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**Written Submission from
Health Canada**

In the Matter of

Ontario Power Generation Inc.

Proposed Environmental Impact Statement
for OPG's Deep Geological Repository
(DGR) Project for Low and Intermediate
Level Waste

Joint Review Panel

September 16 to October 12, 2013

**Mémoire de
Santé Canada**

À l'égard de

Ontario Power Generation Inc.

Étude proposée pour l'énoncé des incidences
environnementales pour l'Installation de
stockage de déchets radioactifs à faible et
moyenne activité dans des couches géologiques
profondes

Commission d'examen conjoint

16 septembre au 12 octobre 2013


JOINT REVIEW PANEL

**REVIEW OF THE ENVIRONMENTAL IMPACT ASSESSMENT FOR THE DEEP
GEOLOGIC REPOSITORY FOR LOW AND INTERMEDIATE LEVEL WASTE**

**Submission by
HEALTH CANADA**

**Date of Submission
July 23, 2013**

Health Canada Signing Authority



for L. Butts

**Lucy Butts
Regional Director General
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SECTION 1.0 INTRODUCTION

The following submission contains Health Canada's advice to the Joint Review Panel on the potential impacts to human health resulting from the development of the Deep Geologic Repository following its review of the Environmental Impact Statement (EIS) for *Ontario Power Generation's Deep Geologic Repository Project for Low and Intermediate Level Waste* (the Project) and proponent responses to Joint Review Panel information requests. Health Canada comments are limited to issues for which the Department has possession of specialist or expert information or knowledge.

SECTION 2.0 HEALTH CANADA ROLES AND RESPONSIBILITIES

The Joint Review Panel for the proposed project has been convened pursuant to the *Canadian Environmental Assessment Act, 2012 (CEAA)*. Human health is considered in an environmental assessment under *CEAA*, according to the Act's definition of "environmental effect." Health Canada is the federal department responsible for helping Canadians maintain and improve their health and is participating in this process as a federal authority under section 20 of *CEAA* as requested by the Joint Review Panel. In this role, Health Canada is assisting the Joint Review Panel with its evaluation of the potential human health impacts of the proposed project by providing specialist or expert information or knowledge in its possession both to the Joint Review Panel and to the Responsible Authority (the Canadian Nuclear Safety Commission). As a Federal Authority, Health Canada does not assess the significance of the human health effects related to the project as this responsibility rests with the Responsible Authority. Rather, Health Canada's comments focus on the accuracy, scientific validity and completeness of assessments concerning human health effects documented in the EIS. Where Health Canada has expertise regarding actions that may be taken to mitigate health impacts, this information has been provided to the Joint Review Panel and the Responsible Authority. Consistent with its responsibilities under *CEAA*, Health Canada will not be granting any approvals or making any regulatory decisions with respect to this project.

SECTION 3.0 PROPOSED DEVELOPMENT DESCRIPTION

The Deep Geologic Repository is located on the Bruce Power nuclear power site in the municipality of Kincardine. The proposed project includes preparation of the site, and construction, operation, decommissioning and abandonment for the long-term management of low and intermediate level radioactive waste.

SECTION 4.0 HEALTH CANADA REVIEW

Health Canada has reviewed the EIS with respect to: 1) its conformity with the EIS Guidelines; 2) verifying that potential human health impacts resulting from changes in the environment caused by proposed project activities have been properly characterized by the proponent and; 3) identifying whether the mitigation measures proposed are appropriate. In its review of the EIS, Health Canada made available specialist or expert information or knowledge to the Joint Review Panel in those areas where the department is in possession of related expertise. Accordingly, Health Canada's review focuses on potential impacts resulting from changes to the radiological and acoustical environments, air quality, drinking and recreational water quality, and country foods. Health Canada's submissions to the Joint Review Panel are available on the Canadian Environmental Assessment Registry (CEAR docs #574, 765, 771, 875, 976, and 1078).

Health Canada does not possess specialist or expert information or knowledge in: air dispersion modeling; epidemiological expertise related to chronic, low-level effects associated with exposure to particulates and volatile combustibles or; verifying predictions of concentrations of non-radiological contaminants in water, including any modelling. As Health Canada does not possess specialist or expert information or knowledge to confirm the adequacy of the results of environmental fate modeling conducted by the proponent, Health Canada's conclusions are dependent on the validity of the environmental concentrations predicted by the proponent. If there are changes made to these concentrations, it may be prudent for the proponent to update predictions in the EIS to confirm that the risks are acceptable.

