

Record of Proceedings, Including Reasons for Decision

In the Matter of

Proponent Ontario Power Generation Inc.

Subject Screening Environmental Assessment of the
Pickering Nuclear Generating Station B
Refurbishment and Continued Operations
Project, Pickering, Ontario

Date of
Hearing December 10, 2008

RECORD OF PROCEEDINGS

Proponent: Ontario Power Generation Inc.

Address/Location: 1675 Montgomery Park Road, Box 160,
Pickering, Ontario L1V 2R5

Purpose: Screening Environmental Assessment of the Pickering Nuclear
Generating Station B Refurbishment and Continued Operations
Project, Pickering, Ontario

Letter of intent: June 15, 2006

Date of hearing: December 10, 2008

Location: Ajax Convention Centre, 550 Beck Crescent, Ajax, Ontario

Members present: M. Binder, Chair
C.R. Barnes
A.R. Graham
B.J. Barriault
A. Harvey
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Proponent Represented By	Document Number
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CNSC staff	Document Number
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Intervenors	Document Number
See Appendix A	

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Introduction

1. Ontario Power Generation Inc. (OPG) has notified the Canadian Nuclear Safety Commission (CNSC) of its intention to refurbish and to continue to operate the Pickering B Units 5, 6, 7 and 8 until about 2060.
2. Before the Canadian Nuclear Safety Commission¹ (CNSC) can make a licensing decision pursuant to the *Nuclear Safety and Control Act*² (NSCA) with respect to the proposed project, it must, in accordance with the requirements of the *Canadian Environmental Assessment Act*³ (CEAA), make a decision on the Environmental Assessment (EA) screening of the proposal. The CNSC is the sole Responsible Authority⁴ (RA) for this EA.
3. As requested under sections 15 and 16 of the CEAA, Guidelines for the EA (EA Guidelines) of the proposed project, including statements of the scope of the project and scope of the assessment, were prepared by CNSC staff. Pursuant to the *Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements*⁵, the following federal authorities were notified of the project and invited to participate in the preparation of the Draft EA Guidelines: Environment Canada (EC), the Department of Fisheries and Oceans Canada (DFO), Natural Resources Canada (NRCan) and Health Canada (HC). The Ontario Ministry of the Environment (OMOE) was also provided with an opportunity to comment on the draft EA Guidelines. The EA Guidelines were reviewed and approved by the Commission at a Public Hearing⁶ held on January 24, 2007 in Ottawa, Ontario. The conduct of the technical studies for the screening of this project was delegated to OPG on April 3, 2007 in accordance with subsection 17(1) of the CEAA.
4. This *Record of Proceedings, Including Reasons for Decision* describes the Commission's consideration of the Screening Report and its reasons for decisions on the results. The Screening Report is attached as an appendix to CMD 08-H27.
5. The proposed refurbishment and continued operations activities at the Pickering B site would require an amendment to OPG's operating licence (currently PROL 08.00/2013). The consideration to amend the operating licence is not part of this hearing. Should the Commission conclude that the project is not likely to cause significant adverse environmental impacts and should OPG decide to proceed with this project, the Commission would consider the amendment of the operating licence at a separate hearing.

¹ The Canadian Nuclear Safety Commission is referred to as the "CNSC" when referring to the organization and its staff in general, and as the "Commission" when referring to the tribunal component.

² S.C. 1997, c. 9.

³ S.C. 1992, c.37.

⁴ Responsible Authority in relation to an EA is determined in accordance with subsection 11(1) of the CEAA.

⁵ S.O.R./97-181

⁶ Record of Proceedings - Ontario Power Generation Inc. - Environmental Assessment Guidelines (Scope of Project and Assessment) for the Proposed Refurbishment and Continued Operation of Pickering B Reactors at the Pickering B Nuclear Generating Station:

http://www.nuclearsafety.gc.ca/eng/commission/hearings/documents_search/results.cfm

Issues

6. In considering the Screening Report, the Commission was required to decide:
 - a) whether the Screening Report is complete; that is, whether all of the factors and instructions set out in the approved EA Guidelines and subsection 16(1) of the CEEA were adequately addressed;
 - b) whether the project, taking into account the mitigation measures identified in the Screening Report, is likely to cause significant adverse environmental effects;
 - c) whether the project must be referred to the federal Minister of the Environment for referral to a review panel or mediator, pursuant to paragraph 20(1)(c) of the CEEA; and
 - d) whether the Commission may proceed with its consideration of an application for a licence under the NSCA, consistent with paragraph 20(1)(a) of the CEEA.

Hearing

7. Pursuant to section 22 of the NSCA, the President of the Commission established a panel to hear this matter.
8. The panel of the Commission (hereafter referred to as the Commission), in making its decision, considered information presented for a public hearing held on December 10, 2008 in Ajax, Ontario. During the hearing, the Commission received written and oral submissions from OPG (CMD 08-H27.1 and 08-H27.1A) and from CNSC staff (CMD 08-H27 and CMD 08-H27.A). The Commission also considered 109 oral and written submissions from intervenors from which 66 were in the form of a petition letter (a list of the intervenors is provided in Appendix 1).

Decision

9. Based on its consideration of the matter, as described in more detail in this *Record of Proceedings, Including Reasons for Decision* the Commission decides that:

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| <ol style="list-style-type: none">a) the Environmental Assessment Screening Report appended to CMD 08-H27 is complete; the scope of the project and assessment were appropriately determined in accordance with sections 15 and 16 of the <i>Canadian Environmental Assessment Act</i>, and all of the required assessment factors were addressed during the assessment;b) the project, taking into account the mitigation measures identified in the Environmental Assessment Screening Report, is not likely to cause significant adverse environmental effects; |
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- c) it will not refer the project to the federal Minister of the Environment for his referral to a review panel or mediator; and
- d) it will proceed to consider an application for licence amendment under the provisions of the *Nuclear Safety and Control Act*, consistent with paragraph 20(1)(a) of the *Canadian Environmental Assessment Act*.

Issues and Commission Findings

- 10. The Commission addressed the four issues identified in paragraph 6 under four main headings: (1) the completeness of the Screening Report, (2) the adequacy of the assessment method, (3) the likelihood and significance of the environmental effects, and (4) the nature and level of public concern. The Commission's findings in each of these areas are summarized below.
- 11. The findings of the Commission presented below are based on the Commission's consideration of all the information and submissions available for reference on the record for the hearing.

Completeness of the Screening Report

- 12. In its consideration of the completeness of the Screening Report, the Commission considered whether the assessment had adequately addressed and appropriately defined the scope of the project and the assessment factors.
- 13. OPG stated that the extension of the operation of Pickering Nuclear Generating Station B (PNGSB) would include the refurbishment or replacement of a number of major components in each of the four reactors (units 5 through 8) during planned outages. During the outages, after the reactors have been defueled and dewatered, the fuel channel assemblies, calandria tubes, feeder pipes and steam generators would be removed and replaced in each unit. This would imply: the continued storage of used nuclear fuel in the station's Irradiated Fuel Bay (IFB) for a minimum of ten years; the transfer of the used fuel after ten years to dry storage at the Pickering Waste Management Facility (PWMF); the storage of refurbishment fuel at PWMF or its transfer to the Western Waste Management Facility (WWMF) on the Bruce site near Kincardine, Ontario; the return to full power operation of the refurbished units after each planned outage; and the continued operation after refurbishment including routine scheduled maintenance activities and inspections.
- 14. The project works and activities submitted by OPG are divided in 4 principal stages: the first 3 are part of the "Refurbishment Phase" and the last one is included in the "Continued Operation Phase":
 - 1. preparation for refurbishment;
 - 2. refurbishment;
 - 3. refueling and restarting; and
 - 4. operations and maintenance.

For the purposes of this EA, OPG noted that the operation of the four refurbished reactors is anticipated to continue until 2060.

