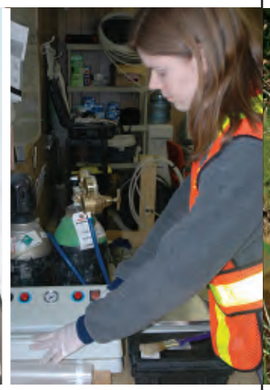
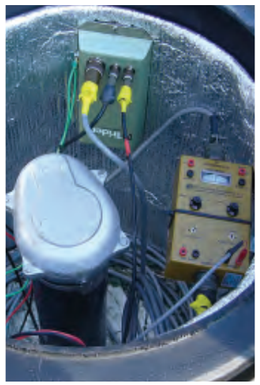






DEEP GEOLOGIC REPOSITORY PROJECT

ANNUAL REPORT 2007

© Materials used in this report are enviromentally friendly. Cover and text stocks are recycled and recyclable, with a minimum of 10% post-consumer waste. Vegetable based inks have been used throughout.

FSC

Design, Print, Distribution: OPG Office Services

ONTARIO POWER GENERATION
www.opg.com/dgr

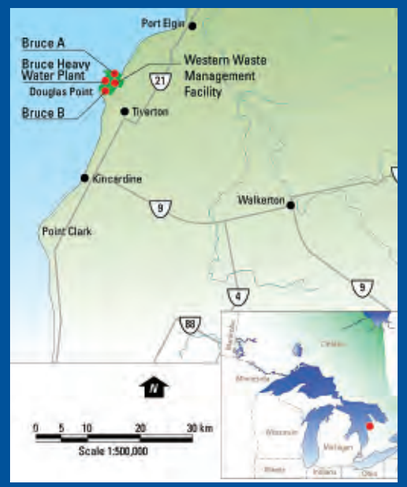
ONTARIO POWER GENERATION

TABLE OF CONTENTS

ARROW indicates proposed location of the DGR at the Bruce site in the Municipality of Kincardine

KEY FEATURES

- Proposed depth about 680 metres (2230 feet)
- Located in geologically stable, low permeability limestone
- Located beneath protective cap of 200 metres of low permeability shale
- Capacity of about 160,000 cubic metres of L&ILW
- Located adjacent to OPG's existing Western Waste Management Facility on the Bruce site



THE DGR PROJECT

Ontario Power Generation (OPG), with the support of the local municipalities, is seeking regulatory approval for the construction of a Deep Geologic Repository (DGR) for the long-term management of low and intermediate level radioactive waste (L&ILW) on lands adjacent to the Western Waste Management Facility on the Bruce site in the Municipality of Kincardine. The facility would manage about 160,000 cubic metres of L&ILW from OPG-owned nuclear generating stations in Ontario.

The DGR is currently in the regulatory approvals phase which is expected to last about five years. This process includes geoscientific site investigations, environmental baseline monitoring, safety assessment analyses, conceptual and preliminary engineering design, completion of an Environmental Assessment, and application for Site Preperation and Construction Licences.

The DGR would be located about 680 m (2230 feet) below ground surface in low permeability limestone, beneath a 200 m (660 feet) thick layer of low permeability shale. These sedimentary bedrock formations, that provide natural barriers, will safely isolate the radioactive waste for many thousands of years and beyond. This rock has remained stable for more than 450 million years in spite of geologic upheavals, major climate change and glacial cycles.

The proposed DGR would be composed of a series of emplacement rooms excavated in the rock. Conventional mining methods would be used to construct the repository over a period of about five years. Access to the DGR and the emplacement rooms would be by vertical shaft. Once the DGR ceases to receive waste and following a period of monitoring, OPG expects to seek approval to close the facility. This would entail sealing the repository access shafts with clay-based and concrete materials.

REGULATORY PROCESS

In June 2007, the federal Environment Minister announced that the DGR project had been referred to a review panel for assessment under the Canadian Environmental Assessment Act. This announcement confirmed the recommendation made by the Canadian Nuclear Safety Commission (CNSC) in December 2006.

In August 2007, consistent with the Minister's announcement, OPG submitted to the CNSC its application for a Site Preparation and Construction Licence. The next step in the regulatory review process is the finalization of the Panel Agreement, which will outline the regulatory review process, and the guidelines (scope) for the environmental assessment.