4.1 Radiological Impacts

Background

Health Canada possesses specialist or expert information or knowledge on the human health effects of exposure to ionizing radiation, which includes alpha, beta, gamma, and x-ray radiation. As well, Health Canada possesses specialist or expert information or knowledge in relation to the guidelines for radioactive isotopes in drinking water, foods, and air.

At nuclear facilities, Health Canada provides human health expertise concerning radiological emissions to which nuclear energy workers (NEWs) may be exposed. Health Canada acts as an advisor to the federal regulator, the Canadian Nuclear Safety Commission.

Consistent with principles adopted by the International Commission on Radiation Protection, Health Canada applied the following radiation protection approach in its review of the EIS:

1. *Optimization*: All exposures shall be kept As Low As Reasonably Achievable (ALARA), with economic and social factors taken into account.
2. *Dose Limitation*: No dose shall exceed the following established limits:

Radiation workers – not more than 50 mSv¹ in any one year, nor more than 100 mSv in a running five year period.

General public - not more than one mSv/year, over and above background, from all industrial applications of radiation. Exposures for medical purposes are excluded.

Health Canada considers several aspects of the radiological information presented in an EIS in order to provide human health advice to the Joint Review Panel. This approach involves:

- Reviewing the predicted radionuclide emissions to the atmosphere and aquatic environments, and uptake into country foods.² Health Canada considers whether these predicted releases in the EIS are realistic, based on the nature of the project and what is known about past radionuclide releases from similar projects.
- Verifying that all relevant pathways for the transfer of radiation (e.g. air, water, soil, food) to a human receptor have been considered and are adequately described to ensure that potential human health implications are properly characterized according to radiation protection principles.
- Reviewing assumptions used in estimation of doses to human receptors to ensure that those assumptions are realistic, based on the nature of the project.
- Reviewing whether the estimated doses are acceptable when compared with the regulated dose limits under the *Nuclear Safety and Control Act*.³
- Providing additional advice concerning mitigation, monitoring and follow-up, as appropriate, in the interest of protecting human health.

Health Canada Comments:

Health Canada has reviewed the EIS and information presented by the proponent during the review process with respect to its conformity with the EIS Guidelines in addressing the human health impacts of radiation, verifying that potential human health impacts resulting from changes in the environment caused by proposed project activities have been properly characterized by the proponent and identifying whether the mitigation measures proposed are appropriate.

Health Canada submitted a number of information requests concerning radiation to the Joint Review Panel throughout the review period. Issues identified in Health Canada's information requests included, but were not limited to: seeking clarification regarding radiation exposure to members of the public in accident and malfunction scenarios; requesting additional information related to the dose assessment for nuclear energy workers and the public; seeking confirmation that groundwater is not used as a source of drinking water on the project site; requesting greater detail regarding projects

¹ Sievert is the SI unit (International System of units) of equivalent dose with dimensions of joules per kilogram. Subdivided into the millisievert (mSv) = 1/1000 of a Sievert and the microsievert (µSv) – one millionth of a Sievert.

² Country foods, also known as traditional foods, include those foods trapped, fished, hunted, harvested or grown for subsistence or medicinal purposes, or obtained from recreational activities such as sport fishing and/or game hunting. Country foods do not include foods produced in commercial operations (large farms, greenhouses, etc.)

³ *Nuclear Safety and Control Act*, 1997, specifies dose limits of 1 millisieverts per year (mSv/year) for members of the public from all sources, and 50 mSv/year, with an average of 20mSv/year over any 5-year period, for Nuclear Energy Workers (NEWs).

having a potential cumulative effect on the radiation⁴ and radioactivity⁵ environment; suggesting that the proponent describe in more detail mitigation measures to reduce tritium concentration releases and; requesting additional information regarding the follow-up and monitoring components of the decommissioning and abandonment stages of the project. The information presented in the EIS combined with the proponent's responses to Joint Review Panel information requests properly characterize potential human health impacts resulting from changes in the environment caused by proposed project activities and are sufficient for assessing and addressing potential project-related radiological impacts.

⁴ Radiation is a process in which energy particles or waves travel through a medium, space or object. It does not deposit itself in plants or the organs or tissues of animals or humans..