15. CNSC staff noted that, in the Commission's April 2007 *Record of Proceedings, Including Reasons for Decision*, the scope of the assessment, including the factors to be considered in the environmental assessment, was fully described. The current EA screening report considers the following factors required under the CEAA: potential effects of this project on the biophysical environment and the resulting changes in the socioeconomic environment or human health. CEAA also requires that the assessment considers potential effects of the environment on the project, effects of accidents and malfunctions on the project, and cumulative effects of the project. The conclusion of the assessment is based on the significance of these residual adverse environmental effects after the implementation of mitigations measures and the consideration of public comments.
16. CNSC staff reported that, in the *Record of Proceedings, Including Reasons for Decision* for the approval of the EA Guidelines, the Commission had requested the expansion of the regional area to be considered in the scope of the project to include any relevant areas of the City of Toronto and its population up to the year 2060. The Commission also requested that projections for the provincial nuclear emergency response be made up to the year 2060. During the EA Guidelines proceedings for the refurbishment of PNGSB, the Commission also heard specific comments from the public on the inclusion of external threats such as terrorism or sabotage and their potential to cause adverse effects on the environment. The Commission decided, based on CNSC staff's recommendation, that malevolent acts would be addressed through the licensing process and that these matters did not need to be considered in the environmental assessment. The Commission, in its decision, also concurred with CNSC staff's recommendation that the EA did not need to consider alternatives to the project; there is no requirement under the CEAA to assess the environmental effects of functionally different ways of producing electricity.

Conclusion

17. The Commission reviewed the EA Screening Report and concluded that it is complete and in accordance with the requirements of the CEAA. The Commission is therefore able to proceed to its consideration of the adequacy of the assessment method, the likelihood and significance of the environmental effects of the project including the adequacy of the proposed mitigation measures, and the public concerns about the project.

Adequacy of the assessment method

18. CNSC staff confirmed that OPG followed, in its EA Study Report, the structure outlined in the EA Guidelines approved by the Commission.
19. CNSC staff noted that all project activities were examined to identify those that could possibly interact with any of the seven following bio-physical environmental components: atmospheric environment, noise, surface water, aquatic biota, aquatic habitat, terrestrial environment and the geologic aspect of the environment including soil, hydrogeology and seismicity. Interactions of the project with human health and the socio-economic environment were also examined including: visual setting and transportation, heritage sources, socio-economic conditions, aboriginal interests and human health. For each components of the biophysical and socio-economic environment and for human health, the assessment considered, using such criteria as

regulatory standards, guidelines, existing conditions, scientific literature and professional judgment, the following activities:

- the site preparation in support of refurbishment;
- the refurbishment of the four reactors;
- the continued operation of the four reactors until 2060;
- the construction of structures for the interim storage of refurbishment waste;
- the processing and interim storage of refurbishment waste at PWWF or its transport off-site to the WWMF for centralized storage;
- the construction of additional storage capacity for the used nuclear fuel produced from the continued operation of the PNGSB; and
- the interim storage of additional used nuclear fuel at the Pickering site.

After having assessed the potential environmental effects of the project, mitigation measures for these potential effects were considered and the residual effects remaining after application of the measures were evaluated for their significance.

20. With respect to the adequacy of consultations, CNSC staff reported that an extensive consultation and information program had been implemented by OPG as outlined in Table 12-1 of the proposed EA Screening Report attached to CMD 08-H27. CNSC staff also added that the public had been given the opportunity to comment on both the draft of the EA Guidelines and the draft of the EA Screening Report.
21. CNSC staff noted that the draft EA Screening Report was available for public review for a period of six weeks, from July 24, 2008 until September 4, 2008. Copies of the report were sent directly to the federal and provincial authorities. A letter was also sent to over 100 stakeholders and First Nations and Métis groups informing them that the draft EA Screening Report was available for review and comment. The draft EA Screening Report was made available at the Pickering Library and the CNSC Library and notices of the availability of the report were posted on the CNSC Web site and the Canadian Environmental Assessment Registry. The public was also made aware of the project and the draft EA Screening Report at two Open Houses held in Pickering on July 29, 2008 and August 12, 2008. Comments on the draft EA Screening Report were received from Federal Authorities, members of the public and other stakeholders. Comments, in the form of a submission, on the draft EA Screening Report were sent to CNSC staff by 9 stakeholders in total. Responses to the issues raised in these submissions are available in Appendix B of the proposed EA Screening Report.
22. CNSC staff added that OPG had put in place during the environmental screening assessment a consultation program intended to inform stakeholders of the Pickering area, the First Nations and Métis communities and other interested groups about the proposed refurbishment and continued operation project. The program was established to address questions or concerns related to the project. CNSC staff noted that OPG stakeholder consultation activities are described in section 12.0 of the proposed EA Screening Report.

Conclusion

23. The Commission is satisfied that the methods used to consult during the EA, including opportunities to comment and review the EA Screening Report, were acceptable and provided a suitable basis for the Commission to evaluate the public concerns about the project. The Commission's findings on public concerns are discussed further in the section below entitled Nature and Level of Public Concern. Based on its review of the EA Screening Report and the above information, the Commission concludes that the EA methods were acceptable and appropriate, and that the EA Screening Report is complete and compliant with the requirements of the CEAA.

Likelihood and Significance of Environmental Effects

24. This section contains the Commission's findings with respect to whether the project, taking into account the identified mitigation measures, is likely to cause significant adverse environmental effects. In examining this question, the Commission considered the predicted effects on the relevant components of the environment.

Effects of the Project on the Environment

25. CNSC staff reported that the proposed EA Screening Report provides an illustration of the potential project-environment interactions during the Refurbishment Phase and the Continued Operation Phase. A description of each interaction and an assessment of the potential effects are described in detail in section 8.2 of the proposed EA Screening Report. The assessment is based on the identification of 15 project works and activities during the PNGSB Refurbishment Phase and 15 project works and activities during the PNGSB Continued Operation Phase. The environment was divided into ten environmental components.
26. CNSC staff noted that each of the project works and activities included in the project were examined to identify those that could potentially interact with the environmental components identified in the EA. In total, with the exception of malfunctions and accidents, 170 potential interactions were identified, 94 during the Refurbishment Phase and 76 during the Continued Operation Phase. Project-environment interactions were identified in all of the ten environmental components, with the largest number being found in the socio-economics, terrestrial environment, aquatic environment and radiation and radioactivity environmental components.
27. CNSC staff further noted that measurable effects were identified for the following environmental components: surface water, aquatic environment, geology and hydrogeology, terrestrial environment, human health, visual setting and transportation, physical and cultural heritage resources and socio-economic conditions. This involved quantification of the effects, when possible, and identification of appropriate mitigation measures to reduce or eliminate any adverse effects generated by the project. These measures are discussed in section 8 of the proposed EA Screening Report. The effects remaining after mitigation are referred to as residual effects.

28. CNSC staff reported that the analysis of the assessment of the effects of the project on the environment showed nine potential adverse residual effects: six under normal operations and three under malfunctions and accidents. The identified adverse residual effects of the project on the environment are associated with:

- fish impingement and temperature impacts;
- tritium in groundwater;
- radiation dose to workers during the refurbishment phase;
- traffic during the refurbishment phase;
- reduced use and enjoyment of community and recreational features;
- reduced use and enjoyment of property;
- release of transformer oil;
- release of tritiated water to Lake Ontario; and
- nuclear accidents which may result in exposure to the public.

These effects are discussed in detail in section 11 of the proposed EA Screening Report.

Aquatic Biota

29. The Commission asked for more detail in relation to fish impingement and entrainment, and on the number of fish killed reported in the EA Screening Report being 2.5 times higher than that reported by OPG. CNSC staff explained that the higher number of fish killed reported in the EA Screening Report is in reference to that number which estimates the potential biomass of fish in the absence of impingement or entrainment. CNSC staff also noted that it agreed with OPG's estimate that, at a maximum pump design flow per year, direct mortality of the fish is about 800,000 adult fish and up to 62 million fish eggs and fish larvae.
30. The Commission required from OPG an overview of the mitigation measures to be implemented to reduce the number of fish impacted by the proposed project. OPG responded that it was presently doing an assessment of the most feasible and efficient measures to implement without impacting on the plant operations. OPG reported that it was currently consulting with CNSC staff to find the best mitigating method and that it was committed to implement concrete measures by the end of 2009. OPG added that, at this stage, it would be premature to give details on the measures to be implemented.
31. The Commission insisted that OPG, given that the end of 2009 is close, elaborate on the measures it was considering to implement. OPG responded that two specific options were considered: the first one was the installation of a net and, the second one, the usage of sonar to minimize the entrainment and impingement of fish.
32. The Commission requested an estimation of the reduction of the number of fish killed if one or the other mitigation measure was implemented. CNSC staff reported that, it has estimated, in collaboration with DFO and based on data from the United States Environmental Protection Agency and electricity producing associations in the Great Lakes, the number of fish killed would be reduced by about 80 percent.