Although the scope and process have not been finalized, OPG has been progressing with studies to verify the site-specific geologic information, which to date have indicated favourable conditions for the DGR, as well as environmental baseline studies, safety studies, and conceptual engineering work.

Information on baseline environment is collected in support of the environmental assessment.

GEOSCIENTIFIC SITE CHARACTERIZATION STUDIES

Geoscientific investigations to assess and confirm the suitability of the Bruce site to safely host the DGR were initiated in 2006. These investigations are part of a stepwise multi-year program scheduled for completion in 2010. A key goal of these investigations is to verify preliminary geoscientific assessments, initiated as early as 2002, that provided independent and peer reviewed evidence of favourable conditions for implementation of the DGR concept.

In 2007 Site Characterization studies focused on the completion of Phase 1 Bruce site field investigations and the development of a Geosynthesis report. The site-specific field investigations were focused on the drilling, testing, and instrumentation of two deep boreholes.

The Geoscience Review Group at work

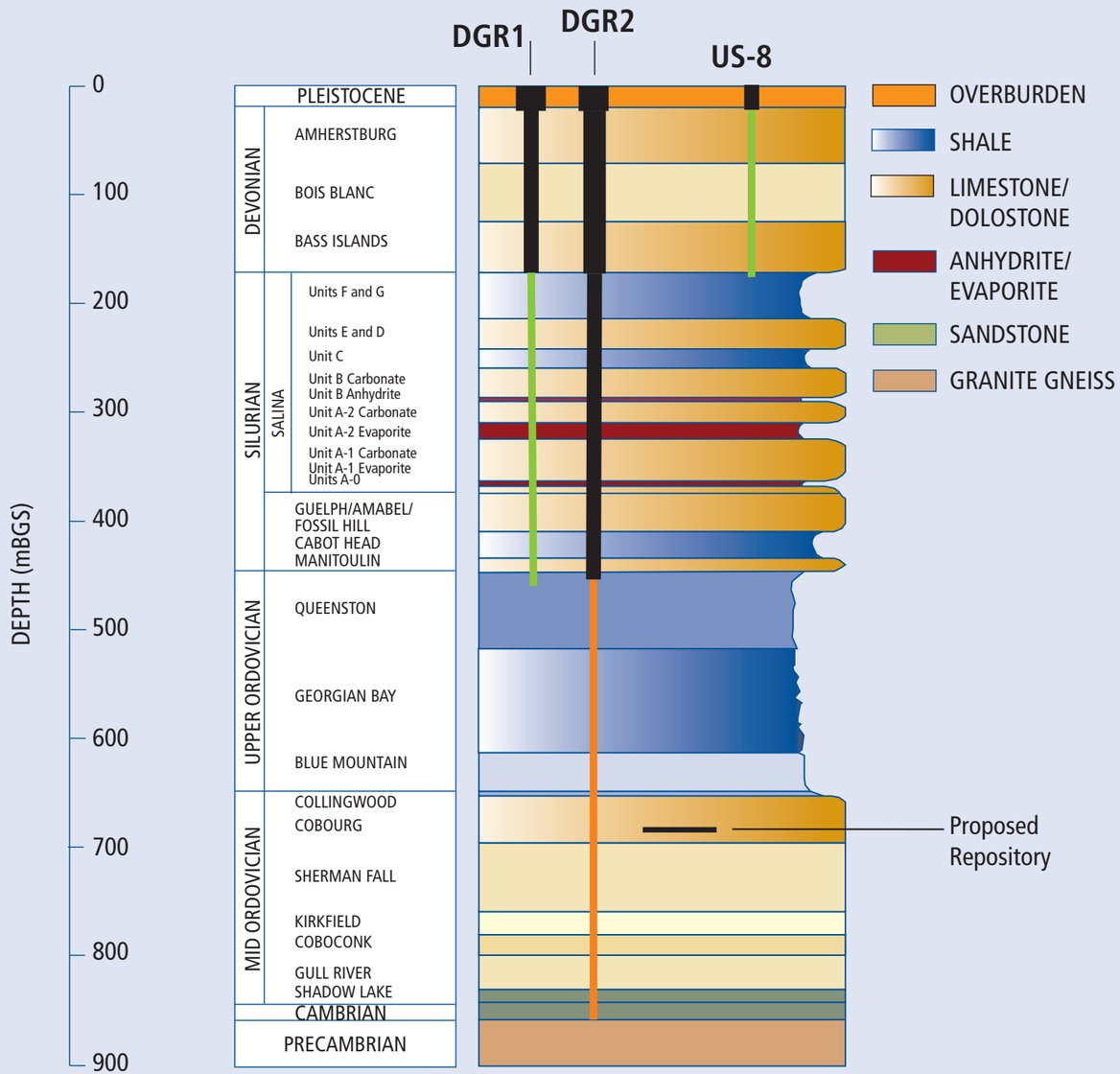
The Geosynthesis work program examined issues at a regional scale to establish a geoscientific basis for understanding site characteristics that contribute to predictions of long-term DGR performance and safety. This work program has involved the coordinated effort of universities (6) in Canada and abroad, along with 30 other geoscientist professionals. In addition, an independent Geoscience Review Group, which draws on experience from the French and Swiss Radioactive Waste Management programs in similar geologic settings, has provided technical oversight and advice throughout 2007.

