OPG's DEEP GEOLOGIC REPOSITORY FOR LOW AND INTERMEDIATE LEVEL WASTE – PROJECT OVERVIEW

Frank King
Nuclear Waste Management Organization
Toronto, Ontario, Canada

Gord Sullivan
Ontario Power Generation
Toronto, Ontario, Canada

ABSTRACT

Ontario Power Generation (OPG) is undergoing a multi-year planning and regulatory approvals process for a deep geologic repository (DGR) for the long-term management of low and intermediate level waste (L&ILW). The DGR Project involves the construction, operation and eventual decommissioning of a repository situated nominally at 680 metres below the Bruce nuclear site, near Tiverton, Ontario, in an argillaceous limestone formation. The basic need for the DGR Project derives from the fact that L&ILW consists of materials that can remain hazardous for hundreds, and in some case, thousands of years due to the presence of long-lived radionuclides. These long timeframes require that a solution be found that protects humans and the environment, that is passive, and that does not rely on long-term institutional control. The Environmental Impact Statement (EIS), Preliminary Safety Report (PSR) and other supporting documents in support of a site preparation and construction licence for the project were submitted to the Canadian Nuclear Safety Commission on April 14, 2011 as part of the regulatory approvals process. The DGR is a first-of-a-kind facility in Canada for the long-term management of radioactive wastes. It is consistent with government policy and regulatory expectations and has the support of the local host community. Construction of the DGR is expected to start in 2013 with waste emplacement commencing about 2019. This paper provides an overview of the DGR project.

1. INTRODUCTION

Ontario Power Generation (OPG) is undergoing a multi-year planning and regulatory approvals process for a deep geologic repository (DGR) for the long-term management of low and intermediate level waste (L&ILW). For over 35 years, the L&ILW produced as a result of the operation of OPG-owned nuclear reactors has been stored centrally at OPG's Western Waste Management Facility (WWMF) on the Bruce nuclear site near Tiverton, Ontario. Although current storage practices are safe and could be continued safely for many decades, OPG's long-standing plan is to manage these wastes in a permanent long-term management facility.

Low-level wastes are non-fuel radioactive wastes generated in the operation, maintenance and refurbishment of nuclear reactors and are typically composed of rags, paper towels, temporary floor coverings, protective clothing and hardware items such as tools. Intermediate-level wastes typically include ion exchange resins, filters and in-core components.

The DGR Project involves the design and licensing, construction, operation and eventual decommissioning of a repository situated nominally at 680 metres below the Bruce nuclear site in an argillaceous limestone formation. An illustration of the DGR is presented in Figure 1.

In addition to overview information presented in this paper, more detailed information on the DGR Project can be found in other papers at this conference [1 to 6].