33. The Commission noted that the fish impingement and entrainment issue had been present for a while and that OPG had not taken action to solve the problem. OPG responded that the reduction in the number of fish killed that CNSC staff proposed was a target and that the implementation of measures to achieve this reduction was requesting considerable work. OPG noted that seasonal variations in fish populations were complicating the implantation of mitigation measures. OPG reiterated that it was committed to install some mitigation measures in 2009, during the present operation of PNGSB. CNSC staff added that, for the purposes of the current environmental assessment, taking into account the refurbishment project proceeds, additional mitigation measures would be put in place. CNSC staff reported that OPG had also proposed an Adaptive Management Program, described as the fish effects action plan. This program would ensure that the most appropriate mitigation measures are implemented, their effectiveness evaluated, and that further modifications are made if necessary to reduce any impact of the project on fish. OPG added that this was an item of ongoing discussion with CNSC staff and that OPG was committed to take significant measures to deal with the problem.
34. In response to Lake Ontario Waterkeeper's intervention and concern on the release of warm water from the plant in Lake Ontario, the Commission asked CNSC staff if there were existing mitigation measures to reduce this release effect. CNSC staff responded that thermal impacts from the return of the cooling water to the lake had been studied in the late 1990s when another EA was conducted for the return to service of Pickering A. CNSC staff added that the Pickering A follow-up program had shown some deficiencies and that it has not been possible to draw conclusions on the impacts of the thermal discharges to the lake. Since then, OPG has been requested by CNSC staff and has committed to initiate some work in 2009-2010 to find out if these impacts were significant and if mitigation measures to reduce the thermal discharges from the plant could be implemented.
35. The Commission asked OPG if it had considered using cooling towers as a mitigation measure to reduce the thermal plume generated in Lake Ontario from PNGSB's operation. The Commission noted that, in the United States, the use of this type of towers to avoid the presence of thermal plume seemed to now be more common.
36. OPG answered that it did look at the potential use of cooling towers to reduce the amount of heat discharged in Lake Ontario but that there was insufficient room on the existing site to construct these towers. Therefore this alternative could not be considered as a potential mitigation measure. OPG added that other alternatives were considered, for example, having at PNGSB, like at the Darlington NGS, both a submerged intake and a submerged discharge. In relation to the construction of cooling towers, OPG also reported that, during a public consultation meeting for a separate EA on the new nuclear plant construction project, members of the public expressed concern about the construction of cooling towers in the vicinity of old or new nuclear plants.

37. The Commission also asked OPG to elaborate on the fish sampling in the regional study area in response to the Lake Ontario Waterkeeper's intervention and concern regarding potential contamination of fish with tritium. OPG responded that the fish sampling was extensively described in the EA Screening Report and that the numbers were extracted from the Radiological Environmental Monitoring Program (REMP) reports done annually for specific locations. OPG added that, during the study, additional sampling associated with the valued ecosystem components was conducted. CNSC staff added that the assessment for tritium contamination done by OPG confirmed the previous assessments done in the context of an ecological risk assessment a few years ago. All the assessments had indicated that tritium releases from the Pickering B station as well as the release of other radionuclides did not have any impact on fish populations or on bird populations that might eat fish.

Aquatic Habitat

38. The Commission asked for clarifications on the effect the heated water rejected from the plant has on the growth of algae in the lake. OPG reported that it had contracted the University of Waterloo to carry out a three-year study on the development of algae in Lake Ontario close to the plant water discharge. The study is now at mid-term and preliminary results are showing that the main issue is that algae do not have an even pattern of growth; they mostly grow in the spring and at fall at optimum temperatures. These results are suggesting that OPG's thermal plume might have a role only in the spring and fall when the heat island is slightly expanded. OPG also reported observations from former studies, documented in section 8 of the EA Screening report, telling that the algae effects were much more widespread and in a larger area than the thermal plume area. This led to the conclusion that the thermal plume might not be substantively responsible for the growth of algae in this part of Lake Ontario. OPG added that it was expecting details from the current study next year that should clarify the exact contribution of the thermal plume on the amount of algae in the lake and its spatial extent.
39. The Commission asked if the reduced amount of heated water discharged into the lake during the refurbishment would have an effect on the local flora and fauna. OPG responded that, considering that only one unit would be out of service at a time, the effect would be minimal and the plume will ebb and flow with currents and ambient winds. OPG added that studies conducted on several species of fish, like small mouth bass, reported that the fish can adapt to follow the heat and manage their position to use the warm water. OPG added that this implies that the refurbishment of one unit at a time would not have major impact on fish environment in term of water temperature. CNSC staff added that even if some fish mortality was observed, it was not at a level that would affect local populations.

Human Health

40. The Commission asked OPG about the predicted dose of radiation to the workers during the refurbishment project. OPG answered that, as reported in section 8 and 11 of the EA Screening Report, the collective dose to workers for the site during the entire period of refurbishment would be higher than during normal operations, and has been estimated at 40 Sv for the refurbishment of one reactor over three years. OPG noted that, if the refurbishment project was

approved, it would do a detailed assessment of the barriers and activities that could be put in place to reduce this dose as much as possible. These activities would include decontamination and shielding and would be part of the process to be implemented for planning the work in the plant. OPG also added that all of the doses that individuals would receive would remain within the regulatory limit of 1 mSv/year and that it would, when planning its activities, rely on the operating experience from other refurbishment projects to implement any additional measures identified to reduce the dose.

41. The Commission asked CNSC staff how nuclear workers were monitored for radiation exposure. CNSC staff responded that *Radiation Protection Regulations* require that doses to workers be measured and reported to the National Dosimetry Database at Health Canada. CNSC staff added that, for dosage of radio nuclides, the most common test was the urine analysis which gives the measure for uranium and the loading for the total body is estimated from that measure. It is also possible for exposure to uranium ore dust to do a whole body count and measure the activity coming off the lungs.
42. The Commission asked the Power Workers Union (PWU) representative how the safety issues at PNGSB were resolved. The PWU representative responded that there was a Joint Health and Safety Committee that met every two weeks. He added that there was also a Joint Radiation Protection Committee that met every three months and finally that the Policy Committee, including a Joint Working Committee consisting of members of the PWU and representatives from the Society and Corporate Health and Safety Committee, met with the senior management on a quarterly basis. He reported that each nuclear station committee was responsible for solving health and safety issues and that, in case of difficulties, it would report to the higher level committees that had the responsibility to review the safety performance and the incidents. He concluded that there was a constant dialogue in respect of health as part of the safety culture to keep health and safety issues a priority.
43. The Commission inquired on the estimated radiation dose to sport fishers when practicing their hobby in the vicinity of PNGSB. OPG reported that, based on monitoring of the presence of fishermen around the facility, it has been estimated that sport fishers were spending 1% of their time fishing. CNSC staff concurred with OPG's estimation and added that 1% of a person's time fishing very close to the site appeared conservative based on the land use information and other information used by OPG to develop the Radiological Environmental Monitoring Program. CNSC staff reported that it was a non-significant addition to the 1 mSv annual dose of radiation limit for a member of the public. CNSC staff added that this estimation also includes the assumption that 100 percent of the fish captured close to the plant were eaten by the sport fisher.
44. The Commission asked OPG if it was its intention to use Slightly Enriched Uranium (SEU) during Pickering B operation in the future. The Commission added that this question had been raised several times in the public interventions. OPG responded that the low-void reactivity fuel was not included in the scope of the EA for the Pickering B proposed project. OPG added that if it ever explores the use of a low-void reactivity fuel in the future, it would make the necessary submission to the Commission. OPG insisted that, currently, the use of SEU was not planned and that the safety margin at Pickering B was more than sufficient.

45. The Commission asked CNSC staff to discuss studies reported by an intervenor on the presence of Uranium-234 in the urine of some individuals living in the proximity of Port Hope, Ontario. CNSC staff responded that the Uranium Medical Research Center has indicated that the levels of uranium measured in the urine of individuals in this particular study were very low and similar to the levels measured elsewhere in Canada and in the rest of the world in individuals not living in the vicinity of a nuclear power facility. CNSC staff added that Health Canada and other organizations who measure these radioisotopes came to the same conclusion and observed that the level of radioisotopes measured was too close to the limit of detection to be reliable. CNSC staff also stated that, from a health risk perspective, the potential kidney toxicity is also assessed to evaluate the potential health effects of uranium and that, in this case, the levels reported would have no effects on the kidneys.
46. CNSC staff added that another study conducted by the Durham Medical Officer of Health in the Pickering area also measured the presence of radionuclide in the population due to the operation of NPGSB and that it came to the same conclusion. OPG offered to make this study available on-line on their Web site for the benefit of the public⁷.
47. The Commission asked OPG to elaborate on a survey reporting that only 8% of the population was preoccupied by its well-being even in the presence of the nuclear power plant. OPG reported that this public research included people from the local study area within the 10 km zone and also people from the regional zone as far as Scarborough, Markham and the Northern Durham region and as far east as the Darlington plant. The sample size of the survey was around a thousand and statistically significant. OPG added that this survey had been conducted repeatedly to assure that changes in people's attitude over time would be captured. The survey showed that the people were less preoccupied by Pickering B being close to their home than in the 1990's. OPG added that this was a much bigger concern amongst the population in the past and that the work done by OPG to better inform the population living in the vicinity of the plant had reduced that concern over time.