BOREHOLES

The two deep boreholes, DGR1 and DGR2, provided the first opportunity to explore the Paleozoic age sedimentary bedrock formations directly beneath the Bruce site. The 160 mm diameter boreholes were drilled from a single site of depths to 463m and 863m below ground surface (mBGS). The boreholes were cored such that a continuous record of the Devonian to Cambrian age sedimentary rock layers occurring beneath the site was brought to surface for inspection, sampling and storage at an 0n-site Core Storage Facility. More than 850 m of rock core was retrieved in 2007, from which over 200 samples were collected and preserved for laboratory mineralogical, petrophysical, geomechanical and pore fluid analysis.

The bedrock stratigraphy at DGR1 and DGR2 was consistent with earlier conceptual models of the site and is comprised of 33 horizontally layered carbonate, shale, evaporite and sandstone bedrock formations that vary in thickness from approximately 2 to 99 m. The limestone of the Cobourg Formation proposed to host the DGR is first intersected at approximately 660 mBGS and has a thickness of 27m. The Cobourg is overlain by more than 200 m of shale comprising the Queenston, Georgian Bay and Blue Mountain bedrock formations. Preliminary results indicate water held within the rock core pore space below a depth of approximately 180 m possess Total Dissolved Solid concentrations in excess of 200 gm /L (i.e. 6 times more saline than seawater). This supports an earlier contention that the water has been isolated in the rock for a very long time.

Drill crew displays a 10-foot long section of rock core from DGR2.



BEDROCK FORMATIONS AND STRATIGRAPHY BENEATH THE BRUCE SITE BASED ON RESULTS OF PHASE 1 DEEP BOREHOLE DRILLING.

A borehole testing program immediately followed the completion of drilling. This program included geophysical logging in which instruments are lowered into the open boreholes to measure bedrock properties necessary to select bedrock formation boundaries, and to reveal information on bedrock fracturing, strength and stress conditions, and mineralogy. These tests were followed by down-hole hydraulic straddle packer tests to estimate rock permeabilities that, for the rock enclosing the repository, were at or less than 10^{-11} m/sec. Upon completion of the borehole testing, casing systems that allow long-term monitoring of groundwater conditions at 48 isolated intervals within the two boreholes were installed. These deep casing systems, in addition to three other shallow casing systems installed in the upper 100-180 m of the bedrock surface at different site locations, are part of a growing monitoring well network that will be used to establish baseline conditions at the site.

GEOSYNTHESIS

The Geosynthesis activities complement the site-specific investigation by examining issues surrounding the origin and evolution of sedimentary bedrock formations that are to enclose and isolate the proposed DGR. These activities have focused on compiling existing scientific data at a regional scale to examine issues of bedrock formation stratigraphic predictability, groundwater migration, bedrock fracturing, natural resources and seismicity. Numerical modelling of the regional scale groundwater system has also been undertaken to explore the role of bedrock formation layering and permeabilities, depth dependent variably saline ground and pore waters, and glacial events on groundwater movement and stability at time frames relevant to repository safety. These studies will be documented in supporting technical reports contributing to a Phase I Geosynthesis being prepared.

Representatives of the Geological Survey of Canada, Ontario Geological Survey and Ministry of Natural Resources examined the core from DGR2 during a September 2007 Workshop at the on-site Core Storage Facility.

