



Canadian Nuclear
Safety Commission

Commission canadienne
de sûreté nucléaire

Record of Proceedings, Including Reasons for Decision

In the Matter of

Applicant **Ontario Power Generation Inc.**

Subject **Application to Renew the Power Reactor
Operating Licence for the Pickering Nuclear
Generating Station**

**Public Hearing
Dates** **February 20 and May 29 to 31, 2013**

RECORD OF PROCEEDINGS

Applicant: Ontario Power Generation Inc.

Address/Location: 700 University Avenue, Toronto, Ontario, M5G 1X6

Purpose: Application to renew the Power Reactor Operating Licence for the Pickering Nuclear Generating Station

Application received: July 4 and August 31, 2012

Dates of public hearing: February 20, 2013 and May 29 to 31, 2013

Location: Canadian Nuclear Safety Commission (CNSC) Public Hearing Room, 280 Slater St., 14th. Floor, Ottawa, Ontario

Members present: M. Binder, Chair R. Velshi
 R. J. Barriault M. J. McDill
 A. Harvey D.D. Tolgyesi

Secretary: M.A. Leblanc
 Recording Secretary: M. Young
 Senior General Counsel: J. Lavoie

Applicant Represented By	Document Number
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Intervenors		Document Number
See Appendix A		
Others		
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Licence: Renewed

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1.0 INTRODUCTION

1. Ontario Power Generation Inc. (OPG) has applied to the Canadian Nuclear Safety Commission¹ for the renewal of the Power Reactor Operating Licence (PROL) for its Pickering Nuclear Generating Station (NGS), located in Pickering, Ontario. The Pickering NGS is comprised of two reactor facilities, Pickering A (units 1 to 4) and Pickering B (units 5 to 8), operating under separate PROLs. The current Pickering A PROL was issued on July 1, 2010 and the Pickering B PROL was issued on July 1, 2008. Both expire on August 30, 2013². OPG has applied for a one-site licence, covering both Pickering A and Pickering B, for a period of five years.
2. The Pickering NGS is located on the north shore of Lake Ontario, in the regional municipality of Durham. The facility lies 32 kilometres (km) northeast of downtown Toronto and 21 km southwest of Oshawa. The nuclear facility consists of eight CANDU pressurized heavy water reactors and their associated equipment, which were designed, constructed and operated to produce electrical power. Construction of the facility started in 1966 and the first criticality of a reactor unit was in 1971. The in-service dates for units 1 to 4 ranged from 1971 to 1973, and between the years 1983 to 1986 for units 5 to 8. The pressure tubes in Pickering Units 1 to 4 were replaced in the mid to late 1980s and, after operating at full power, the units were shut down and placed in a lay-up state in 1997. Unit 4 was restarted in 2003 and Unit 1 was restarted in 2005. Units 2 and 3 are currently in a laid-up state and are not operating. These units were defuelled in 2008 and will be in a safe storage state until the eventual decommissioning of the Pickering NGS.
3. OPG has announced its intent to cease commercial operations at the Pickering NGS by the end of 2020, which is beyond the assumed design life of the pressure tubes in the NGS of 210,000 Effective Full Power Hours (EFPH) of operation. As such, OPG is required to provide a technical basis to demonstrate that the Pickering NGS can be operated safely until this time.
4. The proposed one-site PROL from CNSC staff follows the standardized format of licences proposed for nuclear power plants since 2008. The PROL references new or updated regulatory documents and Canadian standards, and is accompanied by a licence conditions handbook (LCH), which documents the compliance verification criteria to be used by both OPG and CNSC staff. The licence also includes site-specific licence conditions pertaining to Cobalt-60, end-of-life, and a regulatory hold point for the end of assumed design life, 210,000 EFPH of operation. It specifically requires that OPG implement and maintain a continued operations plan (COP) and a sustainable operations plan (SOP), as well as to notify the Commission in writing by June 30, 2017 of the end date of commercial operations of all Pickering NGS units.

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 On June 24, 2013, the Commission extended, through amendment, the licences for Pickering A and Pickering B until August 31, 2013.

Issue

5. In considering the application, the Commission was required to decide, pursuant to subsection 24(4) of the *Nuclear Safety and Control Act*³ (NSCA):
 - a) if OPG is qualified to carry on the activity that the licence would authorize; and
 - b) if, in carrying on that activity, OPG would make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

Public Hearing

6. The Commission, in making its decision, considered information presented for a public hearing held on February 20, 2013 in Ottawa, Ontario and from May 29 to 31, 2013 in Pickering, Ontario. The public hearing was conducted in accordance with the *Canadian Nuclear Safety Commission Rules of Procedure*⁴. During the public hearing, the Commission considered written submissions and heard oral presentations from CNSC staff (CMD 13-H2, CMD 13-H2.A, CMD 13-H2.B) and OPG (CMD 13-H2.1, CMD 13 H2.1A to CMD 13-H2.1E). The Commission also considered oral and written submissions from 136 intervenors (see Appendix A for a detailed list of interventions).