Socio-economic Conditions

48. The Commission sought information on the availability of trained staff to work on the proposed refurbishment project. The PWU representative responded that the number of trained workers was sufficient. He added that there were workers currently in apprentice programs and training programs and that more personnel would be hired and trained in the future to accomplish the work. He mentioned that there would be enough time before the project starts to hire more workers and transfer the required skills. He admitted that staffing was an issue but that he was confident the facility would be refurbished and operated in a safe manner. OPG added that a new division, the Nuclear Refurbishment Unit, had been created for the planning and the execution of the refurbishment work.

⁷ The report is available since December 17, 2008, on the Durham Region Web site at www.region.Durham.on.ca or can be accessed via OPG Website at OPG.com.

Groundwater

49. The Commission further asked CNSC staff to elaborate on the current amount of tritium present in groundwater and on how refurbishment would affect this amount. The Commission insisted on the fact that the presence of tritium in groundwater was a major concern for the public and that the regulatory limits used to benchmark the amount of tritium measured near the PNGSB site needed to be well understood by the population so it could evaluate the risk related to tritium by comparing these limits to existing standards. CNSC staff responded that the tritium level in the drinking water at supply plants around the Pickering site had been measured below 20 Bq/L for the past few years. CNSC staff added that it was not expecting any increase of tritium in drinking water at supply plants around the Pickering site due to the refurbishment, taking into account PNGSB would operate within the same environmental performance. CNSC staff reported that the value of tritium in the drinking water at supply plants was currently below 10 Bq/L, well below the standard limit of 7,000 Bq/L stated in Guidelines for Canadian Drinking Water Quality⁸ and below any other standard or guidelines adopted anywhere in the world.
50. The Commission asked OPG what was the tritium limit it was committed to respect considering that, at this time, the drinking water standard in Canada, including Ontario, was still 7,000 Bq/L. OPG reported that its Radiological Environmental Monitoring Program calculated, for 2007, a dose to the public as low as 3 µSv, well below the legal limit of 1 mSv. OPG added that the levels of tritium in drinking water at the water supply plants had been around 5 Bq/L for a number of years. OPG concluded that it was voluntarily committed to respecting a limit of 100 Bq/L at the water supply plants on an annual average basis and that this limit had always been met over the past years.
51. The Commission further asked if OPG could provide tritium measurements from the past years as a comparison. OPG answered that, in 1994, the level of tritium in drinking water at the Ajax water supply plant was approximately 15 Bq/L, slightly higher than at the present day. OPG added that the decline was due to the implementation of programs to reduce tritium emissions, like the replacement of heat exchangers and the improvement of the monitoring. CNSC staff further added that tritium in water and in the environment had slightly increased until 2003 and since had remained at the same level. (available in OPG's technical support documents).
52. The Commission raised an important issue on the presence of tritium in groundwater identified in the Turbine Auxiliary Bay (TAB) inactive building effluent sumps, the TAB foundation drains and near the irradiator fuel bay B (IFB/B) unit. The Commission expressed concern that the accumulated tritium was being drained directly in the uncontaminated water intake channel and further into the lake.

⁸ Prepared by the Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment, Health Canada, May 2008.

53. OPG confirmed that, as indicated in the study, there were small amounts of tritium identified around the irradiator fuel bay due to the elevation forcing the water to drain from the enacted drainage sump pumps into the lowest level of the turbine hull. OPG added that the tritium present in the water was migrating to that particular pump which was then pumping the water in the lake.
54. The Commission asked why this contaminated water was not captured and treated separately to avoid discharge of tritium into the lake. CNSC staff responded that it was aware of the presence of tritium in groundwater on the Pickering site since the middle to late 1990's and that this was the result of either bad practices or malfunctions and leaks. CNSC staff added that, since then, OPG had taken action to correct the situation. The Commission noted that, in the spirit of the As Low As Reasonably Acceptable (ALARA) Principle, the material from those sump pumps should be captured and treated so that the tritium would not go into the lake. The Commission also insisted that this action be included in the follow-up program if the EA Screening Report was approved.

Atmospheric Environment

55. Greenpeace Canada, in its intervention, asked OPG to give more detail on the schedule of the PNGSB refurbishment due to the potential impacts on labour force, the thermal plume and greenhouse gas emissions. OPG responded that assumptions made for the duration of the refurbishment were outlined in the EA Screening Report. OPG added that, at this time, it was not in a position to provide precise dates on outages and confirmed that the decision whether or not to refurbish Pickering B had not been taken. The decision was expected to be made in 2009 or later. OPG added that all the details concerning the refurbishment, including the timing, depended on the overall condition of the plant. OPG confirmed that the physical condition of the facility would be assessed, as it is regularly done, before the decision to refurbish would be made.

Conclusion

56. The Commission recognizes the importance of properly implementing mitigation measures to ensure that the effects of the project on the environment are not significant. In this regard, the Commission expects CNSC staff to ensure that appropriate monitoring activities are implemented to verify whether these mitigation measures remain effective.
57. Based on its review of the Screening Report and the above-noted information provided on the record, the Commission concludes that the proposed project, taking into account the mitigation measures, described in section 8 of the EA Screening Report, is not likely to cause significant adverse effects to the environment.

Effects of the Environment on the Project

58. Non-routine environmental events can produce extreme conditions affecting the performance of project activities. For the PNGSB site, CNSC staff reported that such events were identified as flooding and fluctuation in water levels, lake ice, severe weather conditions (tornados, thunderstorms, ice storms, and heavy precipitation), and seismic activity. The probability of occurrence of any such events is low. As discussed in section 8.3 of the proposed EA Screening Report, existing design and operational measures, including robust structures and equipment redundancy reduce the potential that the environment will have effects on the project that will, in turn, adversely effect the environment.
59. CNSC staff also reported that the presence of exotic mussels, attached algae and pelagic fish could have some effects on the project. These effects could be reduced by the implementation of mitigation measures including the application of sodium hypochlorite to reduce exotic mussels and the usage of a seasonal algae mesh barrier to reduce the amount of algae at the PNGSB site. More mitigation features at the PNGSB site will continue to be developed to ensure that mussels, algae and pelagic fish do not become numerous enough to represent a threat to the operation of the facility.
60. The Commission asked OPG if the structure of the facility would be affected by the work that would need to be performed, for example drilling holes through the roof, during the refurbishment. The Commission wanted to be reassured on the robustness of the facility in the event of an earthquake. OPG answered that the manner the work would be performed would ensure the structure of the facility be back into its original condition and remain resistant to such incidents.
61. The Commission further asked if recent data on seismicity resistance at PNGSB were available. CNSC staff referred the Commission to section 8.3.4 of the EA Screening Report that gives a reference to a 2006 OPG document on seismicity assessment. OPG commented that this reference was very accurate and that a number of criteria to evaluate seismic resistance had been taken into account to prepare it. OPG pointed out that the components requiring maintenance to keep their resistance are always monitored and repaired or replaced if necessary.
62. Considering that design and operational measures and contingency plans are put in place to prevent or reduce potential environmental effects on the proposed project, CNSC staff submitted that the environment is not likely to cause significant adverse effects on the project.

Conclusion

63. Based on the above information, the Commission concludes that the environment is not likely to cause adverse effects on the project.

Effects of Climate Change on the Project

64. The potential effect of climate change on the project was also considered by CNSC staff. The climate change parameters that may have an interaction with PNGSB physical structures and systems include precipitation, extreme weather events, and Lake Ontario water temperature and water level. OPG prepared its assessment of climate change effects on the proposed project following the procedures outlined in the Canadian Environmental Assessment Agency's procedural guide "*Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners*"⁹. CNSC staff concluded that, in spite of possible changes to the climate in the future, none of the climate change parameters would have an effect on the physical structures or systems that would result in a risk to either the public or the environment.