SEISMOLOGY

A network of three borehole seismometers was installed by the University of Western Ontario in the summer of 2007 to monitor low-level seismic activity within an approximate 50 km radius of the DGR site. Annual reports of seismic activity from this network, prepared by the Geological Survey of Canada, will improve the understanding of low-level seismic activity in the region.

One of three low-level seismometers installed as part of the DGR geoscience program.

The Geoscience Review Group examines core from DGR1

GEOSCIENCE REVIEW GROUP

The Geoscience Review Group (GRG) is a peer review group comprised of internationally renowned scientists and engineers who ensure that information and lessons learned in similar international work programs are reflected in OPG's work. The GRG reviewed test plans, and visited the Bruce site to observe the drilling of DGR2 and the hydraulic testing of DGR1 and core recovered from DGR1. They also participated in reviewing Geosynthesis work. Based on its 2007 work the GRG reported that the Phase 1 site program has been well designed, is being carried out according to well-documented test plans, and is producing results that will be used to further assess the suitability of the Bruce site.

SAFETY ASSESSMENT

The primary purpose of the DGR is to contain and isolate the wastes. Based on our current understanding, the following safety principles are expected to apply:

- *There are no significant adverse near-term environmental or socioeconomic effects*
- *The site geological features and conditions provide several lines of evidence supporting long-term safety*
- *The facility design can be built and operated using proven technologies and in a safe manner*
- *Considering the facility design, waste inventory and site geological features, the postclosure impacts will be very small*

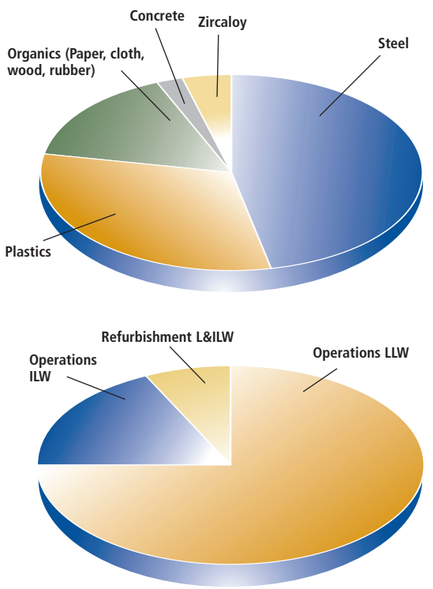
The potential impacts of the facility are addressed through safety assessment. The pre-closure assessment considers the safety of the repository during the operational period. The post-closure assessment addresses the safety of the repository after the underground portion has been closed and sealed, and extends far into the future.

The safety assessment is following Canadian and international guidelines, which encourage a well-structured, transparent and traceable approach. The assessment will consider both a normal evolution scenario and disruptive scenarios. The latter include a variety of potential hazards and "what if" scenarios, such as future human intrusion, in order to test and illustrate the safety of the repository. The results from the safety assessment in turn provide feedback to the site characterization and facility design work.

The safety assessment is conducted in stages, with interaction with the site characterization, waste inventory and facility design work programs.

A preliminary assessment, completed in 2003, is presently being updated to take into account:

- *Current forecast waste inventory, including intermediate level wastes such as those presently received at the WWMF*
- *Geological data from the Site Characterization Program, including results from the first two deep boreholes at the site*
- *Current facility design*



Waste composition: by weight and material (top), and by volume and source (bottom).

Head Frame Building at the Nickel Rim Mine in Sudbury

FACILITY ENGINEERING

The conceptual design for the DGR that was developed in 2004 has been updated and further optimized through more detailed analyses of key elements of the design. In addition, OPG has benchmarked the DGR design against designs of other similar existing and proposed facilities located in Europe and the United States and this has led to improvements in the DGR design.

The DGR concept is comprised of horizontally-excavated emplacement rooms arranged in two panels with access provided via two vertical concrete-lined shafts. The emplacement rooms would be constructed at a depth of about 680 m within a stable limestone formation. In this concept, waste packages are lowered by shaft hoist to the repository horizon and then transferred by forklift to emplacement rooms. Waste packages are stacked within emplacement rooms by forklift and, when full, the rooms are isolated by closure walls. When filled with waste and after receipt of all necessary regulatory approvals, the repository would be sealed by placing low permeability clay based materials and concrete plugs in each shaft.