⁵ Radioactivity is the release of energy by emitting ionizing particles (ionizing radiation). The emission is spontaneous, and it is released into the environment, biosphere, plants, animals and human beings

4.2 Air Quality

Background

There is consensus amongst international and national organizations (e.g. World Health Organization⁶, Health Canada and Environment Canada⁷, U.S. Environmental Protection Agency⁸) that air pollution has adverse public health impacts including increased mortality and hospitalizations, respiratory symptoms, and cardiovascular effects. Changes in air quality due to project emissions of gases, particulate matter, and other chemicals in relation to a project are included in environmental assessments to address the potential of these substances to affect human health.

Health Canada's approach is to review the risks to human health resulting from exposure to air pollutants using health-based evaluation tools, guidelines and toxicological reference values (TRVs). The information reviewed by Health Canada includes baseline conditions and predicted project-related air pollutant concentrations for different assessment scenarios at locations where human receptors may be affected. Health Canada does not verify air quality modeling results and assumes that correct and accepted and/or validated methods were used. In addition, Health Canada currently does not possess specialist or expert information or knowledge in order to provide advice to the Joint Review Panel on odour, the environmental fate of airborne contaminants, or socio-economic effects related to changes in air quality.

Health Canada Comments:

Health Canada has reviewed the EIS and information presented by the proponent during the review process with respect to its conformity with the EIS Guidelines in addressing the human health impacts of project-related changes to air quality. Health Canada has verified that project-related potential human health impacts are properly characterized, and has confirmed that the mitigation measures proposed are appropriate.

The EIS identifies site preparation and construction phases of the project as sources of conventional (i.e. non-radiological) contaminants such as:

- nitrogen oxides (NO_x);
- sulphur dioxides (SO₂);
- carbon monoxide (CO);
- particulate matter (PM₁₀, PM_{2.5}) and dust (i.e. Suspended Particulate Matter (SPM));
- volatile organic compounds (VOCs); and,
- polycyclic aromatic hydrocarbons (PAHs).

⁶ World Health Organization (WHO). 2003. *Health aspects of air pollution with particulate matter, ozone, and nitrogen dioxide*. Report on a WHO Working Group. Bonn, Germany 13-15 January 2003. Copenhagen: World Health Organization. Available at: http://www.euro.who.int/_data/assets/pdf_file/0005/112199/E79097.pdf

⁷ Judek, S., Jessiman, B., Stieb, D. and Vet, R. 2004. Estimated Number of Excess Deaths in Canada Due To Air Pollution. Health Canada and Environment Canada. Available on request: air@hc-sc.gc.ca

⁸ United States Environmental Protection Agency. Health Effects of Air Pollution. Accessed July 15, 2013 <http://www.epa.gov/region07/air/quality/health.htm>.

Health Canada submitted a number of information requests concerning air quality to the Joint Review Panel throughout the review period. Issues identified in Health Canada's information requests included, but were not limited to: seeking clarification from the proponent regarding the impact of the project's NO_x emissions on ozone formation and related mitigation measures and; seeking clarity regarding the methodology used to determine significance of the effects of air quality on health. The information presented in the EIS combined with the proponent's responses to Joint Review Panel information requests properly characterize potential human health impacts resulting from changes in the environment caused by proposed project activities and are sufficient for assessing and addressing potential project-related air quality impacts.

4.3 Noise

Background:

Noise can be defined as unwanted exposure to acoustic stimulation. At very high levels, noise can cause hearing loss, but community noise exposure at levels that would not cause hearing loss is also capable of causing potential human health effects. The World Health Organization identifies high annoyance, interference with communication, and disturbed sleep, as health effects of community noise exposure.⁹

Health Canada provides advice to the Joint Review Panel on the expected changes between existing and predicted daytime and night-time sound levels (for construction, operation and decommissioning activities) at locations where people are or will be present, as well as on the characteristics of the noise (e.g. impulsive¹⁰ or tonal¹¹) or the type of community (e.g. urban, suburban or quiet rural areas).

Health Canada does not possess specialist or expert information or knowledge on the impacts of noise on animals or ecosystems, or on occupational noise exposure.

Health Canada Comments:

Health Canada has reviewed the EIS and information presented by the proponent during the review process with respect to its conformity with the EIS Guidelines in addressing human health impacts of project-related changes to the acoustical environment.