Effects of Accidents and Malfunction Events on the Project

65. CNSC staff summarized the identification, description, potential effects and prevention and contingency measures to eliminate or minimize the effects of accidents and malfunctions. CNSC staff noted that the criteria used to judge the events include the probability of occurrence, potential for effects on worker health and safety, potential for releases to the environment and potential for effects on public health and the environment.
66. The potential accidents of malfunctions identified by CNSC staff at PNGSB are the following:
- the release of transformer oil and its potential adverse residual effect on fish species in Lake Ontario and on members of the public. The probability of occurrence of this malfunction or accident was determined to be low and the residual effect minor and not significant;
 - the release of heavy water as a result of a break in the heavy water moderator transfer system that could result in a release of tritium into Lake Ontario. The effect was determined to have a moderate magnitude, as the drinking water criteria for tritium may be exceeded in an area including the regional water supply plants. The duration of the effect was determined to be low, limited to within a few hours of the release. Although water quality criteria may be temporarily exceeded, no effect on human health is expected. This residual effect, therefore, was determined to be minor and not significant.
 - the occurrence of a nuclear accident that would result in radioactive releases to the environment during the remaining design life of PNGSB following refurbishment. In the event of a nuclear accident, Emergency Response Plans developed by the Province, designated municipalities (Region of Durham and City of Toronto) and OPG would all be activated.

⁹ Prepared by Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, November 2003.

67. As requested by the Commission in the *Record of Proceedings, Including Reasons for Decision* on the “*Environmental Assessment Guidelines (Scope of Project and Assessment) for the Proposed Refurbishment and Continued Operation of Pickering B Reactors at the Pickering B Nuclear Generating Station*” OPG has recently prepared an updated Evacuation Time Estimates (ETEs) study and noted that, in the event of an EPRC5-type¹⁰ event where more than 24 hours is expected between the start of the accident and the first release of radionuclides, evacuation was a feasible mitigation measure. This study reported that based on the 2006 population, the entire 10 kilometre (km) zone from the site could be evacuated in less than 6.5 hours, which is below the first release time of 24 hours. By 2060, the study estimated that the entire 10 km zone could be evacuated in less than 13 hours, which is also less than the initial release time of 24 hours.
68. The Commission asked OPG to elaborate on the figures provided on the EA Screening Report on the Evacuation Time Estimates (ETEs) in the event of an EPRC5-type event and on the method used to estimate them. OPG reported that the study assumed 100 percent evacuation of the population within the 10 km zone. OPG added that, based on other studies conducted on evacuations of major events like hurricanes, it has been acknowledged that around 30 percent of the people beyond the required evacuation zone would also evacuate. The study conducted for the EA took into account this fact and assumed that 33 percent of the people in the 10 to 15 km zone would also voluntarily evacuate. OPG noted that this important factor is taken into consideration in modern analyses of evacuation issue.
69. The Commission inquired why the population growth between now and year 2025 had a different trend than between year 2025 and year 2060 in the proposed estimates and if the addition of roads had been explored. OPG responded that the year 2025 information was interpolated from the population predictions for the Durham Region up to year 2031. For the estimation for year 2060, a number of scenarios were considered but no firm plan was available. OPG took into account the limit of urbanization and made some projections for Pickering, using the density of an urban growth for residential and industrial development similar to the urbanized areas in East Toronto, and, with a weighting factor, estimated the year 2060 population. OPG then added that, on the road issue, the current transportation master plan was used as a baseline and, using the Region of Durham and the Greater Toronto area 2021 projections of transportation expansion, it extrapolated the road needs for year 2025. The master plan for 2021 includes widening the roads and building new roads.
70. The Commission further asked if the infrastructures in place could support such a population growth. OPG reported that the studies had also looked at the infrastructure improvements needed. OPG added that even if infrastructures and population growth were not being perfectly matched, the growth in the population was often limited by the ability to drive to and from the area.

¹⁰ Event category EPRC5 are identified as a residual adverse effect, as a delayed release of radiation to the environment may occur from an intermediate steam line break. The EPRC 5 event is a slow accident progression that results in late (>24 hours) releases from containment.

71. The Commission asked OPG to elaborate on how and by whom it would be decided to evacuate in case of an emergency. OPG responded that the decision would be made by the Province of Ontario and that the province emergency response organization would be notified within 15 minutes of an accident at OPG stations. OPG added that Ontario has in place a technical support group that interprets and receives data from the stations and re-transmit these data to the OPG emergency response organization in order to evaluate the potential impacts on the public. The Province would then determine the appropriate protective actions to be taken and when they should be implemented. Finally, the regional emergency organizations and other relevant organizations would be notified to implement those protective actions.
72. The Commission asked OPG if an evacuation during difficult road conditions had been considered. OPG responded that, during the evacuation time estimate study, a series of key advisors and stakeholders, including members of the Durham Region and the City of Toronto, as well as Emergency Management Ontario, were consulted. A representative from OPG gave the following example to illustrate a potential evacuation: the number of vehicles to evacuate from the 10 km zone around Pickering is comparable to the volume of vehicles getting out of the City of Toronto everyday at peak hours. The OPG representative added that, even in the worst snow conditions or in the rainiest weather, it was possible to evacuate all the workers from downtown Toronto within four to six hours. He added that this example could illustrate the extent of the evacuation that would have to be performed in case of an emergency at PNGSB which means that it could be done within four to six hours.
73. The Commission wanted to be reassured that OPG's model for evacuation took into consideration the fact that the population to be moved would be very anxious, which could have an impact on the evacuation. OPG responded that the model used had looked at a wide-range of issues, including the psychological impact, and that it had been tested many times in the United States. OPG noted that there was also a second aspect in the model that includes verification through phone surveys to individual families to accumulate data that could influence the evacuation. This was helpful to assist the model and to understand how much of a challenge an evacuation could be. Finally OPG added that six hours was a credible estimate of time, taking into consideration the different scenarios considered. CNSC staff noted that it was in agreement with OPG's model for evacuation time estimation.
74. The Commission asked OPG if the evacuation model in place was including the need to provide shelter for the population. OPG responded that the evacuation model did not assess that item. CNSC staff added that the screening report describes the measures that would be put in place to lodge people as well as to put in place a decontamination process if necessary. CNSC staff reported that this information was part of the emergency management measures in place and that it had been tested.
75. The Commission asked OPG if it had considered the probability of an aircraft crash near the Pickering B nuclear plant. OPG answered that this type of question was not of public domain but added that this scenario and its impact were considered. To a second question from the Commission to find out if there was a no-fly zone over PNGSB, OPG answered negatively. OPG added that the level of risk or frequency of an airplane accident did not require such a consideration.

76. The Commission asked the City of Pickering representative if sirens had been installed. The Commission also required information on the city emergency preparedness plan. The City of Pickering representative responded that four sirens had been installed and that they were now being tested for their efficiency. He also added that the emergency management plan and program had been revised and approved by the City Council two years ago.
77. CNSC staff submitted that, taking into consideration the design of the PNGSB plant, prevention measures, and contingency plans in place to prevent, eliminate or minimize the occurrence or effects arising from accidents and malfunctions, the environmental effects of accidents and malfunctions would not be significant.

Conclusion

78. Based on the above information and considerations, the Commission concludes that accidents and malfunctions are not likely to cause adverse effects to humans or the environment. However the Commission expects that more detail regarding the issues raised on evacuation be provided at the licensing stage.

Effects of the project on sustainability of the resources

79. CNSC staff reported that the proposed project may affect groundwater quality, recharge and flow which were identified as a source of a renewable resource to present or future generations. As a result of maintenance and repair issues during operation of the PNGSB auxiliary systems, tritium in groundwater has been identified beneath the licensed site. CNSC staff added that the tritium concentration was below the limit for tritium in non-potable groundwater. CNSC staff submitted that there would be no effect on the sustainability of groundwater as a result of the project.
80. CNSC staff reported that the material used for the project would derive from non-renewable resources, including fuel, oil, lubricants and chemicals used to operate and maintain the various systems; and uranium dioxide fuel used in operation. The quantities of fuel, lubricants, oil and chemicals used during the proposed project would be relatively small and not substantive in the context of resource availability. CNSC staff concluded that the amount of uranium used for the proposed project is not likely to significantly affect the availability of this resource.

