledge required for job performance and will be provided with feedback and remedial training if necessary. The Training Management Plan will include requirements for evaluation of training programs to ensure that training is effective and the overall plan remains effective.
Emergency Response Plan	NWMO DGR-PLAN-08962-1002	The Emergency Response Plan is the Plan for response to abnormal conditions that have been assessed as having the potential to result in significant loss, thus requiring emergency response rules and instructions. (i.e.,- fire, medical, first aid, radiation emergencies, weather restrictions, winter storm and the containment of released or spilled materials). To be revised prior to start of site preparation and construction.
Fire Protection Program	NWMO DGR-PROC-ES-0001-R000	Will be prepared for the site preparation and construction phase in accordance with the National Building Code of Canada-Part 8, the National Fire Code of Canada, the Ontario Health and Safety Act, and guidance from National Fire Protection Association (NFPA) standards 122 and 801, and Ontario Regulation 213/81. The document will describe fire protection goals and will also describe roles and responsibilities, fire response, fire

Document Title	Document Number	Scope
		assessments, managing changes that affect fire protection, work practice and procedures, fire planning, inspection and maintenance of fire protection systems, quality assurance, housekeeping, storage and handling of hazardous goods, control of ignition sources, transient material, reporting and drills. This document will include a requirement for a Fire Hazard Analysis (FHA) based on the guidance of NFPA 122 and 801.
Site Security Plan	TBD	Security requirements for controlling access to the DGR site, and details regarding how the storage, use and transportation of explosives (used during underground construction) will be securely managed, taking into account the potential impacts to other facilities.
Repository Development Plan	TBD	Will provide further details on the following aspects of repository planning and development: ▪ Introduction: This will include purpose, background, scope, and a description of where in the PSR and other licence application documents information is available on the following: Management System; Design; Conventional Safety; Environmental Protection; Ventilation Monitoring; Emergency Response; and, Training for Underground Workers ▪ Repository Development ▪ Ventilation ▪ Excavation ▪ Water Management ▪ Waste Rock Management ▪ Key general arrangement drawings at the 80% or beyond (AFC) stage.
Geotechnical Design Basis	NWMO DGR-REP-01130-31123	Will describe geotechnical site characterization, rock mass qualities, shaft design basis and detailed geotechnical design basis for the following: ▪ Emplacement Rooms;

Document Title	Document Number	Scope
		▪ Access tunnels; ▪ Ventilation return air tunnels; ▪ Shaft area excavations and intersections; and ▪ Ancillary excavations
Geotechnical Investigation and Rock Monitoring During Construction	NWMO DGR-REP-01130-xxxxx	Will describe shaft and repository design arrangement, excavation method and sequence, key geometric parameters and their uncertainties, observation and verification approaches during construction, review of geoscientific verification plan, shaft investigation program, and repository investigation program.

PART H: RESOLUTION OF CONFLICTS OR INCONSISTENCIES

Part H of this LCH associated with WFCL-W6-3900.00/2024 provides a table used to record resolutions to identified conflicts or inconsistencies.

Licence Condition	Subject of Conflict or Inconsistency	E-DOCS #	Identifier	Approved Date