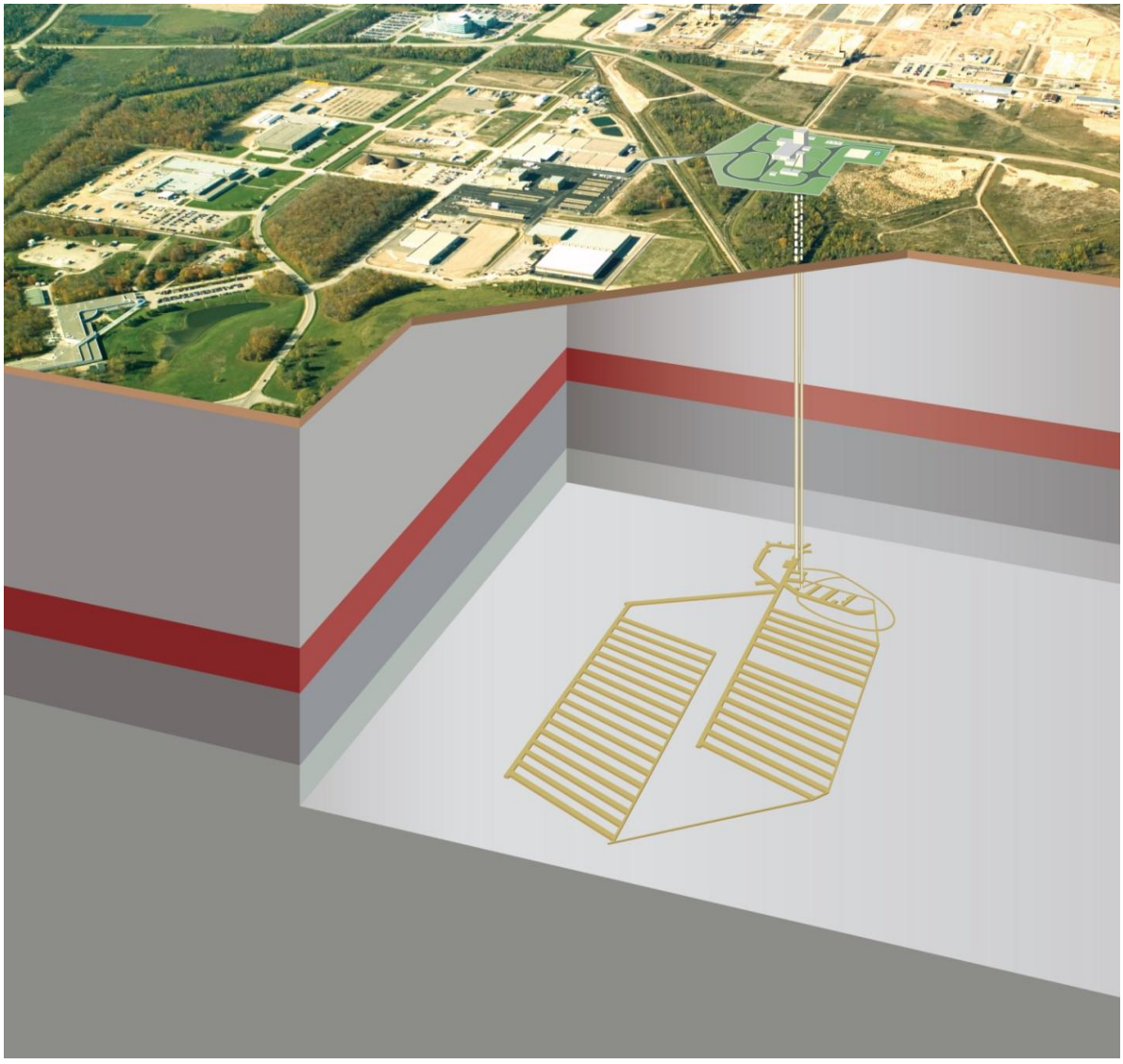

Figure 1. Deep Geologic Repository on Bruce Nuclear Site

2. PROJECT HISTORY

In 2001, the Municipality of Kincardine requested that OPG consider options for the long-term management of the WWMF's L&ILW. This led, in 2002, to a Memorandum of Understanding (MOU) between the parties. The MOU set out the terms for a plan to study long-term management options. An independent consultant was retained to examine the costs, impacts and benefits of constructing and operating each of four long-term management concepts on the Bruce nuclear site, namely: Enhanced Processing and Storage; Surface Concrete Vaults; Deep Rock Vaults, and status quo. The study report, known as the Independent Assessment Study [7], was completed in early 2004, and concluded that all four options were technically feasible and could be safely constructed and operated at the site. All options were assessed in terms of environmental impacts, economic benefits, public attitude and tourism, with favourable conclusions. Communication activities were conducted throughout the duration of the study to inform the public and other stakeholders of the study, and obtain their comments on the long-term management options.

