NORTHWATCH

June 4th, 2013

Dr. Stella Swanson, Panel Chair
Dr. James F. Archibald, Panel Member
Dr. Gunter Muecke, Panel Member
Deep Geologic Repository Project Joint Review Panel
Canadian Environmental Assessment Agency
160 Elgin St., 22nd Floor, Ottawa ON K1A 0H3

Email: DGR.Review@ceaa-acee.gc.ca

Dear Dr. Swanson and Panel Members:

On May 24th, 2013 Northwatch made submissions to this Joint Review Panel on the conformity of Ontario Power Generation's Environmental Impact Statement and supporting documents with the requirements of the Environmental Impact Statement Guidelines issued in January 2009. Northwatch also submitted 11 supplementary Information Requests, in addition to IRs submitted in 2012.

While we appreciate that May 24th was the close of the public comment period related to the review of the conformity of the EIS and supporting information with the EIS guidelines, information has emerged since May 24th which we believe to be reasonable cause for Northwatch to submit one additional Information Request, and for the Panel to forward this Request to Ontario Power Generation for response.

Prior to the May 29th Day Two hearing by the Canadian Nuclear Safety Commission of Ontario Power Generation's application to renew the Pickering Reactor Operating License we had accepted Ontario Power Generation's numerous statements that decommissioning wastes were not part of the waste volumes intended for the proposed DGR, and that the inclusion of decommissioning wastes in Section 10 of the EIS was only in response to directions in the EIS Guidelines to do so. However, discussions at the May 29th hearing and subsequent communication from Ontario Power Generation have caused us to re-evaluate this. We now believe it likely that Ontario Power Generation's intention is to place the decommissioning wastes in the same DGR as is currently under review, but through project-splitting avoid having to do a full assessment. In our view, this is a serious matter and fundamental to the scope of the project and this review.

Our additional Information Request is intended to assist the Joint Review Panel and review participants by having OPG clarify this matter in advance of the Joint Review Panel making its determination on the sufficiency of the information that has been provided.

Thank you for your consideration

Sincerely,

<original signed by>

Brennain Lloyd

IR #	EIS Guidelines Section	EIS Section	Information Request	Context
NW S-49	Section 1.2.1.4 Scope of Project Section 4.1 Scope of the Project Section 8.1 General Information and Design Section 7.1 Purpose and Need for the Project Section 14 Cumulative	3.1 PURPOSE OF THE PROJECT 3.2.2 Long-term Planning by OPG 4.5 WASTE TO BE PLACED IN THE DGR 10. CUMULATIVE EFFECTS	Provide a definitive statement on the inclusion/exclusion of decommissioning wastes from Ontario Power Generation's nuclear stations in the proposed deep geological repository which is the subject of the current EA review and licencing application. In this statement, discuss the various inconsistencies between statements in the EIS, statements contained in the Information Responses which relate to decommissioning wastes, statements made by OPG before the Canadian Nuclear Safety Commission during the May 29th Day Two hearing on the Pickering Reactor Operating License application for renewal .	The 2011 Environmental Impact Statement includes numerous statements which singly and in combination indicate that decommissioning wastes are not part of the DGR project.[1] In the "purposes" section of the EIS, OPG states that "the currently proposed DGR Project does not include management of decommissioning waste"[2] and confirms this in later sections with the statement that "decommissioning L&ILW is not included in this discussion"[3]. Consistent with those statements, in the Section 10 discussion of Cumulative Effects, OPG states that " the EIS Guidelines require that emplacement of decommissioning waste at the Bruce nuclear site be included in the assessment of cumulative effects even though it is not a project that is planned or a project for which the schedule is in the reasonably foreseeable future".[4] In response to JRP Information Requests, OPG has variously stated that its current licence application does not include decommissioning waste,[5] and that the placing of decommissioning wastes in the DGR is among "reasonably foreseeable projects. [6] When summarizing OPG's response to questions from SON about decommissioning wastes, OPG stated simply and directly that "The DGR Project is for operational waste, as discussed in the EIS"[7] But OPG has also stated that "If in future OPG decided it wished to put some forms of decommissioning waste into the DGR then it would need to apply to the CNSC for a licence amendment to allow this activity, and the associated regulatory process would be triggered."[8] OPG states in a response to EIS IR 04-110 that "Given that decommissioning waste from reactor dismantlement is not expected to be generated before 2050, the exact facility(ies) and means by which decommissioning waste would be managed in the long term are not fully identified and hence any associated activities are not considered 'planned' at this time[9], but despite this statement and despite having stated in the EIS that the

				"emplacement of decommissioning waste at the Bruce nuclear …is not a project that is planned or a project for which the schedule is in the reasonably foreseeable future"[10], in response to IR EIS-06-233, OPG places a"DGR for Decommissioning Waste at Bruce Nuclear Site"[11] on a list of "Reasonably Foreseeable Projects", stating that "By the time decommissioning waste could possibly be received at the DGR, the majority of operational low and intermediate level waste would be in place in the DGR and access tunnel closure walls would have been constructed, eliminating all radioactive emissions from this waste", as it if such a project is an accepted eventuality. Responses to IR's EIS-08-341 and EIS-08-378 are consistent with the examples summarized above and additional summaries would be unlikely to add clarification. In Ontario Power Generation's Application for Renewal of Pickering Nuclear Generating Station Power Reactor Operation Licence OPG stated that decommissioning wastes would be managed in "*a regional disposal facility located in Ontario, approximately equidistant from OPG's five nuclear stations*." [12] (attached). In discussion at the CNSC Day Two Hearing in Pickering on May 29th following Northwatch's oral submission, which had included a report to the CNSC that Northwatch's request to OPG for details on this disposal facility had not received a reply, OPG further stated that the espoused facility had been referenced for business planning purposes only. OPG then went on to state that the DGR currently under review could be expanded to accommodate the decommissioning wastes.[13] A followup email from OPG further indicated that "both the EA and the Kincardine Hosting Agreement recognize that, subject to future agreement and regulatory approval, OPG may be permitted to modify the DGR license to accommodate decommissioning waste."[14]

Attachments: Excerpts of EIS related to Decommissioning
Excerpts of IR Responses related to Decommissioning
Pickering Reactor Operating License, Section

[1] EIS Sections 3.1 PURPOSE OF THE PROJECT, 3.2.2 Long-term Planning by OPG, 4.5 WASTE TO BE PLACED IN THE DGR, and 10. CUMULATIVE EFFECTS
[2] Environmental Impact Statement - 3-4 - March 2011, Section 3.1 PURPOSE OF THE PROJECT
[3] Environmental Impact Statement - 4-18 - March 2011, Section 4.5 WASTE TO BE PLACED IN THE DGR
[4] Environmental Impact Statement - 10-1 - March 2011, Section 10. CUMULATIVE EFFECTS, Subsection 10.0 OVERVIEW
[5] EIS-04-102
[6] EIS-06-233
[7] IR EIS-05-203, Table 2: Questions on the Engineering, Safety Assessment and Geoscientific Studies
[8] EIS-04-102
[9] EIS-04-110
[10] Environmental Impact Statement, March 2011, Section 10. CUMULATIVE EFFECTS, Subsection 10.1 OVERVIEW, 3rd bullet
[11] EIS-06-233
[12] Application for Renewal of Pickering Nuclear Generating Station Power Reactor Operation Licence CD#P-CORR-00531-03719
[13] CNSC Day Two Hearing on PROL, 29 May 2013, Transcripts not yet available
[14] Personal communication from OPG, by email, 30 May 2013

OPG's Deep Geologic Repository
for Low and Intermediate Level Radioactive Wastes
Environmental Impact Statement
March 2011

EXCERPTS RELATED TO DECOMMISSIONING WASTES

Environmental Impact Statement - 2-76 - March 2011
Greenpeace also asked questions about overall costs of the DGR Project, retrievability of the waste, accepting decommissioning waste, monitoring and the regulatory standards to which the DGR would be subject.