In 2007, OPG's engineering consultant assessed alternative arrangements for various aspects of the 2004 DGR design concept, recommended a preferred arrangement for each, and then updated the conceptual design. In particular the consultant assessed and optimized the design for the following key aspects of the DGR facility design:

- *Configuration of selected repository waste packages*
- *Repository access-ways (i.e., shaft versus ramp access)*
- *Main shaft hoisting system*
- *Shaft design and sealing*
- *Underground waste package handling system*
- *Emplacement room and tunnel configurations*
- *Repository development (i.e., timing of emplacement room construction)*
- *Waste rock management*
- *Facility location and layout*

During visits to L&ILW repositories at Olkiluoto in Finland, Konrad in Germany, and WIPP in the United States, OPG and its engineering consultant toured the repositories and met with operators to gather design information that would be relevant to the DGR design. The major observations and findings are related to type of repository access, hoisting equipment, ventilation design and controls, layout of emplacement rooms, underground mobile equipment and materials handling.

Accessway at the Olkiluoto repository in Finland. The repository was commissioned in 1992 and manages low and intermediate level waste.

An emplacement room at the Waste Isolation Pilot Plant in New Mexico, United States, a facility which was constructed at about the same depth as OPG's DGR is planned.

Kincardine resident discusses the DGR Project at an Open House.

COMMUNITY ENGAGEMENT

OPG's strategy for engaging stakeholders in discussion on the DGR project is to go to events where the public would already be gathering. Events that DGR staff participated in, along with the DGR trailer, included the Owen Sound, Port Elgin and Kincardine Home Shows, Tiverton Energy Expo, Kincardine Scottish Games, Saugeen PowWow, Port Elgin Pumpkinfest, Clarington Family Safety Day and summer markets in Kincardine and the surrounding area.

OPG staff made presentations on the DGR project to a number of local business groups, service clubs and associations, and agricultural, angling and hunting, and retiree associations. Presentations were also made to groups in other nuclear host communities including the Durham Nuclear Health Committee and the Pickering Community Advisory Council.

Attendees complete comment cards after having visited the DGR Open House in Owen Sound.

Open Houses for the DGR project were held in October in the communities of Kincardine, Port Elgin, Owen Sound, Walkerton, Wiarton, Chesley, and Ripley. More than 200 people attended the seven open houses to obtain an update on the status of the DGR project and to provide their feedback on the proposed DGR to OPG. The public has expressed their appreciation for the opportunity to obtain regular updates on the status of the DGR project.

OPG met several times through the year with representatives of the Saugeen Ojibway Nations to provide updates on the proposed DGR and to discuss with them their views on how they wish to be involved in the environmental assessment process.

Three DGR Project-specific newsletters were published and distributed to more than 25,000 local residences.

DGR Exhibit at Kincardine Scottish Festival.

Environmental baseline studies include an assessment of terrestrial habitat.

ENVIRONMENTAL ASSESSMENT

A series of field studies were undertaken at the Bruce site to establish baseline environmental data to better assess the potential effects of the proposed DGR. Completed work to date includes studies of noise level, on-site surface water quality, wild turkey, breeding birds, amphibians and muskrat surveys, as well as archaeological and terrestrial habitat assessments.

This information will augment data which is already available as a result of ongoing monitoring programs and recent environmental assessments

Another key component of the environmental assessment which began in 2007 was the development of the preliminary list of Valued Ecosystem Components (VECs). The VECs are features of the environment selected to be a focus of the environmental assessment because of their ecological, social, or economic value and their potential vulnerability to the effects of the DGR project. OPG sought comments from the public on the preliminary list of VECs at its Open Houses in the fall of 2007 and will continue to consult on them until the EA guidelines are finalized.

OPG is awaiting the final guidelines for the environmental assessment, expected from the regulatory agencies in 2008, as a basis for advancing the environmental assessment process.

Baseline environment studies assessed the habitat for various species including wild turkey in winter and in summer.

Scientists conduct baseline fish monitoring studies in a stream near the proposed DGR site.

PROJECT SCHEDULE
L & ILW DEEP GEOLOGIC REPOSITORY

The current schedule for the regulatory review phase of the DGR project is based on a number of planning assumptions. The schedule will be revised as further information is available.