With the finalization of the study, Kincardine Council passed a resolution requesting OPG to pursue a deep geologic repository for all L&ILW stored at the WWMF, citing reasons that this option offered the highest margin of long-term safety among the four technical options studied, was consistent with international best practice, provided economic benefit to the residents of the municipality, and offered a permanent solution for all low and intermediate level waste (i.e., deep geologic disposal is the only option of the four that can manage long-lived intermediate level waste). In considering this request, OPG assessed a number of options, including the option of pursuing a greenfield location. In August 2004, the OPG Board of Directors agreed to proceed with a DGR, recognizing the reasons cited above by Kincardine, and also that the project was supported by the community, and that long-term risks associated with the interim storage of L&ILW would be reduced.

A DGR Hosting Agreement was signed in October 2004 between OPG and the Municipality of Kincardine. The Agreement allows for the construction and operation of a deep geologic repository for the long-term management of L&ILW waste from Ontario's nuclear generating stations, and provides a series of hosting payments to Kincardine and surrounding communities subject to meeting major project licensing and construction milestones. The agreement also required that a clear mandate be provided by the Kincardine community to its council in favour of the DGR. A poll was conducted in early 2005 targeting all Kincardine permanent (by telephone) and seasonal (by mail) residents over the age of eighteen by an independent polling company working on behalf of the Municipality of Kincardine. With a 72% response rate, 60% of the Kincardine community voted in favour of the DGR, 22% against, 13% neutral, and 5% don't know/refused to answer.

The local First Nations (Saugeen Ojibway Nation (SON)) were first approached in 2003 by OPG to inform them of the Independent Assessment Study. A Communication Protocol was signed in 2004 that included resources and provision for SON to conduct their own independent peer review of the study report. Since 2003, there have been a number of meetings, workshops and open houses to discuss the project and disseminate information with the SON and their communities, including the establishment of SON's Environmental Office for the purpose of interfacing with the DGR project. In March 2009, the signing of a Protocol Agreement between

SON, OPG, and the Nuclear Waste Management Organization (NWMO) provided SON with the necessary resources to be able to participate in the EA process for the project. The engagement process with the SON is ongoing.

Local Métis interests include the Historic Saugeen Métis, and the Métis Nation of Ontario-represented citizens in the Georgian Bay Region. The engagement process with these groups began in 2008. A participation agreement with the Historic Saugeen Métis was finalized in 2010 providing capacity to facilitate their engagement on the DGR Project. A similar participation agreement has been signed with the Métis Nation of Ontario.

A Project Description for the DGR was prepared and filed with the Canadian Nuclear Safety Commission (CNSC) in December 2005, and initiated the regulatory approvals phase for the project. The CNSC presided over a public hearing in October 2006 in Bruce County for the purpose of determining the type of environmental assessment process required for this undertaking. In December 2006, the Commission published its report with a recommendation to the federal Minister of Environment that the project should be subjected to a Panel Review EA. In June 2007, the federal Minister of Environment referred the project to a joint review panel. Final instructions and guidelines for the preparation of the project Environmental Impact Statement (EIS) were jointly released by the CNSC and the Canadian Environmental Assessment Agency in January 2009.

Beginning in 2006, a comprehensive program of field and technical studies and investigations were undertaken including the disciplines of geoscience, safety assessment, environmental assessment, public communications and development of the engineering design. Expert review panels in the areas of geoscience, engineering and safety assessment were established to guide and review study findings. All work was completed in 2010 leading to the regulatory submission in April 2011.

Over the course of the project lifetime, an extensive public communications program has been in place for the purpose of keeping all interested parties updated on developments with the project. The program includes annual open houses, newsletters, annual reports, technical materials, speaking engagements, and attendance at community events with exhibits. Public surveys have indicated strong overall support for the project from the community and its leaders.

3. NEED FOR THE PROJECT

The basic need for the DGR Project derives from the fact that L&ILW consists of materials that can remain hazardous for hundreds, and in some case, thousands of years due to the presence of long-lived radionuclides. These long timeframes require that a solution be found that protects humans and the environment, that is passive, and that does not rely on long-term institutional control. For shorter-lived radionuclides, near-surface disposal facilities could provide the required protection; however, for long-lived radionuclides, deep geologic disposal in suitable rock formations is the solution consistent with international guidance and practice.