Environmental Impact Statement - 3-4 - March 2011
3.1 PURPOSE OF THE PROJECT
In the future, an additional approximately 135,000 m^3 of L&ILW is expected to be produced during the decommissioning of the reactors and the associated nuclear waste storage facilities. The majority of this waste (i.e., >85%) will likely be LLW. **The currently proposed DGR Project does not include management of decommissioning waste**. At the time that each generating station is decommissioned, an EA is expected to be required and it will address management of the decommissioning waste. The cumulative effects assessment presented in Section 10 considers the emplacement of decommissioning waste in the DGR at a conceptual level, as required by the EIS Guidelines.

In the early 1990s, OPG established a planning scenario for financial planning purposes that assumed that low and short-lived intermediate level radioactive waste would be emplaced in a low level waste repository. Management of selected long-lived intermediate level waste was assumed to be co-located with used fuel in a separate deep geologic repository. These planning scenarios did not include specific locations or plans for identifying a site for either facility.

Environmental Impact Statement - 3-6, 3.7 - March 2011
3.2.2 Long-term Planning by OPG
The WWMF was originally developed with the concept that it would provide interim storage for the L&ILW until such time as a long-term management facility was developed. The current structures have been designed for a minimum life of 50 years. These structures could, with proper maintenance, continue to safely store the waste much longer than 50 years. However, Canadians have indicated that they do not want to wait another generation for substantial progress to be made on developing long-term solutions for waste management.
OPG developed the financial plans on the basis that future generations should not bear the cost of today's operations. OPG makes financial contributions to segregated funds dedicated solely for the long-term management of waste and for the decommissioning of its generating stations. **These funds will pay the costs associated with developing and operating a facility for the longterm management of L&ILW, a facility for long-term management of used fuel, and the decommissioning generating facilities.** As of end of 2009, the fund was valued at approximately $10 billion [20].

Environmental Impact Statement - 4-18 - March 2011
4.5 WASTE TO BE PLACED IN THE DGR
The L&ILW are generated from a variety of activities. For the purposes of safety assessment and engineering, it is convenient to distinguish the operational L&ILW from refurbishment L&ILW. **A third general category, decommissioning L&ILW is not included in this discussion.**

Environmental Impact Statement - 4-27 - March 2011
The results for the assumed repository decommissioning date of 2062 indicate the total radioactivity will be dominated by tritium (H-3), carbon-14, niobium-94 and nickel-63. **A more complete listing of radionuclides in the waste is given in the Reference Inventory Report [**30].

Environmental Impact Statement - 10-1 - March 2011
10. CUMULATIVE EFFECTS
The EIS Guidelines require the consideration of cumulative environmental effects in relation to the DGR Project. Cumulative effects are the combination of the incremental effects caused by the DGR Project with the effects caused by other projects or activities on-site as well as off-site, including past, present and reasonably foreseeable projects.
10.1 OVERVIEW
The method for assessment of cumulative effects is consistent with the EIS Guidelines and the Canadian Environmental Assessment Agency's Cumulative Effects Assessment Practitioners Guide [465]. The steps for the assessment of cumulative effects are detailed further in Section 10.2. The cumulative effects assessment builds on the results of the direct effects assessment completed in Section 7 and considers all of the incremental effects of the DGR Project that were assessed to have a likely residual adverse effect or beneficial effect on a VEC. Other projects that have the potential to act cumulatively with the DGR Project are then identified in three categories.

- Past and existing projects and activities. Although these activities occurred in the past, the effects from these projects may continue into the future. The effects from the past and existing projects and activities that have occurred in the past or are currently occurring are captured under the existing conditions (Section 6)
- Certain/planned projects and activities. These include projects that have been approved, but yet to start construction and/or operations. This category can also include projects that are well advanced in the planning process, but have not yet been approved.
- Reasonably foreseeable projects and activities. These are projects that have started in the approval process and are on the path to obtaining approval. This category would also include smaller routine activities that one can say, with a fair degree of certainty, will need to occur (e.g., routine building and infrastructure upgrades). In the case of the DGR Project, the EIS Guidelines require that emplacement of decommissioning waste at the Bruce nuclear site be included in the assessment of cumulative effects even though it is not a project that is planned or a project for which the schedule is in the reasonably foreseeable future.

Using professional judgement, the projects are then screened to focus the assessment of cumulative effects on those projects whose effects overlap in type of effect, time and space with those residual adverse effects of the DGR Project. The cumulative effects assessment is conducted at a more general level of detail than in previous sections of the EIS since the projects

are more remote in time and space. Consistent with EA practice, the cumulative effects assessment applies to activities during normal operations only

Environmental Impact Statement - 10-18 -

Table 10.4-3: Reasonably Foreseeable Project Descriptions (continued)

DGR for Decommissioning Waste at Bruce Nuclear Site

The decommissioning waste from OPG-owned or operated reactors will, at some point in the future, be relocated to a suitable long-term management site. The long-term management of decommissioning waste is not expected to start before 2050. Although no site has been identified, the DGR Hosting Agreement includes provision for decommissioning waste to be placed in the DGR Project and the EIS Guidelines stipulate that consideration of placing decommissioning waste in the DGR be included in the cumulative effects assessment. The assessment is based on emplacement of decommissioning waste in an extension of the DGR (approximately doubling the underground capacity). The extension could be accommodated within the DGR Project site (i.e., no additional site clearance would be required). Management of decommissioning waste at the DGR would require a separate EA process.

Environmental Impact Statement - 10-24 -

10.5.1.4 Air Quality

Likely residual adverse effects of the DGR Project on air quality were identified during the site preparation, construction, operations and decommissioning phases. Specifically, there is expected to be an increase in emissions of combustion products (i.e., NO_2 and CO) and particulate matter (i.e., SPM, PM_{10} and $PM_{2.5}$). Other projects that may cause an increase in combustion products or particulate matter will overlap in the type of effect with the DGR Project. Based on the information in Tables 10.4-1 to 10.4-3, the following other projects and activities are advanced for further assessment based on effects on air quality:

- Bruce A (operations and refurbishment);
- Bruce B (operations);
- WWMF;
- WUFDSF;
- centre of site facilities;
- Bruce Eco-Industrial Park;
- Heavy Water Plant decommissioning;
- Bruce to Milton transmission line;
- Bruce A decommissioning and safe storage;
- Bruce B decommissioning and safe storage;
- WWMF upgrades;
- municipal/county road upgrades;
- WUFDSF expansion;
- Bruce B refurbishment, continued operations, decommissioning and safe storage;
- additional transmission;
- centre of site additions and modifications; and
- **DGR for decommissioning waste at Bruce nuclear site.**

(last bullet repeated in subsequent sections)

Environmental Impact Statement - 10-33 - March 2011
Table 10.5.4-1: Summary of Effects that Overlap in Type of Effect, Time and Space (continued)
- includes "DGR for Decommissioning Waste at Bruce Nuclear Site"

Environmental Impact Statement - 10-34 - March 2011
10.6 ASSESSMENT OF CUMULATIVE EFFECTS
10.6.1 Surface Water Quantity and Flow
There were no other projects that may result in effects that overlap with the DGR Project effects in type, time and space. Therefore, there are no cumulative effects on surface water quantity and flow.
10.6.2 Terrestrial Environment
The residual adverse effect on eastern white cedar resulting from site clearing for the DGR Project was identified to interact with centre of site additions and modifications in type of effect, time and space. Additions to the centre of site facilities may result in additional land clearing. Forest areas (Figure 6.4.3-1) are located adjacent to the south of the centre of site facilities (Figure 1.1.1-3). It is likely that these projects would require relatively small areas of land clearing. The habitat loss as a result of these projects is expected to be small and is unlikely to result in adverse cumulative effects on eastern white cedar. **Extension of the DGR to accommodate decommissioning wastes would not require any additional land clearing**.

Environmental Impact Statement - 10-35
Long-term management of decommissioning wastes is considered to occur at some time in the future. This would require additional construction and emplacement activities. Effects from this would be assumed to be similar to those identified for the site preparation and construction phase of the DGR Project. However, these effects would occur after the site preparation and construction phase of the DGR Project, and would likely be after completion of the operations phase and installation of the closure walls in the current DGR layout. Therefore, the air quality effects from the construction of emplacement rooms for decommissioning wastes would not overlap with the air quality effects of the DGR Project. Thus, no measurable cumulative effects are likely from these emissions.