Requests for Ruling

7. The Commission received several requests for rulings, pursuant to section 20(3) of the *Canadian Nuclear Safety Commission Rules of Procedure*. In the interest of fairness and expeditiousness, some of the requests were received by the Commission Secretary in writing and read into the record at the hearing. Whereas requests for rulings normally refer to procedural considerations, and that it could be disputed whether some of the requests fall within such an interpretation, the Commission has nonetheless considered these requests.
8. Greenpeace requested that the Commission should “require CNSC staff to publish a site level risk assessment for both the Pickering A and B reactors by the end of 2013 if it renews the licence for Pickering NGS.” Greenpeace expressed the view that “a transparent total estimate of the large release frequency for the six operating Pickering reactors would provide objective information on the risk posed by the station to surrounding populations and the environment.”

³ Statutes of Canada (S.C.) 1997, chapter (c.) 9.

⁴ Statutory Orders and Regulations (SOR)/2000-211.

9. The Canadian Environmental Law Association (CELA), along with Greenpeace, Durham Nuclear Awareness, Northwatch and CCNB Action, requested that “OPG not be granted permission to operate beyond its design life without an additional public hearing once all of the missing data from the safety case can be made public.”
10. Regarding these requests, a representative from OPG stated that OPG had completed the Pickering B Probabilistic Risk Assessment (PRA) in accordance with the methodology accepted by the CNSC and CNSC Regulatory Standard S-294⁵, and that the Pickering A updated PRA, using accepted methodology, was underway and scheduled to be completed within the timeframe established in OPG’s licence. The OPG representative expressed the view that OPG’s licence conditions were sufficient to address these requests and that no additional conditions were required.
11. CNSC staff confirmed that the existing safety case presented to the Commission was complete, valid and robust.
12. CCNB Action submitted three requests and provided written reasons for these requests following the hearing. OPG was provided an opportunity to respond to these requests. CCNB Action’s first request was that the Pickering NGS “not be able to operate beyond its design life without the installation of a passive emergency filtered vent in addition to its current venting capabilities.” CCNB Action later clarified its request that “an emergency filtered vent be added to each unit and not just one big one on the vacuum building.”
13. OPG’s response to this request was that the Pickering NGS has a Filtered Air Discharge System (FADS) that is dedicated to post-accident venting of containment. OPG stated that the purpose of this seismically-qualified system is to maintain containment pressure sub-atmospheric following a range of design basis accidents such as a Loss of Coolant Accident (LOCA) to more serious accidents that include a LOCA with failure of Emergency Coolant Injection. OPG further stated that it was assessing future enhancements to protect containment through its Fukushima Action Items. OPG stated that it was on track for completion of the applicable Fukushima Action Items before the early committed date of December 2014, which is within the CNSC due date of December 2015.
14. CCNB Action’s second request was that “between the time that the draft Licence Conditions Handbook has been presented to the Commission in the staff CMDs and when the licence is granted, that no changes to the draft Licence Conditions Handbook be made unless it is noted in the Commission’s Reasons for Decision.” OPG did not comment on this request. It will be addressed in the “Licence Length and Conditions” section of this *Record of Proceedings*.

⁵ CNSC Regulatory Standard S-294, *Probabilistic Safety Assessment (PSA) for Nuclear Power Plants*, April 2005.

15. CCNB Action's third request was a ruling that "the wind-large release frequency be considered the same as the wind-core damage frequency, unless OPG can prove otherwise. Further request a ruling that the same or a revised wind-large release frequency be added to the large release frequency, so that the Commission can see if OPG's regulatory large release frequency limit is met."
16. With respect to the Large Release Frequency (LRF) being considered to be the same as the wind Severe Core Damage Frequency (SCDF), OPG stated that it agreed with this statement for the Pickering B PRA. Regarding the question of adding the risks, OPG stated that the current state of the art of PRA methodology, particularly for external events such as fires and floods, does not support the simple addition of SCDF and LRF from the different hazards. OPG explained that each hazard was addressed with different methodologies with diverse assumptions, conservatisms, and computer codes, and different degrees of uncertainty. OPG noted that there is not yet an accepted methodology for calculating risk aggregation. OPG acknowledged that, ultimately, a total risk number ought to be derived and stated that it would be participating in the development of this area and would apply the methodology once it has been developed.
17. Regarding CCNB Action's opinion that, according to international guidance from the American Society of Mechanical Engineers (ASME) and others, the wind LRF should not have been screened out from further analysis, OPG stated that its screening approach was consistent with ASME, was accepted by CNSC, and is consistent with international best practice. OPG noted that it had performed a high wind PRA.
18. Determinations by the Commission regarding these requests will be set out in the appropriate sections of this *Record of Proceedings*.