Health Canada submitted a number of information requests to the Joint Review Panel related to the noise assessment presented in the EIS, and responded to Joint Review Panel requests to review additional proponent responses regarding noise. Issues identified in Health Canada's information requests included, but were not limited to: seeking clarification regarding whether the calculation of

⁹ World Health Organization. 1999. *Guidelines for Community Noise*. Berglund, B., Lindvall, T. & Schwela, D.H. (eds). <http://www.who.int/docstore/peh/noise/guidelines2.html>

¹⁰ Regular impulsive noise is impulsive noise from sources that are neither highly impulsive nor high-energy impulsive. Internationally agreed upon examples of these sources are listed in CAN CSA 2005 (ISO 1996-1:2003) and include slamming car doors and truck tailgates.

¹¹ Tonal noise is noise containing prominent (audible) tones such as backup alarms on trucks.

percentage highly annoyed included particular sound characteristics (e.g. highly impulsive, tonal noise); requesting information concerning the assessment of potential health effects of blasting noise and; seeking clarification regarding the inclusion of potential noise impacts on sleep in the noise assessment. The information presented in the EIS combined with the proponent's responses to Joint Review Panel information requests properly characterize potential human health impacts resulting from changes in the environment caused by proposed project activities and are sufficient for assessing and addressing potential project-related impacts to the acoustical environment.

4.4 Country Foods

Background:

Health Canada's role in respect to contamination of country foods in environmental assessments conducted under *CEAA* is to review country foods-related information in environmental assessment documentation to check the accuracy, scientific validity, completeness, use of appropriate methods, and rationale for the conclusions on potential human health effects.

Health Canada defines country foods to be foods that are trapped, fished, hunted, harvested or grown for subsistence or medicinal purposes, or obtained from recreational activities such as sport fishing and/or game hunting. Country foods, also known as traditional foods, do not include foods produced in commercial operations (e.g. large farms or greenhouses).

Health Canada Comments:

Health Canada submitted an information request to the Joint Review Panel seeking clarification from the proponent regarding assessment of arsenic and mercury in the human health risk assessment. The information presented in the EIS combined with the proponent's response to the Joint Review Panel's information request properly characterize potential human health impacts resulting from changes in the environment caused by proposed project activities and are sufficient for assessing and addressing potential project-related impacts to country foods.

4.5 Drinking Water

Background:

In Canada, potable drinking water and safe recreational water are a shared responsibility. However, the regulation of safe drinking water for the public generally rests with the provinces and territories. Health Canada provides leadership in science and research by developing the *Guidelines for Canadian Drinking Water Quality* (GCDWQ), in partnership with the provinces and territories. These guidelines have been used as the basis for provincial and territorial drinking water quality requirements. Health Canada has also worked with provincial and territorial partners to develop the *Guidelines for Canadian Recreational Water Quality* (GCRWQ).

In its review of the EIS, Health Canada sought the following information:

1. identification of sources used for drinking and recreational water
2. determination of potential changes to source and well water quality
3. determination of impacts of changes in water quality
4. monitoring and mitigation (as appropriate)
5. assessment of any residual risk if adverse effects to drinking and recreational water quality are predicted

Health Canada Comments:

Health Canada reviewed the water quality assessment provided in the EIS. As it was demonstrated in the EIS that the project will not result in any exceedance of applicable water quality guidelines or standards at the point of human consumption or exposure, it is reasonable to conclude that negative impacts on human health associated with the proposed project are not expected from exposure to drinking or recreational water.

SECTION 5.0 SUMMARY AND CLOSING REMARKS

Health Canada has reviewed the EIS for the Deep Geologic Repository for Low and Intermediate Level Waste and proponent responses to Joint Review Panel information requests giving consideration to: 1) conformity with the EIS Guidelines; 2) verifying that potential human health impacts resulting from changes in the environment caused by proposed project activities have been properly characterized by the proponent and; 3) identifying whether the mitigation measures proposed are appropriate. Health Canada provided advice to the Joint Review Panel only in those areas where the department is in possession of specialist or expert information or knowledge. Accordingly, Health Canada's review focuses on potential impacts resulting from changes to the radiological and acoustical environments, air quality, drinking and recreational water quality, and country foods. Health Canada has determined that the EIS and proponent responses to Joint Review Panel information requests regarding potential human health risks characterize and mitigate potential human health risks appropriately and are sufficient for Health Canada's review of the project.

Health Canada is pleased to participate in the Joint Review Panel's review of the proposed project as part of the department's role in helping Canadians to maintain and improve their health. The department appreciates the opportunity to provide the Joint Review Panel with the specialist or expert information or knowledge that is in its possession in accordance with the *Canadian Environmental Assessment Act*.