Environmental Impact Statement - 10-36 - March 2011
10.6.5 Noise Levels

Long-term management of decommissioning wastes in the DGR is considered as a potential project to occur at some time in the future. This would require additional construction and emplacement activities. However, it is unlikely that construction would occur concurrent with the operation of the DGR Project. Therefore, no cumulative effect is likely from these emissions.

10.6.6 Radiation and Radioactivity
Environmental Impact Statement - 10-37 -

At some time in the future, used fuel and decommissioning wastes will be transferred to a longterm repository. The DGR is not for the long-term management of used fuel; therefore, the

repository will be located off-site. Any dose will be solely from the transport of used fuel, and as the used fuel is transferred off-site, will result in a net reduction of dose. **The Hosting Agreement does, however, include a provision for the long-term management of decommissioning wastes. If this is the case, the operational doses are expected to be similar to those of the DGR for operating waste. There would be no additive effect because panels in the DGR for operating waste would be closed. It would increase the radiological releases during the abandonment and long-term performance phase of the DGR. However, even if they were to double, doses would still be small (i.e., <2 μSv/a), and would be well below regulatory limits. Therefore, no further consideration is required.**

Information Requests and Responses Related to Decommissioning Wastes
IR Packages 1-10
2012 – May, 2013

EIS-04-102

Section 1.2.1.4,
Scope of Project

Information Request:

Clarify whether Low and Intermediate Level Waste from pending or approved OPG new build, refurbishment or closure operations will be placed in the DGR.

Context:

Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository Report specifically notes in Section 1.3 page 9 that "waste projections from any proposed new-build reactors in Ontario are not included in this report".

The Executive Summary states on page 7, that: "future operational L&ILW will be shipped" (to WWMF for processing).

This statement could be interpreted as including waste from any new build

OPG Response:

The referenced sentence in the Context, on page 7 of the Executive Summary of the Reference Inventory Report (OPG 2010),

"*It is also assumed that the future operational L&ILW will be shipped in containers similar to those currently used to store the L&ILW.*" refers to low and intermediate level waste (L&ILW) that will be generated in future by the continued operation and refurbishment of OPG's existing reactors.

OPG's licence application is to prepare a site and construct a Deep Geologic Repository (DGR) for 200,000 m^3 (disposed volume) of L&ILW from the operation and refurbishment of OPG-owned or operated nuclear reactors in Ontario. This could include L&ILW from the operation and refurbishment of OPG-owned or operated new-build reactors.

It would need to be demonstrated to the Canadian Nuclear Safety Commission (CNSC), prior to the emplacement of any new-build L&ILW into the DGR, that the safety case for the DGR remains valid for such wastes and there were no significant additional environmental effects. L&ILW generated under an operating licence for a nuclear facility is considered operational or refurbishment waste. OPG's current licence application does not include decommissioning waste. If in future OPG decided it wished to put some forms of decommissioning waste into the DGR then it would need to apply to the CNSC for a licence amendment to allow this activity, and the associated regulatory process would be triggered.

Reference:

OPG. 2010. Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository. Ontario Power Generation report 00216-REP-03902-00003-R003. Toronto, Canada. (CEAA Registry Doc# 300)

EIS-04-110

Section 14,
Cumulative Effects

Information Request:

a) Clarify why "the DGR for decommissioning Bruce Power waste" is "not a planned activity, but is included to meet guideline requirements".

b) Explain why the following other operations and potential projects were not included in the cumulative effects assessment:

- *Wastes from any new build of nuclear reactors;*
- *The potential for storing L&IL wastes from reactors other than OPG's fleet;*
- *Possible changes to the operations for minimizing waste, particularly incineration.*

Context:

The EIS Guidelines indicate that the management of decommissioning waste would be a potential future project that should be included in an assessment of cumulative effects.

In the EIS Summary, page 40, the chart lists cumulative impacts with other projects over the lifespan of the DGR. Past,Existing and Planned Projects (certainty) identified include for example, Decommissioning Bruce A and B, "WWMF upgrades" and Reasonably Foreseeable Projects

OPG Response:

Please note that the words within quotation marks in part a) of this Information Request are not the same words at the bottom of the chart on page 40 of the EIS Summary Report.

Table 10.4-3 (specifically, item 31 on page 10-18) of the Environmental Impact Statement (EIS) (OPG 2011) explains the context under which a ”DGR for Decommissioning Waste at Bruce Nuclear Site” was considered as a ‘reasonably foreseeable project’ under the cumulative effects assessment as required by the EIS Guidelines (CEAA/CNSC 2009).

The Guidelines (Section 14) identify the management of decommissioning waste in the DGR as a potential future project to be included in the assessment of cumulative effects. The ‘project’, for assessment purposes, is assumed to be an extension of OPG’s DGR for low and intermediate level waste. Given that decommissioning waste from reactor dismantlement is not expected to be generated before 2050, the exact facility(ies) and means by which decommissioning waste would be managed in the long term are not fully identified and hence any associated activities are not considered ‘planned’ at this time.

OPG’s response to Information Request EIS-04-102 indicates that new-build waste could be emplaced in the DGR if new-build wastes characteristics were consistent with the submitted environmental and safety assessments. As such, the environmental effects of including new-build wastes up to the licensed capacity of the DGR are already considered and there is no need to consider such effects under cumulative effects. Any significant expansion of the DGR’s capacity would need the approval of all applicable regulatory authorities following the required processes of the day.

Wastes from other reactors were not considered, as the DGR is only intended for wastes from OPG-owned or operated reactors.

As discussed in OPG’s response to Information Request EIS-04-104, incineration is a part of current waste processing at the WWMF. For the purposes of assessing cumulative effects, it is included in Table 10.4-3 (item 3, page 10-8) as ‘WWMF Operation’. EIS Table 10.4-3 (specifically, item 23 on page 10-16) addresses future planned ‘WWMF upgrades’, such as additional waste storage, in the assessment of cumulative effects.

References:

CEAA/CNSC. 2009. Guidelines for the Preparation of the Environmental Impact Statement for the Deep Geologic Repository for Low- and Intermediate-Level Radioactive Waste. (CEAA Registry Doc# 150)

OPG. 2011. OPG’s Deep Geologic Repository for Low and Intermediate Level Waste - Environmental Impact Statement. Ontario Power Generation report 00216-REP-07701-00001-R000. Toronto, Canada. (CEAA Registry Doc#298)

EIS-04-120

Section 4.1, Scope of the Project

Information Request:

Provide a description of conceptual DGR extension plans that will be used to accommodate storage of additional L&ILW materials, or other permitted decommissioning wastes, beyond those volumes currently estimated for the DGR operation.

The description should include both temporal and spatial extension plans to the current proposed DGR design.

Context:

In the EIS (Section 4.10.2. p. 4-71) it is noted that: "there may be a need to increase the number of emplacement rooms …" and "The decommissioning waste from OPG-owned or operated reactors will, at some point in the future, be relocated to a suitable long-term management site … DGR Hosting Agreement includes provision for decommissioning waste to be placed in the DGR Project … in an extension of the DGR (approximately doubling the underground capacity)."

In Fig. 10.4-2 (EIS, p. 10-21) the timeline shown indicates that decommissioning waste from the Bruce Nuclear site will be placed into the DGR between 2054 and 2088, for an extended additional operational period approximating 35 years.

Inasmuch as current DGR operation is planned for completion by 2063, it may be anticipated that cumulative impacts created by extension of DGR operations will result. At a minimum, it may be anticipated that: (a) in order to extend panels within the DGR to permit construction of new rooms, the placement of planned shaft closure/sealing walls may have to be postponed in order to extend drifts away from shaft sites, if rooms progress in similar directions to those currently shown; (b) different ventilation strategies will be required to accommodate different excavation layouts; (c) room and drift walls, left open for longer periods and not reinforced using planned monolith materials, may suffer more extensive structural degradation during manned operations that may result in enlargement of excavation damage zones.