Mandate of the Commission

19. The Commission states that it has the independence necessary to fulfill its mandate and that the process in place to obtain the information necessary for making informed decisions is open and transparent. The Commission, as a quasi-judicial administrative tribunal, considers itself independent of all political, governmental or private sector influence in its decision-making.
20. Several intervenors raised questions on the future of nuclear energy in Ontario. In particular, they asked why more consideration has not been given to alternative forms of energy, such as solar or wind power. The Commission notes that, as the regulatory authority over nuclear matters in Canada, its mandate is not to evaluate alternative energy sources or to make energy policy decisions, but to ensure, in accordance with the NSCA, the regulation of the development, production and use of nuclear energy to prevent unreasonable risk to the environment and to the health and safety of persons. The choice of a source of energy or the consideration of economic benefits of a project is not within the Commission's authority. These decisions fall under the purview of other governmental authorities.

2.0 DECISION

21. Based on its consideration of the matter, as described in more detail in the following sections of this *Record of Proceedings*, the Commission concludes that OPG is qualified to carry on the activity that the licence will authorize. The Commission is of the opinion that OPG, in carrying on that activity, will make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed. Therefore,

the Commission, pursuant to section 24 of the *Nuclear Safety and Control Act*, issues a one-site Power Reactor Operating Licence to Ontario Power Generation Inc. for the operation of the Pickering Nuclear Generating Station, located in Pickering, Ontario. The licence, PROL 48.00/2018, will be valid from September 1, 2013 to August 31, 2018.

22. The Commission includes in the licence the conditions as recommended by CNSC staff and set out in the draft licence attached to CMD 13-H2.A. The Commission instructs CNSC staff to modify the relevant sections of the LCH to include the direction detailed below.
23. The Commission does not accept CNSC staff's proposed delegation of authority to remove the regulatory hold point to allow OPG to proceed beyond 210,000 EFPH. The Commission will consider this matter in a future proceeding of the Commission with public participation. The Commission will allow written comments only. The Commission accepts all other CNSC staff recommendations regarding the delegation of authority, and notes that CNSC staff can bring any matter to the Commission as applicable.
24. The Commission directs OPG to provide the following, before the removal of the hold point can be approved:
- the revised PSA for Pickering A that meets the requirements of CNSC Regulatory Standard S-294;
 - an updated PSA for both Pickering A and Pickering B that takes into account the enhancements required under the Fukushima Action Plan; and
 - a whole-site PSA or a methodology for a whole-site PSA, specific to the Pickering NGS site.
25. The Commission understands that if the PSA values are between the limits and the targets, then safety improvements should be put in place if practicable, and that if the PSA values are above acceptable limits then safety improvements would be mandatory. As such, the Commission requests that OPG provide an action plan to address any identified issues should OPG exceed its targeted safety goals.

26. The Commission notes that OPG will be considering filtered containment as part of its analysis of future enhancements to protect containment through its Fukushima Action Items. The Commission directs OPG to report on its analysis and way forward on this issue at the time of its request to remove the hold point to proceed beyond 210,000 EFPH.
27. The Commission also directs CNSC staff to review the Pickering PSA methodology, and provide its recommendation for the Commission's consideration at the time of OPG's request for the release of the hold point.
28. The Commission directs OPG to ensure the production of an emergency management public information document, to be distributed to all households in the Pickering area, summarizing the integrated emergency response plan of all involved organizations, including all key roles and responsibilities. This document should also include information on potassium iodide (KI) tablet distribution and information included in CSA Standard N1600. This document is expected to be produced by the end of June 2014.
29. The Commission directs OPG to clarify its long-term plan for waste management, by June 30, 2017, at the time of OPG's notification to the Commission of the end date of commercial operations of all Pickering NGS units.
30. The Commission recommends that OPG make environmental monitoring data accessible to the public on a more frequent basis than its current annual report.
31. With this decision, the Commission directs CNSC staff to provide an annual report on the performance of the Pickering NGS, as part of the annual *Integrated Safety Assessment of Canadian Nuclear Power Plants*. CNSC staff shall present these reports at public proceedings of the Commission. The public will have an opportunity to participate, in writing, in these proceedings.

3.0 ISSUES AND COMMISSION FINDINGS

32. In making its licensing decision, the Commission considered a number of issues relating to OPG's qualification to carry out the proposed activities and the adequacy of the proposed measures for protecting the environment, the health and safety of persons, national security and international obligations to which Canada has agreed.