Geologic repositories for L&ILW are currently in operation in Finland, Sweden and the United States of America, are under construction in Germany and South Korea, and are planned in other countries, such as France and Japan, to meet the same basic need.

The DGR Project is also consistent with the Government of Canada's radioactive waste policy framework [8] which states that "The waste producers and owners are responsible, in accordance with the principle of 'polluter pays', for the funding, organization, management and operation of disposal and other facilities for their wastes".

4. PROJECT MANAGEMENT

From project inception in 2002 until 2008 the DGR project was fully managed within the Nuclear Waste Management Division of OPG. As of January 1, 2009 the majority of staff working on the project within OPG were transferred to the Nuclear Waste Management Organization (NWMO) and OPG contracted NWMO to manage the regulatory approvals phase for the DGR project on OPG's behalf. OPG continues to be the owner, and prospective licence holder and operator of the DGR. In 2011 OPG also contracted the NWMO to lead the design and construction phase of the DGR project.

The NWMO is an independent, not-for-profit company established by OPG, Hydro Québec and New Brunswick Power in accordance with Canada's *Nuclear Fuel Waste Act*, and has as its primary mandate the implementation of Adaptive Phased Management (APM), the NWMO-recommended, government-selected long-term management approach for Canada's nuclear fuel waste. Given that the technical component of APM involves a deep geologic repository, having the development of both geologic repositories within the same organization provides considerable staffing and experience-sharing efficiencies. OPG maintains a small internal organization to provide oversight of NMWO's activities on the DGR Project.

5. REGULATORY SUBMISSION

The Environmental Impact Statement (EIS), Preliminary Safety Report (PSR) and other supporting documents in support of a site preparation and construction licence for the project were submitted to the Canadian Nuclear Safety Commission on April 14, 2011 for delivery to the Joint Review Panel (JRP), when appointed. The EIS and licensing related documents in the submission package are shown in Figures 2 and 3, respectively. The documents themselves can be accessed from http://www.opg.com/dgr. Many other lower-tier supporting documents were also produced and can be accessed from the same website.

6. FUTURE ACTIVITIES

The next step in the regulatory approvals process is the JRP review. The JRP, when appointed, is expected to issue the submission package for a 6-month public review period which will be followed by a public hearing. The JRP must then submit a report to the federal Minister of Environment. If the conclusion of the EIS is accepted, then the JRP under its authority can issue a site preparation and construction licence to OPG. This is expected to occur in 2013.

The site preparation and construction process involves site clearing, installation of site services, construction of shaft collars, construction of shaft headframes, shaft sinking, excavation of waste emplacement rooms and other underground facilities, and facility commissioning, all of which are expected to take between five and six years. First waste emplacement is expected to occur about 2019.