Additionally, the need to have workers operate within an underground facility of greater extent and that may suffer extended degradation in physical character for longer intervals than initially planned may present additional occupational hazards from ground falls and the like. There are also implications to surface operations. There will be a requirement for more waste rock storage space. There will also be an extension to the requirement for surface water management and treatment. The extensions to surface operations may in turn trigger requirements for additional mitigation of environmental impacts, e.g., habitat loss.

The "extension of the DGR (approximately doubling the underground capacity)" may present detrimental impacts on repository structural performance and worker safety. No consideration of these effects has been provided in the cumulative effects assessment review section of the EIS, as in Table 10.7-1 (Summary of Likely Adverse Cumulative Effects), EIS, p. 10-38.

OPG Response:

OPG notes, the second quote in the Context section is from Section 10 (page 10-18) of the EIS and is associated with the cumulative effects assessment which considered decommissioning waste in the DGR based on the direction of the EIS Guidelines (CEAA/CNSC 2009, Section 14).

EIS-05-203

Section 2.2,
Public Participation and Aboriginal

Information Request:

Describe how input from the SON was used to develop the methods for assessment of effects of the project on VECs (including the use of the burial site); in particular, the magnitude and overall significance of any effects as may be interpreted using Traditional Knowledge.

Context:

According to Section 2.3 of the EIS Guidelines, traditional knowledge can contribute to project siting and design, identification of issues, the evaluation of potential effects, and their significance, the effectiveness of proposed mitigation, cumulative impacts, and the consideration of follow-up and monitoring programs. Sections 2.3 and 7.16 of the EIS do not present information regarding how Traditional Knowledge obtained through consultation with the SON was incorporated into decisions regarding project siting and design, the evaluation of potential effects, their significance, the effectiveness of proposed mitigation and follow-up and monitoring.

OPG Response:

OPG and the NWMO encouraged the on-going participation of Aboriginal peoples in the DGR Project and initiated engagement with Saugeen Ojibway Nation (SON) early in the project. Specific information regarding Traditional Knowledge was not provided by SON throughout the Environmental Assessment (EA). Where feedback, insight and comments were provided, they were used to inform the EA methodology. Listed below are three examples which summarize the feedback and how it was used:
[goes on at length, includes three tables, relevant statement in Table 2, excerpt is below]

Table 2: Questions on the Engineering, Safety Assessment and Geoscientific Studies

Questions	**Answers/ Guide to Where Subject Matter Is Addressed in the EIS**
Is decommissioning waste being emplaced in the DGR?	The DGR Project is for operational waste, as discussed in the EIS (OPG 2011a, Section 4.5).

EIS-06-233

Section 14,
Cumulative Effects

Information Request:

Provide a temporal distribution of cumulative dose estimates for members of the public.

Context:

16 projects have been identified that may act cumulatively in the radiation and radioactivity environment. The projects should be described individually, along with expected doses resulting from each project. These doses should be summed to calculate the cumulative dose to a member of the public over time.

OPG Response:

As discussed in OPG's response to Information Request (IR) EIS-06-232, the Environmental Impact Statement (EIS) (OPG 2011, Tables 10.4-1, 10.4-2 and 10.4-3) provides a list of past and existing, certain and planned, and reasonably foreseeable projects that may overlap temporally or geographically with the DGR Project. These tables include a description of each individual project and the level of detail provided in each project description is consistent with environmental assessment practice. The EIS did not identify a residual adverse effect on radiation and radioactivity and hence an assessment of cumulative effects on radiation and radioactivity was not required. However, in keeping with a precautionary approach, the cumulative effects on radiation and radioactivity were assessed because the DGR Project may have a small additive effect with other future projects.

As discussed in the EIS (OPG 2011, Section 10.6.6), 16 projects located within the Bruce nuclear site have the potential to contribute to public dose and to act cumulatively with the DGR Project. Each of the 16 projects identified is, or would be, located within the Bruce nuclear site. The dose to the public resulting from projects located at the Bruce nuclear site is based upon measured levels of radioactivity in the environment, calculated from reported emissions, or calculated from estimated future emissions. The potential change to the dose resulting from each of the 16 projects that could act cumulatively with the DGR Project is described in the EIS (OPG 2011, Section 10.6.6). Estimated doses for the existing projects and the magnitude of change for planned and foreseeable projects are provided below.

<u>DGR Project</u>

1. Operation of DGR

A bounding assessment of doses to members of the critical group resulting from radiological releases due to operation of the DGR was presented in response to IR-EIS-06-245, providing an annual dose of 0.7 µSv.

<u>Existing Projects</u>

2. Existing Projects

Eight of the 16 projects — operation of Bruce A, Bruce B, refurbishment of Bruce A Units 1 and 2, operation of the Western Waste Management Facility (WWMF), operation of the Western Used Fuel Dry Storage Facility (WUFDSF), Douglas Point, Radioactive Waste Operations Site 1 (RWOS1) safe storage, and centre of site facility operation — are existing projects and the doses from these projects are included in the existing doses reported annually (BRUCE POWER 2010, Section 3.7). The doses reported in the EIS (OPG 2011, Table 6.6.10-2) present the cumulative dose to members of the public from all projects in place at the Bruce nuclear site for the reporting period.

Activities associated with Heavy Water Plant decommissioning were completed in 2011; dose contributions from the Heavy Water Plant site are not expected to increase relative to current because there are no on-going operations leading to releases of radioactivity.

The doses to the public over the period from 2001 to 2009 are provided in the EIS (OPG 2011, Table 6.6.10-2).

The highest existing dose among the nine potential critical groups representing members of the public over this period was 4 µSv/a (OPG 2011, Section 6.11.4.3). The 2010 dose to the public was 2.85 µSv/a (BRUCE POWER 2011, Section 2.0), and the 2011 dose was 1.53 µSv/a (BRUCE POWER 2012, Section 4.10.1). For the 20th consecutive year, the calculated dose to a member of the public is less than the 10 µSv/a value that is regarded as the lower threshold for relevance (*de minimus*) (BRUCE POWER 2012, Section 4.10.1).

The majority of radionuclide releases and the resulting doses were due to operation of the Bruce B nuclear generating station and Units 3 and 4 of the Bruce A nuclear generating station. Units 1 and 2 at Bruce A were out of service or undergoing refurbishment in recent years. All 8 units at the Bruce nuclear site were in operation during the period of 1991 to 1996. Maximum dose to the public during this period was 6.93 μSv/a, which was observed in 1994 (BRUCE POWER 2005, Section 5.8). A higher dose value was reported in 1991; however, this was calculated prior to the change to the current dose assessment procedures.
Based on this it can be estimated that with both the Bruce A and Bruce B nuclear generating stations operating at full capacity, total dose to members of the critical group will be less than 8 μSv/a, with each nuclear generating station contributing less than 4 μSv/a. This is a bounding estimate because doses due to operation of refurbished units are lower than prior to refurbishment.

Certain/Planned Projects

3. Bruce A and Bruce B Decommissioning

Emissions to the environment, and the resulting incremental dose due to decommissioning of each nuclear generating station, will be similar to those resulting from refurbishment as the activities resulting in potential emissions are of a similar nature. Incremental dose to members of the public during the refurbishment of Bruce A was estimated to be 0.035 μSv/a for an infant in the critical group (BRUCE POWER 2005, Section 6.2.1.6).
Estimated doses due to decommissioning are small compared to those due to operation of a nuclear power plant. Therefore, shutdown and decommissioning of the Bruce A and Bruce B nuclear generating stations will result in a net reduction in doses to potential critical groups compared to baseline.
Thus doses due to decommissioning of Bruce A and Bruce B will each be less than 0.04 μSv/a.

4. Bruce A and Bruce B Safe Storage

This project involves placing the nuclear generating stations into a safe storage configuration after initial decommissioning activities until the eventual dismantling and decontamination activities occur. There are no significant emissions associated with safe storage. This will result in a net reduction in doses to potential critical groups compared to baseline.

5. RWOS1 Safe Storage

The majority of radioactive waste has already been transferred from RWOS1. A small quantity of waste, which is encased in concrete, remains. The residual waste will be transferred to the DGR. This will be an activity of limited duration and it will involve removal of the waste and concrete and transfer to the DGR. The resulting dose will be negligible compared to baseline dose to the critical group at Bruce nuclear site.