Effects of Decommissioning on the Environment

81. CNSC staff reported that decommissioning activities were not part of the scope of the project established by the Commission in the April 2007 Commission Decision *Record of Proceedings, Including Reasons for Decision*. However, the financial guarantee and preliminary decommissioning plans for PNGSB and the PWF had been developed and would be reviewed in the future and updated as necessary.

Cumulative Effects on the Environment

82. CNSC staff reported that the likely effects of the project were assessed together with other projects and activities in the area (i.e. existing, planned and reasonably foreseeable during the lifetime of the project) to determine the cumulative effects of the project. The cumulative effects assessment is presented in section 10.0 of the proposed EA Screening Report. CNSC staff noted that cumulative effects can only occur for environmental components for which residual effects have been identified. Residual adverse effects from the PNGSB project were identified for the following environmental components: aquatic environment; geology; hydrogeology; radiation and radioactivity; visual setting and transportation; and socio-economic conditions as stated in paragraph 28 of this Record of Proceedings.
83. CNSC staff added that the main sources of cumulative effects for the project resulted from past, ongoing and planned projects and activities at the PNGSB site and the Darlington NGS (DNGS) site. CNSC staff concluded that the overlapping of the residual adverse effects between the proposed project and other projects and activities was not likely to cause significant adverse environmental effects, with the implementation of mitigation measures identified in the proposed EA Screening Report.
84. CNSC staff added that as requested in the April 2007 Commission Decision *Record of Proceedings, Including Reasons for Decision*, OPG has considered the contribution to the cumulative effects of the Pickering Airport Construction and Operation as a source of noise, air emissions and increased traffic during operation.
85. CNSC staff added that there are also several other projects which may result in additional traffic during the Refurbishment Phase of the PNGSB project, including: DNGS retubing; the potential construction of a new nuclear generating station at DNGS; Highway 407 completion; Brock Road Expansion; and Growth in Regional Population and Economic Base. A positive effect of Highway 407 completion would be a reduction in flow of southbound traffic on Brock Road accessing Highway 401 eastbound. A bounding scenario for growth in Regional Population and Economic Base (2.2% per year) has already been considered in the traffic analysis. The projected growth is largely responsible for the predicted decrease in level of service at the local intersections. Future transportation plans and improvements to the transportation network will be based on population growth. For example, completion of Highway 407 is one of the initiatives to be taken. CNSC staff concluded that no further consideration of cumulative traffic during refurbishment activities was necessary.

Conclusions on the Likelihood and Significance of Adverse Environmental Effects

86. Based on the considerations and reasons noted above, the Commission agrees with CNSC staff that the EA did not identify any significant adverse effects likely to be caused by the project under normal operations or under malfunctions and accidents. The possible effects of the project on human health were considered and no adverse effects on the health and well-being of PNGSB workers or the public, including Aboriginal persons, were identified. The overall assessment is that the project is not likely to result in any significant adverse effects on the environment.
87. The Commission is also satisfied that the likelihood and significance of the effects have been identified with reasonable certainty.

Follow-Up Monitoring Program

88. A follow-up program under CEAA is a program to verify the accuracy of the EA of a project and to determine the effectiveness of any measures taken to mitigate the adverse environmental effects of the project.
89. CNSC staff has identified that a follow-up program for the following environmental components would be necessary:
- surface water (drainage and water quality);
 - groundwater quality (tritium);
 - aquatic environment (fish impingement and entrainment and water temperature);
 - socio-economic conditions (traffic impacts);
 - malfunctions and accidents;
 - dose to workers and climate change.

A summary of the follow-up program activities is provided in section 13.0 of the proposed EA Screening Report.

90. The Commission insisted that in the event digging would be required during the refurbishment, an archaeological specialist be on site to identify if there was presence of any archeological artifacts.
91. OPG responded that it was committed to look at any issues raised during construction and to define exactly what needs to be done including any issue related to archeological findings.
92. CNSC staff added that the CNSC licensing and compliance program would be used as the mechanism for reporting of results of the follow-up program activities if the Commission proceeds to consideration of a licence under subsection 24(2) of the NSCA.

Conclusion

93. The Commission is satisfied with the proposed follow-up program and with the manner OPG would report the results to CNSC. As noted in paragraph 54 of this Record of Proceedings, the Commission expects that OPG will continue to monitor and find a solution to prevent the release into Lake Ontario of the tritium identified near the irradiator fuel bay.

Nature and Level of Public Concern

94. CNSC staff reported that in accordance with direction from the Commission in section 9.2.9 of the EA Guidelines, OPG has actively consulted with the public and interested stakeholders on the development of the Environmental Assessment Screening Report (EASR). A list of public information activities undertaken by OPG is provided in Table 12-1 of the proposed Screening Report. CNSC staff has also solicited public comments on the draft EA Guidelines and draft EA Screening Report and the input received from these consultations was considered in the EA process as reported in paragraph 20 and 21 of this Record of Proceedings.
95. CNSC staff added that 109 oral and written submissions to be considered by the Commission at the Public Hearing held on December 10, 2008 in Ajax, Ontario, were received from the public, NGOs, municipal authorities and others to express their support or concerns on the proposed project.
96. Eleven intervenors supported the proposed EA Screening Report and were in favor of PNGSB refurbishment and continued operation. They reported that OPG had always hired highly experienced staff and had always considered the safety of workers, the public and the environment as a priority. They also added that reported doses to workers had always been in agreement with the ALARA principle. Finally, they reported that OPG had been transparent since the start of this refurbishment process by keeping the interested public informed as much as possible.
97. The Town of Ajax, which is in support of OPG's proposed project, reported in its submission the extent of OPG's collaboration and transparency in resolving the issues raised after its review of the EA Screening Report. The four issues raised were in relation to the storage of used fuel, the doses to the workers, the assessment of the need for an alternative route to the facility and finally the effect of the thermal plume on the presence of algae in Lake Ontario near the facility.
98. Several intervenors, including the Lake Ontario Waterkeeper, requested that the EA Screening Report be referred to a panel for review while 94 intervenors requested the complete shutdown of the facility by 2014.
99. In their submission, nine intervenors questioned the cost of the project and requested that an alternative renewable source of energy be considered by Ontario. The rest of the interventions, including 66 that came as petition letters, were also against the proposed project and requested the shutdown of PNGSB by 2014. In their requests, intervenors expressed concerns on the

close proximity of the City of Toronto and on the large number of people that would be affected in the event of a nuclear accident resulting from malfunction or terrorism. Their concerns included the possible exposure of the public to large radiation doses and the efficacy of the evacuation plan. Concerns about the management of waste resulting from refurbishment and continued operation of the PNGSB were also voiced. Finally, most of the opponents to the project had concerns about the potential contamination of the environment and the drinking water in the area of the PNGSB due to the release of tritium in Lake Ontario and to the potential future use of Slightly Enriched Uranium (SEU) by OPG.

100. In response to the Lake Ontario Waterkeeper's intervention requesting more opportunity to be heard on the project, the Commission responded that, at this time, it was only considering, through the EA Screening Report, if the proposed project would have significant environmental impact. The Commission added that, in the case the EA Screening Report was approved, OPG would have to come back before the Commission for the consideration of a licence application at another public hearing. The Commission noted that this would provide further opportunity to the public to express its views.
101. One of the intervenor raised concerns on the insufficiency of Canada nuclear liability regime. CNSC staff responded that the existing *Nuclear Liability Act*¹¹ was, at this time, imposing a limit of \$75 million in case of a nuclear incident, but that an amendment to the current Act was proposing an increase of the limit for liability to \$650 million. CNSC staff noted that the bill still needed to be passed by Parliament before it becomes applicable. CNSC staff reported that an analysis on costs associated with "design-based accidents", conducted in 2005 by CNSC and Natural Resources Canada (NRCan) for Darlington and Gentilly-2 NGSs, taking into account different scenarios and types of radionuclides releases, estimated the clean-up cost of an accident at about \$100 million and in most of the scenarios under \$10 million.
102. The Commission asked CNSC staff if some public concerns related to issues not described in the scope of the project were taken into account in the EA assessment and if these public concerns could influence the reference of the project to a panel for decision.
103. CNSC staff answered that its evaluation and how it was reporting it to the Commission were not necessarily based on the number of public interventions on generic issues. CNSC staff added that different concerns raised by the public can be addressed through various means such as open houses and public consultation events if they had not been addressed during the EA process. Concerns of a generic nature, for example related to energy policy or long term plans for waste management, would likely not, in this case, have been addressed by a review panel or a mediator because they were outside the scope of the provisions of the CEAA. Energy policy issues and alternative means of producing electricity would be more appropriately addressed by provincial energy policy direction than by a federal review panel during specific environmental assessment. This also applies to concerns related to Canada's plans for the long term management of waste for which the Nuclear Waste Management Office is responsible.