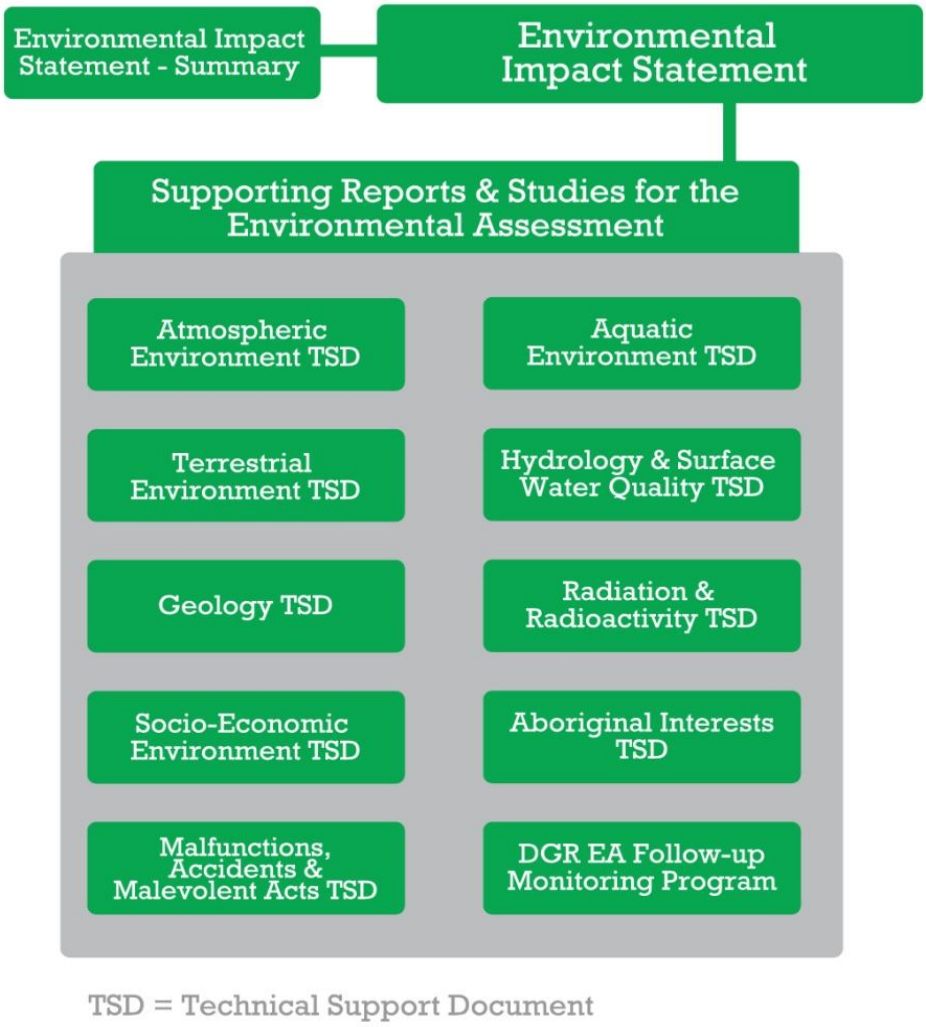

Figure 2. EIS-related Submission Documents

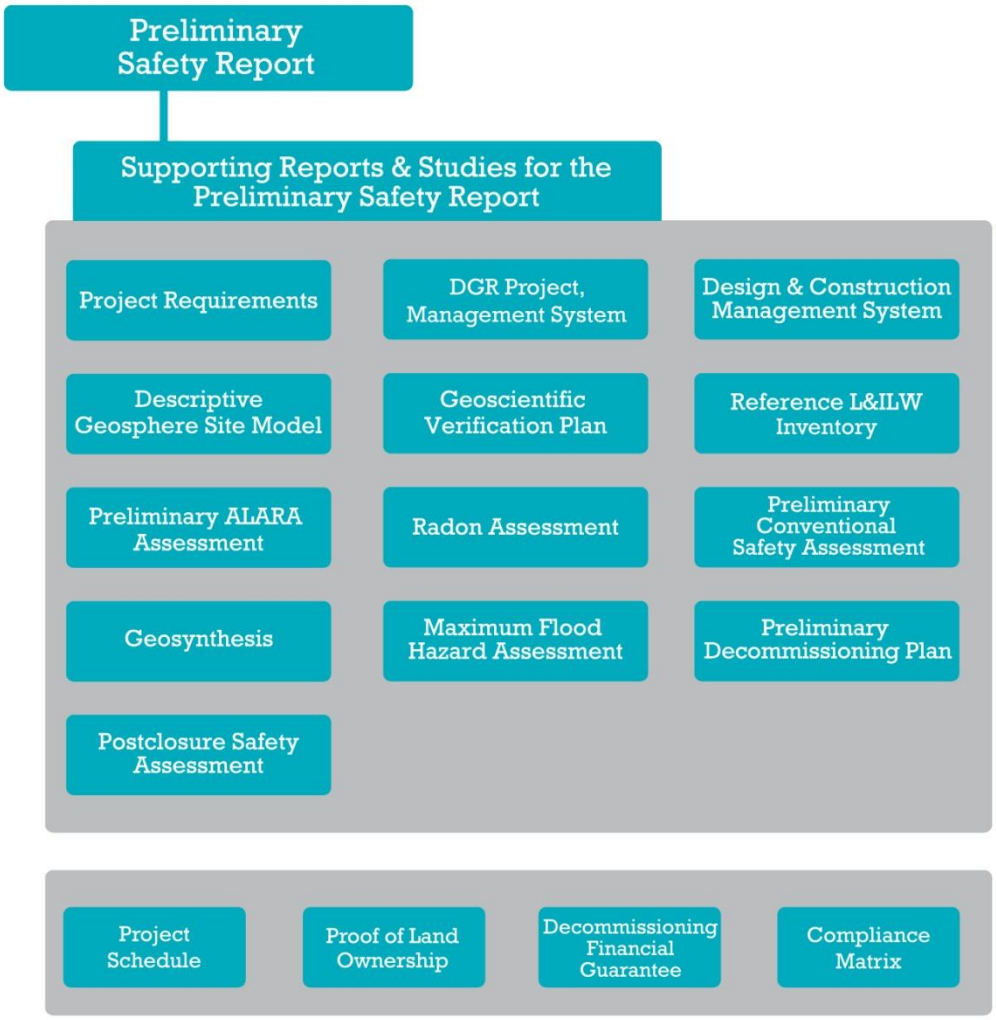

Figure 3. Licensing-related Submission Documents

The main conclusions drawn in the submission documents are:

- The DGR Project is not likely to result in any significant adverse effects on the environment;
- The DGR provides long-term isolation and containment of the wastes;
- Preclosure and postclosure safety criteria are met;
- The DGR system is robust; and
- The DGR can be constructed, operated and decommissioned safely.

7. SUMMARY

The DGR is a first-of-a-kind facility in Canada for the long-term management of radioactive wastes. It is consistent with OPG plans, government policy and regulatory expectations and has the support of the local host community. Comprehensive assessments conducted over the last nine years support the conclusion that the DGR will provide safe long-term management of OPG's L&ILW.

REFERENCES

[1.] Wilson, D. et al, "DGR Project Description – Design and Construction", Proceedings of Waste Management, Decommissioning and Environmental Restoration for Canada's Nuclear Activities conference, Toronto, September 11-14, 2011.