6. WWMF Upgrades

OPG has approval for construction of additional refurbishment waste storage buildings. Emissions at WWMF currently account for less than 4% of radionuclide emissions from the Bruce nuclear site (OPG 2011, Section 6.6.4). Given that doses to members of the critical group from all releases at the Bruce nuclear site were 2 to 4 μSv/a (OPG 2011, Section 6.6.10; BRUCE POWER 2011, Section 2.0; BRUCE POWER 2012, Section 4.10.1), the WWMF contribution can be roughly estimated as below 0.2 μSv/a. Based on a very conservative assumption that following WWMF upgrades, the radioactive inventory of stored waste would be doubled, the incremental dose to members of potential critical groups can be estimated as less than 0.2 μSv/a, resulting in doubling of the current dose due to operation of the WWMF.

7. WUFDSF Expansion

There are negligible public doses due to operation of the WUFDSF facility. There will be no measurable change in doses to potential critical groups due to expansion of this facility.

Reasonably Foreseeable Projects

8. Bruce B Refurbishment

Emissions to the environment, and therefore resulting incremental dose due to Refurbishment of Bruce B nuclear generating station will be similar to those resulting from refurbishment of the Bruce A nuclear generation station. Incremental dose to members of the public during the refurbishment of Bruce A was estimated to be 0.035 μSv/a for an infant in the critical group (BRUCE POWER 2005, Section 6.2.1.6). Estimated doses due to refurbishment are small compared to those due to operation of a nuclear power plant. Therefore, refurbishment of Bruce B will result in a net reduction in doses to potential critical groups compared to baseline.

9. Operation of Bruce B Nuclear Generating Station Following Refurbishment

Following refurbishment, releases from the Bruce B nuclear generating station will be at least as low as or lower than at the present time. There will be no net increase in doses to members of the public.

10. Centre of Site Additions and Modifications

Centre of site emissions are very low as compared with emissions from Bruce A and Bruce B. There are negligible public doses due to current operation of the Central Maintenance and Laundry Facility. There will be no measurable changes in public doses resulting from potential additions and modifications.

11. Transfer of Used Nuclear Fuel to a Long-term Repository

It is reasonably foreseeable that used fuel will be transported to a deep geologic repository outside of the Bruce nuclear site. Effective doses to members of the public due to off-site transportation of used nuclear fuel are estimated to be 0.2 µSv/a (NWMO 2012, Table 6). It should be noted that these doses are estimated for those members of the public sharing a transport route and only a small fraction may be incurred by members of the same potential critical groups as those considered in the baseline assessment for the Bruce nuclear site.

12. DGR for Decommissioning Waste at Bruce Nuclear Site

By the time decommissioning waste could possibly be received at the DGR, the majority of operational low and intermediate level waste would be in place in the DGR and access tunnel closure walls would have been constructed, eliminating all radioactive emissions from this waste. Therefore the total emissions from the DGR from operational wastes will reduce to virtually zero. The contribution to dose from the possible emplacement of decommissioning waste in a DGR at the Bruce nuclear site is not expected to be higher than the previous phase for operational waste. The incremental dose due to disposal of decommissioning waste at DGR will be approximately 0.7 µSv/a.

Summary

Table 1 summarizes the expected trend in change to dose resulting from future projects. Table 2 (provided at the end of the responses to EIS IRs) provides a timeline of cumulative doses.

Table 1: Projected Dose Changes as a Result of Future Projects

Project		Projected Net Change Relative to Current Dose	Estimated Project Dose
DGR Project Operations		▲	< 0.7 µSv/a
Existing Projects		∅	Included in baseline radiological environment < 8 µSv/a
Certain/Planned Projects			
Bruce A	Decommissioning	▼	< 0.04 µSv/a
	Safe Storage	▼	Negligible compared to baseline
Bruce B	Decommissioning	▼	< 0.04 µSv/a
	Safe Storage	▼	Negligible compared to baseline
RWOS1 Safe Storage		∅	Negligible compared to baseline
WWMF Upgrades		▲	< 0.2 µSv/a
WUFDSF Expansion		∅	No change
Reasonably Foreseeable Projects			
Bruce B	Refurbishment	▼	< 0.04 µSv/a
	Operation	∅	No change
	Decommissioning	▼	< 0.04 µSv/a
	Safe Storage	▼	Negligible compared to baseline
Centre of Site Additions and Modifications		∅	No change
Transfer of Used Fuel to Long-term Repository		▲	< 0.2 µSv/a
DGR for Decommissioning Waste at Bruce Nuclear Site		∅	<0.7 µSv/a

Notes: ▲ Increase
▼ Decrease
∅ No change

The overall public dose due to facilities/projects at the Bruce nuclear site will vary temporally as a result of projects that may act cumulatively with the DGR Project, increasing at times and at other times decreasing. The temporal sequence of the projects is provided in Figure 1 (Figure 10.4-2 of OPG 2011, reproduced below). It can be seen from Table 1 and Figure 1 that the highest potential for cumulative radiological effects could take place after operation of the DGR commences, at the same time as the Bruce A and Bruce B nuclear generating stations are operational following WWMF Upgrades and WUFDSF Expansion. The peak annual total cumulative dose from all these projects will be less than 10 µSv/a. This overestimates the cumulative dose because the existing projects/activities are assumed to continue to 2080, which is not the case. As these projects/activities are discontinued the associated dose

would also. These decreases are not reflected in the cumulative doses in the table. Total cumulative dose will reduce after shutdown of, for example, Bruce B nuclear generating station.
Therefore, it is not expected that the dose to the public from the Bruce nuclear site at any time over the life of the DGR Project will reach the lower, *de minimus*, threshold of 10 µSv/a. OPG's response to IR-EIS-06-232 provides further information on the doses to the public relative to regulatory limits and background doses.

EIS-08-341

Section 8.1,
General Information and Design
Description

Information Request:

Provide the maximum expansion capacity of the proposed DGR.
Discuss any obstacles to expansion and how these could conceivably be overcome.

Context:

Given that the safe storage and decommissioning of reactors such as Bruce (in approximately 2024) and Bruce A (in approximately 2046) overlap the operational phase of the DGR, future EAs (addressing decommissioning) could conceivably propose disposal of low and intermediate level decommissioning waste at the DGR.

OPG Response:

OPG's application is for a site preparation and construction licence for a repository with a capacity of approximately 200,000 cubic metres for OPG's operational and refurbishment low and intermediate level waste.

In accordance with the requirements of the Environmental Impact Statement Guidelines (CEAA and CNSC 2009, Section 14), OPG undertook an assessment of the cumulative effects of an expansion of the repository to include OPG's reactor decommissioning wastes, with results reported in the Environmental Impact Statement (OPG 2011, Section 10).

Furthermore, OPG's responses to Information Requests EIS-04-120 (OPG 2012a) and EIS-04-145 (OPG 2012b) discuss the maximum expansion potential of the DGR that has been assessed, as well as some of the factors that would be involved in constructing such an expansion.

References:

CEAA and CNSC. 2009. Guidelines for the Preparation of the Environmental Impact Statement for the Deep Geologic Repository of Low- and Intermediate- Level Radioactive Wastes. (CEAA Registry Doc# 150) OPG. 2011. OPG's Deep Geologic Repository for Low and Intermediate Level Waste – Environmental Impact Statement. Ontario Power Generation report 00216-REP-07701-00001 R000. Toronto, Canada. (CEAA Registry Doc# 298)

OPG. 2012a. OPG Letter, A. Sweetnam to S. Swanson, "Deep Geologic Repository Project for Low and Intermediate Level Waste – Submission of Responses to a Sub-set of Package #4 Information Requests", CD# 00216-CORR-00531-

EIS-08-378

Section 7.1,
Purpose and Need for the Project

Information Request:

Provide a specific break down of waste volumes per reactor and per activity, in the form of a pie chart. Identify whether any decommissioning waste is in the current proposed project description.

Context:

On page 3-2, in section 3.1 'Purpose of the Project' it states if the fleet of 20 reactors each operate to the end of life (a nominal 50 years), which assumes refurbishment of each of the generating stations, approximately 200.000 m_3 (emplaced volume) of operational and refurbishment L&ILW would be produced".