¹¹ R.S.C. 1985, c. N.28.

104. The Commission further asked CNSC staff how the public perception of potential adverse effects to the environment related to the proximity of a nuclear power plant was addressed. CNSC staff responded that it considered that the public perception of a threat was very important because people often consider it as an existing risk. CNSC staff added that, in cases where there would be a release into the environment, it would provide the public with all the available information to understand the incident. CNSC staff added that it assesses the probability of such accidents and puts them into context for the public. For example, information on the expected doses and evacuation information are provided regularly to the public by CNSC staff. CNSC staff stated the importance to inform the public as much as possible so the public can perceive and assess the risk based on facts.
105. The Commission required from CNSC staff, for the benefit of many intervenors, some clarifications on the current water quality standards used in Ontario. CNSC staff responded that the Ontario Minister of Environment had requested that the Ontario Drinking Water Advisory Council (ODWAC) review the current standard of 7,000 Bq/L used in Ontario for drinking water. The ODWAC has held many public information sessions and has met with several stakeholders. CNSC staff added that ODWAC was to make its recommendations to the Ontario Minister of the Environment in the next few months and that it had provided the ODWAC with data on tritium to help the ODWAC with preparing its recommendations. CNSC staff noted it did not have the mandate to set guidelines or standards but could only provide the Council with data available from monitoring information around facilities or tritium concentrations measured during accidents and malfunctions. CNSC staff also informed the Province of Ontario that when a standard would be adopted, CNSC staff would clearly document the scientific and policy basis for that standard so the population can know what health effects and socioeconomic factors have been considered in choosing this standard.
106. The Commission asked CNSC staff to elaborate on the human vulnerability to tritium in respect to the age or stage of development of a person reported in studies referenced by one of the intervenors. CNSC staff reported that the current dose limits for health effects were established by international organizations and based on scientific evidence as well as on experiments and epidemiological studies on nuclear workers and people living around nuclear facilities. CNSC staff reported that the natural environmental background is in the range of 2,000 to 3,000 $\mu\text{Sv}/\text{year}$ and that the total dose of radioactivity emitted from Pickering B, including the contribution of tritium, was around 6 $\mu\text{Sv}/\text{year}$. CNSC staff noted that this represents a small fraction of the natural background of radiation every human is exposed to, including children and young women. No health effects have ever been documented from any study at these levels. CNSC staff added that the Biological Effects of Ionizing Radiation Report VII (BEIR VII Report)¹², often referred to, was a compilation confirming the evidence that there were no health effects reported at doses below 100 mSv. CNSC staff concluded that the doses from the operation of Pickering, or of any other nuclear facilities in Canada, were lower than the dose limit of 1 mSv.

¹² National Research Council of the National Academies, The National Academies Press, Washington D.C.

107. To address concerns raised by several intervenors on waste management, the Commission requested that OPG elaborates on the design of the dry-storage container used for used fuel storage and on the fuel cycle after the removal of fuel from the reactor. OPG responded that the dry-storage container was a very robust container consisting of a 13mm-thick steel inner liner and a 13mm-thick steel outer liner with approximately half a metre of high-density reinforced concrete between those two liners. OPG added that the containers, without fuel, weigh approximately 70 tonnes and that they were extremely robust and very similar to those used elsewhere in North America and around the world. OPG noted that they had proven to be adequate for storing spent nuclear fuel for extended periods of time as long as fifty years. To answer the fuel cycle portion of the question, OPG added that the fuel removed from the reactor is stored in water pools at the stations for a minimum of 10 years to allow the fuel to cool to about 0.1 % of the radioactivity levels present at the time of its removal from the reactor. The fuel is then transferred to dry-storage containers for storage until a disposal facility is available.
108. The Commission asked OPG, following the Citizens for Renewable Energy's intervention, to give details on the volume of waste to be transported to the Western Waste Management Facility in the event Pickering B was refurbished. OPG responded it has been estimated that the refurbishment of the four units would generate approximately 4,000 cubic metres of low-level waste which is approximately twice what would be generated during the same period of time during operation. OPG added that the net increase of waste due to refurbishment had been estimated to 2,000 cubic metres which represents about half of a low-level storage building at the Western Waste Management Facility. OPG also added that it was currently licensed to construct eight additional waste buildings.
109. The Commission asked CNSC staff to address the Great Lakes United's submission that states: "Internal CNSC documents obtained by Greenpeace Canada reveal that the magnitude of the positive void coefficient risk at Pickering B is even more serious than previously recognized." CNSC staff responded that, recently, CNSC staff had undertaken a study to reassess the effectiveness of the special safety system for the most limiting accident conditions for the CANDU reactor. CNSC staff noted that these postulated accident conditions were extremely rare, less than one in a million years, and therefore, the associated related risks should not challenge the very high operational safety record of these reactors, but rather be considered as areas where uncertainty knowledge exists. CNSC staff added that the study was near completion and that it has been concluded that the safety margins were being maintained. CNSC staff also added that CANDU reactors are comparing very well with the international fleet. The main reason is that CANDU reactors are equipped, because of the positive void radioactivity, with two fully independent and effective shutdown systems which compensates for the result of reactivity transient induced by a positive void radioactivity. OPG added that, if the severe core damage frequency for one Pickering B unit was compared to requirements being proposed for new reactors, it would be equal to or better than those particular requirements.

110. The Commission required some details in respect to the amount of E. coli present at one of the beaches in the Ajax area. OPG responded that it was currently working with the Town of Ajax to understand if OPG thermal emissions were contributing to the growth of the bacteria. OPG added that, at this time, the hypothesis was that the high population of E. coli on the beach was a result of waste coming through Duffin's Creek to the beach and forward. In conclusion, OPG felt that the waste from Duffin's Creek washed into the lake was mostly responsible for the bacteria and that OPG's contribution was considered to be negligible. CNSC staff agreed with that conclusion.
111. The Commission wanted to be updated on the Province of Ontario emergency preparedness plans for the City of Pickering and the Town of Ajax for the benefit of the several intervenors that have raised concerns about the emergency preparedness plan adequacy. A representative of Emergency Management Ontario responded that the Province of Ontario had established the Provincial Nuclear Emergency Response Plan (PNERP) required under the *Emergency Management and Civil Protection Act*¹³. He explained that the PNERP was a multi-part plan outlining general processes for the response to any sort of nuclear emergency within the Province of Ontario and that as a part of that plan certain municipalities were involved in the emergency response. He added that, with respect to PNGSB, the Municipality of Durham was responsible for the primary functions, but that municipalities such as Ajax and Pickering were also directly involved in the plan.
112. The Commission asked for further details on the emergency preparedness plan and wanted to be reassured if it was meeting the expectations in respect to evacuation and also if it had been tested so that the population of the area knew about it and was comfortable with it. The Ontario representative responded that the plan itself had been tested on an annual basis with municipal partners, the utilities and the community organizations. Those exercises had contributed to reinforce the plan's contents, particularly with respect to communications procedures and the ability to evacuate the residents. He added that the plan was also supplemented by other levels of response plans such as Durham's Emergency Response Plan and the City of Pickering and the Town of Ajax emergency plans. He added that studies had demonstrated that the most effective way to issue evacuation information was through the public alerting systems and through the media so the population could be directed to use all routes available to move away from the facility. After the population had moved out of the emergency zone, it would be redirected to reception centres in the surrounding areas already agreed on with the municipalities, and would have access to monitoring and decontamination if necessary.
113. The Commission insisted on being reassured that the population was well informed of the existence of such an emergency plan. The Ontario representative responded that there was a comprehensive public education program in place in all of the nuclear designated areas in Ontario, in particular around the Pickering facility, and that the program was the result of a cooperation effort between the Province, the municipalities and OPG. He also gave examples of the techniques used to reach the population: insertion of information in the phone book, distribution of circulars to the doors and advertisement in local newspapers. The Commission was satisfied with the information provided and added that at the time of licensing, a detailed emergency plan would be required from OPG.

¹³ R.S.O. 1990, C.E. 9

114. The Commission is satisfied that opportunities given to the public to comment and review the Screening Report were acceptable and provided a suitable basis for the Commission to evaluate the public concerns about the project. The Commission decides that the level of public concern does not warrant that the project be referred to the Minister of the Environment for referral to a review panel or mediator (i.e., pursuant to paragraph 20(1)(c) of the CEEA).