[2.] Witzke, P., "DGR Project Description – Operations", Proceedings of Waste Management, Decommissioning and Environmental Restoration for Canada's Nuclear Activities conference, Toronto, September 11-14, 2011.

[3.] Jensen, M. et al, "DGR Geoscientific Assessment", Proceedings of Waste Management, Decommissioning and Environmental Restoration for Canada's Nuclear Activities conference, Toronto, September 11-14, 2011.

[4.] Gierszewski, P. et al, "DGR Safety Assessment", Proceedings of Waste Management, Decommissioning and Environmental Restoration for Canada's Nuclear Activities conference, Toronto, September 11-14, 2011.

[5.] Barker, D. et al, "DGR Environmental Assessment", Proceedings of Waste Management, Decommissioning and Environmental Restoration for Canada's Nuclear Activities conference, Toronto, September 11-14, 2011.

[6.] Wilson, M., "DGR Public Participation and Public Engagement", Proceedings of Waste Management, Decommissioning and Environmental Restoration for Canada's Nuclear Activities conference, Toronto, September 11-14, 2011.

[7.] Golder Associates, "Independent Assessment of Long-Term Management Options for Low and Intermediate Level Wastes at OPG's Western Waste Management Facility", 03-1115-012, February 2004.

[8.] Natural Resources Canada, "Radioactive Waste Policy Framework", 96/79, July 10, 1996.