On page 3-4 of the EIS, it states "...as a result of the refurbishment and improvements activities it is expected the life of each reactor unit will be extended for up to 25 to 30 years." "About 21,000 m3 of radioactive waste will be generated from the planned refurbishment activities".

It is not evident if the amount of 21,000 m3 is the waste generated from each of the 16 reactors (20 minus 4 at Pickering B) or a combined amount for all ongoing and possibly planned refurbishments.

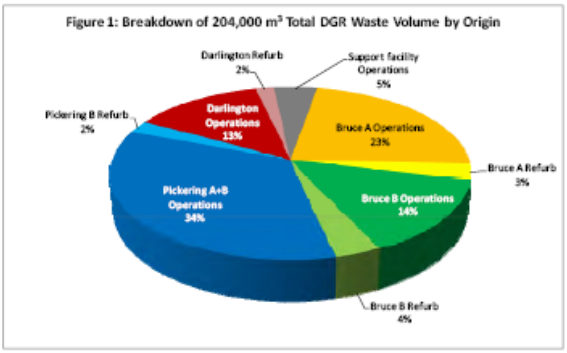
Also, on the page 3-4, OPG states that, "in the future, an additional approximately 135,000 m3 of L&ILW is expected to be produced during the decommissioning of the [20] reactors and the associated nuclear waste storage facilities." The next sentence reads: "The currently proposed DGR Project does not include management of decommissioning waste".

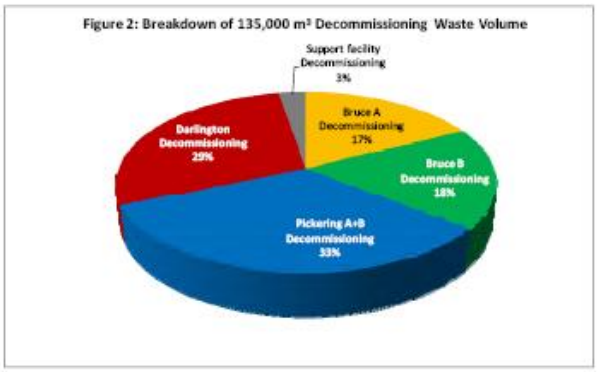
OPG Response:

As documented in the DGR reference inventory report (OPG 2010, Tables 2.1 and 3.1), the amount of waste to be placed in the DGR within the scope of the application is approximately 182,300 m_3 of "operational" low and intermediate level waste plus 21,700 m_3 of "refurbishment" low and intermediate level waste, for a total of 204,000 m_3. This represents the total of all as-packaged waste from OPG owned or operated reactors for emplacement in the DGR, and uses the radiologically-conservative assumption that all reactors except for Pickering A are refurbished for continued operation. (In this context, radiologically-conservative" means maximizing the radionuclide inventory of the waste for postclosure safety assessment purposes.)

The breakdown of the 204,000 m_3 by station and activity is given in Figure 1 below. The "operational" waste includes both the pre- and post-refurbishment periods. The OPG owned or operated support facilities include the waste management facilities at the Pickering, Darlington, and Bruce sites; and the Darlington Tritium Removal Facility, health physics labs, the Central Maintenance and Laundry Facility at the Bruce nuclear site, and other similar facilities required to directly support the operation of the nuclear generating stations.

In addition to this, approximately 135,000 m_3 of decommissioning low and intermediate level waste is expected to be generated in the future. As reported previously in OPG's response to Information Request EIS-04-102 (OPG 2012), this is not included in the current DGR project scope inventory. However, it is identified in the Cumulative Effects Assessment in the Environmental Impact Statement (OPG 2011, Section 10.4.1) as a "reasonably foreseeable" future project. As shown below in Figure 2, the 135,000 m_3 of decommissioning waste can be allocated as approximately 17% Bruce A, 18% Bruce B, 33% Pickering A + B, 29% Darlington, and the remaining 3% for the miscellaneous support facilities.

IR#	EIS Guidelines Section	Information Request and Response
		



References:

OPG. 2010. Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository. Ontario Power Generation report 00216-REP-03902-00003-R003. Toronto, Canada. (CEAA Registry Doc# 300) OPG. 2011. OPG's Deep Geologic Repository for Low and Intermediate Level Waste - Environmental Impact Statement. Ontario Power Generation report 00216-REP-07701-00001-R000. Toronto, Canada. (CEAA Registry Doc# 298)

OPG. 2012. OPG Letter, A. Sweetnam to S. Swanson, "Deep Geologic Repository Project for Low and Intermediate Level Waste - Submission of Responses to a Sub-set of Package #4 Information Requests", CD# 00216-CORR-00531- 00134, August 27, 2012. (CEAA Registry Doc# 704)

Pickering Comprehensive Plan on Decommissioning Strategies

The CNSC has requested that OPG prepare a comprehensive plan on decommissioning strategies as part of the application for a one-site Pickering licence (Ref. 1 and 6). The information presented below is provided in response to the CNSC request.

1.0 Background

OPG's plan has been, and continues to be, to apply a deferred decommissioning strategy with an approximately 30 years, safe storage period after final shut down of its nuclear stations (Ref. 2). The basis for this strategy is provided in Section 3. Applying this strategy, the Pickering Nuclear Generating Station (PNGS) will pass through four distinct stages post shutdown. These are 1) Stabilization (or preparation for safe storage), 2) Storage and Surveillance (or safe storage), 3) Dismantling and Demolition and 4) Site Restoration.

During each of these stages, OPG is committed to ensuring the safe management of the facility commensurate with the prevailing risk. In this regard, a management system is currently being established that addresses all people, process, and facility aspects of safety. OPG's charter document, OPG-CHAR-0001, *"Decommissioning Management System"*, is used to control and manage the decommissioning activities during the four stages post shutdown for OPG's nuclear facilities. Two program level documents, "Planning for Decommissioning" (OPG-PROG-0020) and "Conduct of Decommissioning" (OPG-PROG-0022) are currently under development along with lower tier documents.

Program specifics for each stage are provided in greater detail in Section 2.0 below.

2.0 Decommissioning Plans Specific to Pickering

The End of Life of the Pickering nuclear facility will be managed through the following:

a) A Stabilization Activity Plan (SAP), and
b) A Storage and Surveillance Plan (SSP), and
c) A Detailed Decommissioning Plan (DDP)

In general, the purpose of the plans is to ensure that all reasonable precautions are taken to protect workers, the public and the environment from both radiological and conventional hazards as the plant transitions from operational to safe storage to eventual dismantling and demolition (D&D). The principle task in the development of each of the SAP, SSP and DDP is a thorough safety assessment which addresses all 14 elements of the CNSC Safety and Control Areas (SCAs).

The safety assessments will be commensurate with risk, and will consider credible accident scenarios as well as all safety hazards throughout each stage for routine and non-routine activities. The Safety Assessments will ensure that all hazards can be mitigated and/or managed by the licensee and acts as a baseline for monitoring, maintenance, surveillance and future dismantling.

In addition, Section 7 of CSA N294-09 indicates that a safety assessment shall be performed during the preparation for the D&D stage of decommissioning. The standard specifies that the level of the safety assessment should be commensurate with the type and complexity of the facility.

Table 1 shows the plans and activities specific to the decommissioning of the Pickering station.

Table 1 – Pickering Station Decommissioning Plans and Activities

Item #	Activity Description	Date
Operations		
1	Prepare SAP	2012 to 2015
2	Operating Licence renewal	2013
3	Submit SAP to CNSC	2015
4	Prepare SSP	2017 to 2019
5	Operating Licence renewal*	2018
6	Submit SSP to CNSC	2019
Stabilization Activity		
7	Execute SAP	2020 to 2023
8	Decommissioning Licence application (stage 1 activities) including results of Environmental Assessment (EA), if required	2023
Storage and Surveillance		
9	Execute SSP	2024 to 2051
10	Identify decommissioning waste disposal facilities and methodologies	2030
11	Irradiated fuel removed from wet storage	2034
12	Adaptive Phased Management (APM) Deep Geologic Repository (DGR) in-service	2035
13	Prepare DDP	2040 to 2045
14	Submit DDP to CNSC	2045
15	Decommissioning Licence application (stage 2 activities) including results of EA, if required	2049
Dismantling, Disposal and Site Restoration		
16	Execute DDP	2051 to 2064
17	Decommissioning Licence application (stage 3 activities)	2059
18	Issuance of a Licence to Abandon	2064

*Assumes 5 year operating licence received in 2013

Note that all dates are nominal and listed here for planning purposes only. The dates remain consistent with those previously submitted in the 2011 Sustainable Operations Plan (SOP) (Reference 3 and 4).

