Ontario Power Generation's Proposed L&ILW Deep Geologic Repository: An Overview of Geoscientific Studies

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Introduction

The Nuclear Waste Management Organization (NWMO) on behalf of Ontario Power Generation (OPG) is conducting multi-disciplinary geoscientific studies at the Bruce nuclear site to confirm the suitability of the site to host a proposed Deep Geologic Repository (DGR) for the long-term management of Low and Intermediate Level Radioactive Waste (L&ILW) from OPG owned nuclear generating facilities. An Environmental Assessment for the proposed DGR is currently underway in accordance with the Canadian Environmental Assessment Act. Bruce nuclear site, situated 225 km northwest of Toronto on the eastern shore of Lake Huron, is underlain by an 850 m thick sedimentary sequence of Cambrian to Devonian age near horizontally bedded, weakly deformed shales, carbonates and evaporites of the Michigan Basin. Within this sedimentary pile, the proposed DGR would be excavated within the low permeability argillaceous limestone Cobourg Formation at a depth of 680 m, which is overlain by 200 m of upper Ordovician shale formations (Figure 1).

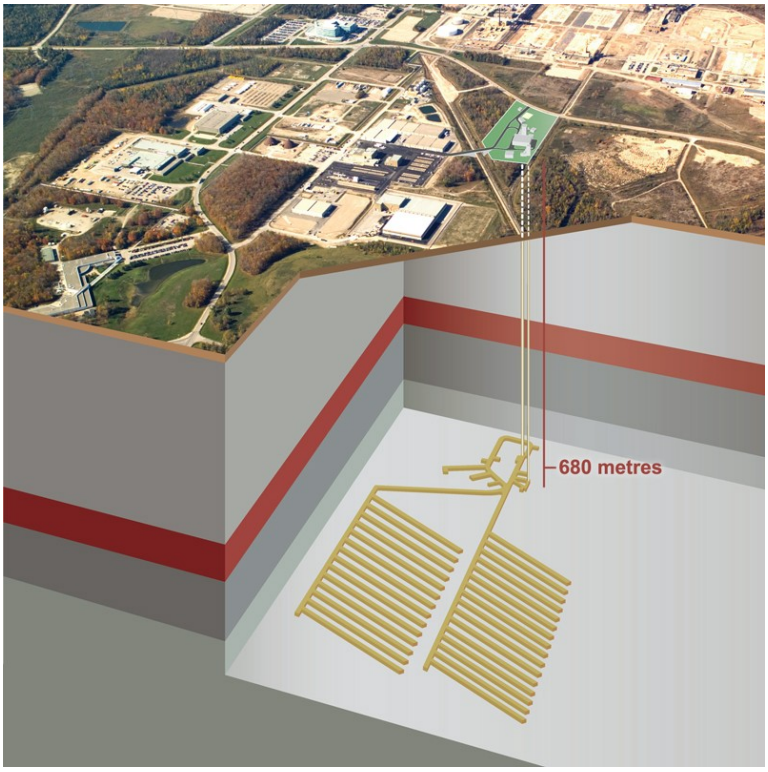

Figure 1: Artist Rendering of Proposed Ontario Power Generation Deep Geologic Repository at the Bruce nuclear site, Tiverton, Ontario.

A key aspect of the DGR Safety Case is the integrity and long-term stability of the sedimentary sequence to contain and isolate L&ILW at timeframes on the order of 1Ma. Early in the project,

geoscientific studies that considered regional and site-specific public domain data sets indicated favourable geologic conditions for implementation of the DGR concept (Golder, 2003; Mazurek, 2004).

Site specific investigations of the Bruce nuclear site began in 2006 (Jensen et al., 2009; Raven et al., 2009). The focus for the geoscientific investigations has been on gathering data to develop and test an understanding of the evolution and stability of the geologic, hydrogeologic, hydrogeochemical and geomechanical environ as it relates to demonstrating repository safety. The investigations were conducted in a stepwise manner and have involved among other studies, the drilling, coring and instrumentation of 6 deep (4 vertical; 2 inclined) boreholes through the sedimentary sequence coupled with in-situ and laboratory testing (Intera 2006; 2008). Interim results provide a unique data set and evidence of a predictable geosphere with a deep seated (≥400 m), low permeability ($K \leq 10^{-13}$ m sec^{-1}), low porosity (0.01-0.08), saline (TDS ≥ 250 gm l^{-1}) groundwater regime. These site specific data, in addition to regional and site-scale hydrogeologic modelling of the sedimentary sequence that among other aspects is examining groundwater system evolution through an understanding of long-term environmental tracer migration and observed abnormally elevated and depressed formation pore pressures, are to be integrated as part of a Geosynthesis document. The geoscientific work program is scheduled for completion in Fall 2010 in support of the submittal of an Environmental Impact Statement EIS) and Site Preparation/ Construction License application in 2011. This paper provides an overview of the DGR project and on-going geoscientific studies in support of the EIS.

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