Conclusion

115. The Commission has considered the information and submissions of the proponent, CNSC staff and the intervenors as presented for reference on the record for the public Hearing.
116. The Commission concludes that the EA Screening Report attached to CMD 08-H27 is complete and meets the requirements of the CEEA for the scope of the project and the scope of the assessment established in the EA Guidelines.
117. The Commission concludes that the project, taking into account the appropriate mitigation measures identified in the Screening Report, is not likely to cause significant adverse environmental effects and that public concerns expressed to date about the project do not warrant a reference to the Minister of the Environment for referral to a mediator or review panel.
118. Furthermore, the Commission also concludes that, at this time, it will not refer the project to the federal Minister of the Environment for a referral to a review panel or mediator in accordance with the provisions of the CEEA.
119. Therefore, the Commission, pursuant to paragraph 20(1)(a) of the CEEA, decides it would proceed with the consideration of a licence application under the *Nuclear Safety and Control Act* if OPG decides to proceed with the project.
120. In addition, the Commission insists on the importance of properly implementing mitigation measures to ensure that the effects of the project on the environment are not significant. In this regard, the Commission expects CNSC staff, via the follow-up program, to ensure that appropriate monitoring activities are implemented to verify whether these mitigation measures remain effective.
121. The Commission requests that more detail regarding the issues raised on evacuation be provided at the licensing stage.

122. The Commission requests that OPG, in the spirit of the As Low As Reasonably Achievable (ALARA) Principle, seek mitigation measures to prevent the tritium identified near the irradiator fuel bay from being released into Lake Ontario. The Commission also insists that this action be included in the follow-up program.
123. Finally, the Commission insists that OPG initiate some work in 2009-2010 to find out if thermal discharge impacts from the plant were significant and if mitigation measures to reduce the impacts could be implemented.



JAN 23 2009

Michael Binder
President,
Canadian Nuclear Safety Commission

Date

Appendix A - Intervenors

Intervenors	Document Number
Pickering Nuclear Community Advisory Council, represented by J. Vincett, J. Dike, Y. Mroueh and M. Pongracz	CMD 08-H27.2
Women's Healthy Environments Network (WHEN), represented by D.G. Rosenberg	CMD 08-H27.3
Great Lakes United, represented by Z. Kleinau	CMD 08-H27.4
North American Young Generation in Nuclear (NA-YGN) Durham Chapter, represented by L. Lees, S. Lagan, J. Ramani and S. Gareau	CMD 08-H27.5
Power Workers' Union, represented by D. Shier and J. Rock	CMD 08-H27.6 CMD 08-H27.6A
Canadian Nuclear Workers' Council, represented by J. Usher and P. Falconer	CMD 08-H27.7 CMD 08-H27.7A
Lake Ontario Waterkeeper, represented by M. Mattson	CMD 08-H27.8
The Pembina Institute	CMD 08-H27.9 CMD 08-H27.9A
City of Pickering, represented by T. Melymuk	CMD 08-H27.10
Environmental Outreach Team, represented by L. Luxemburger	CMD 08-H27.11
Town of Ajax, represented by K. Heritage and B. Bennett	CMD 08-H27.12 CMD 08-H27.12A
Citizens For Renewable Energy, represented by Z. Kleinau	CMD 08-H27.13
Canadian Environmental Law Association	CMD 08-H27.14
Patricia Lawson	CMD 08-H27.15
Port Hope Community Health Concerns Committee, represented by P. Lawson	CMD 08-H27.16
Tom Lawson	CMD 08-H27.17 CMD 08-H27.17A
Johannes Cornelis Sturkenboom	CMD 08-H27.18 CMD 08-H27.18A CMD 08-H27.18B
several organizations and individuals, represented by K. Kamps	CMD 08-H27.19
Michel A. Duguay	CMD 08-H27.20
Greenpeace Canada, represented by S.P. Stensil	CMD 08-H27.21 CMD 08-H27.21A
Community Coalition Against Mining Uranium, represented by W. Erlichman	CMD 08-H27.22
Pickering East Shore Community Association	CMD 08-H27.23
Durham Nuclear Health Committee	CMD 08-H27.24
Durham College	CMD 08-H27.25
University of Ontario Institute of Technology	CMD 08-H27.26
John Liss	CMD 08-H27.27

Jason Becevello	CMD 08-H27.28
Anita M. Payne	CMD 08-H27.29
Elena Lau	CMD 08-H27.30
David Hart Dyke	CMD 08-H27.31
Angela Bischoff	CMD 08-H27.32
Mary Ann Hodge	CMD 08-H27.33
Frank de Jong	CMD 08-H27.34
Ted W. Shado	CMD 08-H27.35
Trifon Haitas	CMD 08-H27.36
Louise Macaulay	CMD 08-H27.37
Hayley Amis	CMD 08-H27.38
Sherry Adams	CMD 08-H27.39
Sarah Lambert	CMD 08-H27.40
Bernie Beyer	CMD 08-H27.41
Kayleigh Schwab	CMD 08-H27.42
Marita Linde	CMD 08-H27.43
Pamela J. Nosworthy	CMD 08-H27.44
Joel Lorentz Maynard	CMD 08-H27.45
Elena Tripatzi	CMD 08-H27.46
Allan Titus	CMD 08-H27.47
Patti Chmelyk	CMD 08-H27.48
Attila Nagy	CMD 08-H27.49
Stephanie Meeks	CMD 08-H27.50
Dayle Turner	CMD 08-H27.51
Dave Finlay	CMD 08-H27.52
Shelagh Young	CMD 08-H27.53
Maria J. Fleita	CMD 08-H27.54
Megan Fischbach	CMD 08-H27.55
Marnie Mellish	CMD 08-H27.56
Cathy MacLellan	CMD 08-H27.57
Karen Heisz	CMD 08-H27.58
Erin Parker	CMD 08-H27.59
	CMD 08-H27.60
Ian Whyte	CMD 08-H27.61
Dimitris Kanellopoulos	CMD 08-H27.62
Michelle Meyer	CMD 08-H27.63
Michal Aisha	CMD 08-H27.64
Phyllis Creighton	CMD 08-H27.65
Al de Jong	CMD 08-H27.66
Andre Papadimitriou	CMD 08-H27.67
Jelena Milenkovic	CMD 08-H27.68
Andrea Percy	CMD 08-H27.69
Toronto Environmental Alliance	CMD 08-H27.70
Ajax-Pickering Board of Trade	CMD 08-H27.71
Elaine Jermy	CMD 08-H27.72

Citizens Environment Alliance of Southwestern Ontario	CMD 08-H27.73
Provincial Council of Women of Ontario	CMD 08-H27.74
Vanessa Butterworth	CMD 08-H27.75
Julie Barker	CMD 08-H27.76
Kathryn Langley	CMD 08-H27.77
Sarah Gauntlett	CMD 08-H27.78
Kathryn Wrong	CMD 08-H27.79
Nadine Hawkins	CMD 08-H27.80
Liam O'Doherty	CMD 08-H27.81
National Council of Women of Canada	CMD 08-H27.82
Teri Strain	CMD 08-H27.83
Sierra Club Ontario	CMD 08-H27.84
Sierra Youth Coalition	CMD 08-H27.85
Janine Carter	CMD 08-H27.86
Karen Raddon	CMD 08-H27.87
Sylvie Lemieux	CMD 08-H27.88
Don Ross	CMD 08-H27.89
Heather Ross	CMD 08-H27.90
Claudia Rodriguez Larrain and Michael Kenny	CMD 08-H27.91
Anita L. Leon	CMD 08-H27.92
Gareth P. Jones	CMD 08-H27.93
Beth Guptill	CMD 08-H27.94
Helen Armstrong	CMD 08-H27.95
International Institute of Concern for Public Health	CMD 08-H27.96
David Suzuki Foundation	CMD 08-H27.97
Marion Odell	CMD 08-H27.98
Peter Shepherd	CMD 08-H27.99
Jeff Brackett	CMD 08-H27.100
Ontario Voice of Women for Peace	CMD 08-H27.101
Rosemary Keenan	CMD 08-H27.102
Virginia Green	CMD 08-H27.103
Environment Haliburton	CMD 08-H27.104
Safe and Green Energy Peterborough	CMD 08-H27.105
Sarah Bailey	CMD 08-H27.106
Louis Bertrand	CMD 08-H27.107
Ellen Michelson	CMD 08-H27.108
Stephen Leahy	CMD 08-H27.109