Refer to Figure 1 for the overview of the overall decommissioning strategy for Pickering. This schedule is based on the current knowledge of the regulations at this time and is subject to change.

Details on the activities to be undertaken in support of the SAP, SSP and DDP are summarized in the following Sections.

2.1 Stabilization Activity Plan (SAP)

The stabilization stage covers the transition period from regular plant operations through shutdown until commencement of the storage and surveillance stage.

Activities to be covered in the SAP include all those which support the safe shutdown of the facility including preliminary planning and pre-shutdown activities, defueling/dewatering, decontamination, deactivation and isolation of systems, islanding modifications, etc. The purpose of the SAP is to not only assess and mitigate hazards for all routine and non-routine activities, but to assess how the hazards will change throughout the transition period, to ensure that workers on site are aware of how these changes will affect safety practices, and to ensure safety culture, programs, and access control remain relevant throughout the transition period. In addition, OPG will assess the need for early submission to the CNSC, of information related to activities to be performed under the SAP, to allow for a timely determination of a need for an Environmental Assessment (EA).

Note that site preparation will be considered in the SAP. All station system components at the facility are to be reviewed to identify which can be taken out of service and which will require modifications or upgrades to support the safe state of storage for the required period of nominally 30 years. The review is to be submitted to the CNSC for acceptance.

As per current planning assumptions, permanent shutdown of the facility is to take place in 2020. The SAP will be prepared five years in advance of this date, in 2015.

2.2 Storage and Surveillance Plan (SSP)

Following the end of commercial operation, the storage and surveillance stage is the bridge between the end of the stabilization activities (as outlined in the SAP) and the initiation of dismantlement and demolition of the station. The specifics of the storage and surveillance period will be outlined in the SSP. As OPG's current strategy is for a deferred decommissioning, the SSP will be in effect from 2024 to 2051 approximately. During this period, OPG is committed to continuous monitoring and surveillance of the safe storage state of the facility to ensure safety.

The SSP, when prepared, will include the following:

- A description of the arrangements and activities required to ensure the maintenance of the safe storage state.
- A description of the required monitoring and surveillance activities that will be completed on a routine basis.

The details of the SSP will be centered on equipment, systems, processes, and procedures that will ensure that the facility is kept in a safe state throughout the extended safe storage period. While the SSP will leverage off of existing programs to the extent practicable, it is recognized that new procedures or programs may be required due to the unique considerations associated with the state of safe storage condition.

SSP details will include, but not be restricted to, the following:

- Actions to be taken during normal and abnormal occurrences.
- Frequency and nature of maintenance, inspection and monitoring activities including aging management programs.
- Physical security for the Nuclear Power Plant (NPP).
- Parameters to be monitored to ensure integrity of the NPP
- Parameters to be monitored to ensure environmental protection and monitoring of potential effluents and releases.
- Parameters to be monitored to ensure radiation protection requirements are met.
- Changes to any plan, program or procedure.
- Resources required for maintenance of the NPP.
- Waste management practices to be applied. All L&ILW generated in this stage will be considered safe storage waste and handled/disposed of at the current licensed facility, Western Waste Management Facility (WWMF).
- Details on any dismantling and/or demolition activities that are being considered under the SSP. These would need to be developed far enough in advance to allow for any EA considerations or regulatory approvals.

Note that limited removal or remediation of radioactive and non-radioactive System, Structures and Components (SSCs) may be required during safe storage for the protection of personnel, public, and environment.

The end state for the station immediately following completion of the preparation for safe storage will be detailed in the SAP. The preliminary end state assumptions have been documented in Appendix A of the Sustainable Operations Plan (Reference 3), which was submitted to the CNSC on December 21, 2011 (Reference 4).

The storage and surveillance stage will be divided into two distinct sub-stages. The first sub-stage is the period when irradiated fuel is being stored on site in the irradiated fuel bays. During this sub-stage, all of the required facilities to maintain wet storage in service will be available. The second sub-stage is the period when all of the irradiated fuel has been removed from wet storage and placed in Dry Storage Containers (DSC), awaiting shipment to its final repository.

As with the SAP, the SSP will be formatted around the 14 Safety & Control Areas (SCA). The SSP will be prepared five (5) years in advance of when it is required. As the storage and surveillance stage is projected to commence in 2024, it is anticipated that the SSP will be submitted to the CNSC in 2019.

2.3 Detailed Decommissioning Plan (DDP)

Following the approximately 30 year safe storage stage, D&D work will begin in approximately 2051. Prior to this date the detailed planning will have been completed and the necessary licences, permits and approvals will have been obtained. The program specific activities that will occur during this stage are described below, with the expectation that a higher level of detail will be provided closer to the actual execution of D&D.

- Preparation of a Detailed Decommissioning Plan

  The current Preliminary Decommissioning Plan (PDP) [R-5] is updated every 5 years and will include updates to the decommissioning strategy in light of regulatory or technical changes. The PDP will be replaced by a DDP prior to the commencement of dismantling and demolition as part of OPG's application for the necessary regulatory permits. The submission is expected to occur at least five years prior to the start of D&D work which is currently planned to be submitted in 2045. The DDP will detail how the D&D of the station will be executed, both technically and organizationally.

  A transition plan will be developed for the orderly progression from safe storage to decommissioning operations, including staff augmentation and any required plant system re-activation.

  A Decommissioning Operations Contractor (DOC) will be hired to manage and perform the dismantling, demolition and site restoration. The activities performed by the DOC will include updating procedures for the characterization surveys, dismantling work, waste packaging, disposal, site restoration and final surveys.

- Environmental and Safety Assessment

  Environmental and safety assessments for the intended dismantling and demolition processes will be performed as required by prevailing regulations prior to dismantling and demolition. OPG will complete those actions necessary to comply with the requirements of the Canadian Environmental Assessment Act (CEAA). The Environmental Assessment if required will be submitted prior to the start of D&D execution consistent with requirements in effect at that time.

- Decommissioning Waste Management Strategy

  Decommissioning low and intermediate level waste (LLW and ILW) will be disposed of at a regional disposal facility located in Ontario, approximately equidistant from OPG's five nuclear stations.

  In addition, all hazardous waste will be transferred to an appropriate, licensed waste management facility for storage or disposal. Appropriate disposal facilities for both radioactive and hazardous wastes will be identified in approximately 2030.

- Used Fuel Strategy

  Under the Nuclear Waste Management Organization's Adaptive Phased Management (APM) program, the long term disposal facility for used-fuel is expected to be in service by the year 2035, at which time, used fuel will be transferred from the interim storage location at OPG to the APM Deep Geologic Repository (DGR). Therefore, when the D&D decommissioning work begins at Pickering, it is expected that most of the fuel will have been removed from the site.

- Radiation Surveys and Site Investigation

  The Historical Site Assessment (HSA) for the Pickering site will be maintained up to the D&D stage of decommissioning as per the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) cited in CSA N294-09. In addition, scoping and characterization surveys will be performed prior to the start of dismantling and demolition stage. D&D operational surveys in support of remedial actions will be performed throughout the dismantling and decontamination process in order to guide and monitor this work. Final status surveys (consistent with requirements of CSA N294-09) will be designed and performed to demonstrate that the residual radioactivity at the site meets the final clearance levels, in order to be able to release the site for other OPG uses. The results will be submitted to the CNSC in support of an application for a License to Abandon.

- Site Release Limits/Clearance Levels

  Acceptable site radiological release criteria or clearance levels will be developed and established prior to the start of D&D decommissioning work for soil and structural surfaces that are within authorized limits based on a dose criterion approved by the regulatory authority. The Pickering site will be shown to meet the final clearance levels in support of release from further regulatory control.

- End State Objectives

  By the end of the D&D and site restoration period, the site will be free of industrial and radiological hazards. All of the station systems will have been dismantled and all of the buildings demolished. Subsurface structures will have been drained, de-energized, decontaminated, removed to a nominal removal depth of 1 m and capped if required. The Pickering site will be restored to a state suitable for other OPG uses as agreed with the CNSC.

- License to Abandon

  Upon completion of decommissioning, the Pickering site will be in a condition that will support its removal from Regulatory control. A final end state report (or site abandonment plan) on the decommissioning program will be prepared. The final report will describe the decommissioning work completed and the results and associated interpretation of the final surveys. The final report will be submitted to the CNSC as part of an application for a License to Abandon.

3.0 Basis for OPG's Decommissioning Strategy

3.1 Context

Canadian regulations require that planning for decommissioning takes place throughout a licensed facility's lifetime. Licences issued by the CNSC include requirements for the submission of decommissioning plans and associated financial guarantees. Further, the CNSC guidelines suggest that the following three basic alternative strategies should be evaluated in support of those plans; prompt decommissioning, deferred decommissioning, and in-situ entombment.

The main feature that distinguishes the decommissioning of a nuclear station from that of any other large industrial plant is the radiological hazard. After approximately 30 years, the level of Cobalt 60 activity, the main radiological contributor, would be reduced by about two orders of magnitude and its contribution to radiological dose would also be reduced. Dismantling the radioactive parts of the stations are considered to be the most challenging and labour and cost intensive activities involved in decommissioning. Hence, reducing the amount of radiation exposure to workers, public, and the environment was one of the most important factors considered when OPG developed its strategy for decommissioning.

3.2 Decommissioning Strategy

Planning for decommissioning of OPG's nuclear generating stations began in the 1980s and considered immediate dismantling and deferral periods of 30, 60, and 100 years. Decommissioning options are re-examined periodically and international trends and approaches are considered for applicability. Currently, OPG's strategy for decommissioning is to shut down and store its nuclear generating stations in a safe state for 30 years, followed by dismantling, demolition, and site restoration. This strategy was chosen based on the following considerations;

- Reduced radiation exposure to workers, public, and the environment consistent with the As Low As Reasonably Achievable (ALARA) principle
- Reduced costs of dismantling activities due to lower radiation levels
- Reduced costs due to lower volumes of radioactive waste, its packaging and transportation to a disposal site
- Potential for reduced costs as a result of technological development and use of operating experience
- Greater costs for 60 or 100 year deferral options due to increased facility caretaking needs with age
- Time for the development of a decommissioning waste disposal site
- Time for the development of a used fuel disposal facility
- Financial benefit through moderated cost of power as a result of future expenditures vs. expenditures in the present
- Alignment with international practice for deferred decommissioning e.g. 48 of 123 Nuclear Power Plants have or are utilizing deferred decommissioning as of 2009

Consistent with this deferred strategy, OPG contributions to a decommissioning fund and financial guarantee have been provided as stipulated by CNSC requirements and agreements with the Ontario government.

4.0 References

1. CNSC letter, M. Santini to G. Jager, “Pickering NGS – Application Requirements for Renewal of Licence to Operate Pickering Nuclear Generating Stations A and B”, March 2, 2012, e-Doc #3811212, CD# P-CORR-00531-03707.

2. OPG letter, P. Tremblay to M. Santini and D. Howard, “Pickering Generating Station A and B Transition from Operations to Safe Storage”, June 9, 2011, CD# N-CORR-00531-05294.

3. OPG Letter, G. Jager to M. Santini, “Pickering A and B- Submission of 2011 Sustainable Operations Plan”, December 21, 2011, CD# P-CORR-00531-0366

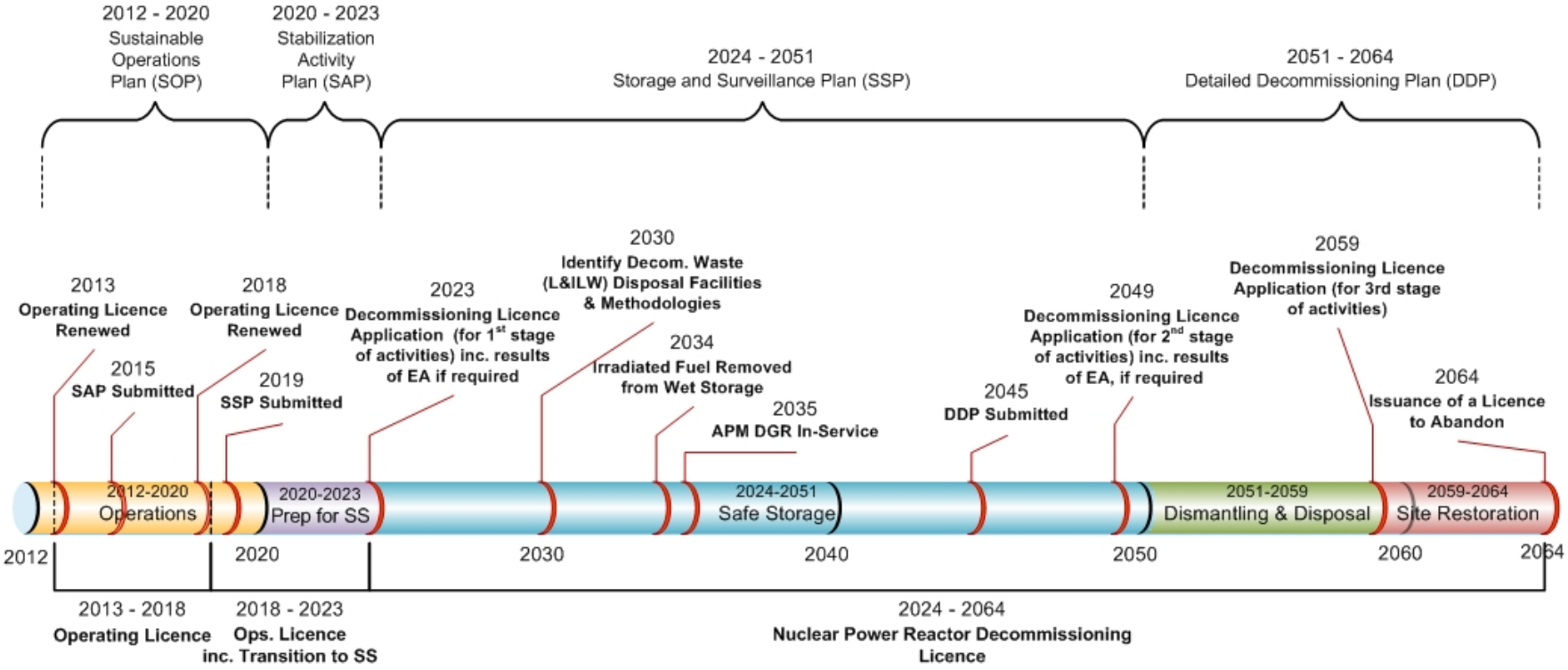
4. OPG letter, G. Jager to M. Santini, “Pickering A and B – Submission of 2011 Sustainable Operations Plan”, December 21, 2011, CD# P-CORR-00531-03669.

5. OPG letter, A. Sweetnam to D. Howard, Submission of Preliminary Decommissioning Plans, Proposed Supporting Financial Guarantee and Documentary Information Summary”, June 27, 2012, CD# N-CORR-00531-05696.

6. Canadian Nuclear Safety Commission, “Record of Proceedings Including Reasons for Decision In the Matter of Ontario Power Generation Inc. Application to Renew the Pickering Nuclear Generating Station A Operating Licence. Public Hearing Dates: February 17, 2010 and May 21, 2010.

Figure 1

Overview of the Overall Decommissioning Strategy for Pickering NGS Units



Notes:

1. All dates are nominal and are for planning purposes. The dates remain consistent with those previously submitted in the 2011 SOP.

Acronyms

APM = Adaptive Phased Management
DGR = Deep Geologic Repository
EA = Environmental Assessment
SS = Safe Storage