3.1 Management System

33. The Commission examined OPG's Management System, which covers the framework that establishes the processes and programs required to ensure the organization achieves its safety objectives, continuously monitors its performance against these objectives, and fosters a healthy safety culture.

34. OPG provided information concerning its Management System. OPG stated that its Management System fulfills the requirements of Canadian Standards Association (CSA) standards N285.0⁶ and N286-05⁷, as well as the International Organization for Standardization (ISO) 14000 series of standards, among others.

3.1.1 Quality Management

35. OPG's quality program consists of quality assurance program reviews, internal audits, and management self-assessment. CNSC staff stated that it is satisfied that OPG has an adequate self-assessment program and conducts regular self-assessments of OPG staff performance and activities.
36. Some intervenors, including Black & McDonald Ltd., commented on quality assurance related to components obtained from third-party suppliers, noting that OPG holds them to high standards. The Commission asked for more information in this regard. A representative from OPG responded that OPG uses an approved supplier list and noted that OPG has a quality control program that audits suppliers and tracks materials to ensure that all components meet the required technical specifications and standards. CNSC staff noted that there are procurement audit committees for CANDUs, and that CNSC staff is satisfied with the audits performed by these committees. CNSC staff further noted that the quality assurance program must comply with CSA Standard N286 05.

3.1.2 Organisation and Change Management

37. Change management ensures that organizational changes are evaluated, managed and communicated, both internally and externally, to ensure that the changes do not adversely impact safety. OPG is required to submit to the CNSC an annual summary of all organizational changes carried out during the year. CNSC staff reported that OPG complied with this licence condition throughout the licence period and kept the CNSC up to date on specific organizational changes. CNSC staff stated that it is satisfied that OPG has a well-documented and implemented process for change management.
38. OPG provided information regarding its organizational structure. OPG noted that it initiated a business transformation process in 2011, which included organizational streamlining and shifting to a centre-led structure, as well as the streamlining of governance. OPG explained that it provides engineering and other support functions such as radiation protection, conventional safety, and human resources through a central organization, which results in a consistent application of OPG programs and provides direct support at the Pickering NGS on an ongoing basis. CNSC staff noted that it would

⁶ CSA Standard N285.0, *General Requirements for Pressure Retaining Systems and Components in CANDU Nuclear Power Plants.*

⁷ CSA Standard N286-05, *Management System Requirements for Nuclear Power Plants.*

continue to monitor OPG's business transformation and ensure that OPG will continue to comply with the requirements of the CSA Standard N286-05.

39. The Commission enquired about OPG's centre-led organization. An OPG representative responded that the centre-led organization was more efficient for its business and noted that it would not negatively affect the performance of its nuclear program.

3.1.3 Safety Culture

40. Safety culture is important for creating a safe environment and reducing the likelihood of nuclear events. OPG stated that it has a program in place to promote a healthy safety culture at the Pickering NGS and to maintain the safety of workers, the public and the environment. OPG noted that its safety culture would be maintained through effective leadership, management, and communication of expectations, especially in the following areas:
 - a high level of human performance and nuclear, conventional, radiological and environmental safety performance will be maintained to the end of commercial operation and beyond;
 - a high level of equipment reliability will be maintained to end of commercial operations and beyond; and
 - adequate staff numbers and staff knowledge and capability will be maintained to take the site safely to end of life.
41. CNSC staff stated that it was satisfied with the engagement and commitment of OPG in promoting a strong safety culture at the Pickering NGS.
42. Several intervenors, including businesses, community organizations, the Canadian Nuclear Workers' Council and the Society of Energy Professionals, commented on OPG's safety culture, noting OPG's good performance regarding lost-time injuries.
43. The Commission enquired about OPG's commitment to continuous improvement, including OPG's Nuclear Safety Review Board. A representative from OPG responded that the mandate of the Nuclear Safety Review Board is to independently evaluate nuclear safety and safety culture on a yearly basis. The OPG representative noted that this is one aspect of its nuclear safety oversight framework, which also takes into consideration an independent industry review by the World Association of Nuclear Operators. The OPG representative further noted the benefit of these reviews as part of OPG's management towards the end of commercial operations.
44. The Commission asked for more information concerning the safety culture reports OPG was planning to develop in 2015 and 2018. An OPG representative responded that OPG conducts a safety culture assessment on a three-year interval, and noted that while the reports are proprietary, OPG shares the results with CNSC staff.

3.1.4 Conclusion on Management System

45. Based on its consideration of the presented information, the Commission concludes that OPG has appropriate organization and management structures in place and that the operating performance at the Pickering NGS provides a positive indication of OPG's ability to adequately carry out the activities under the proposed licence.

3.2 Human Performance Management

46. Human performance management encompasses activities that enable effective human performance through the development and implementation of processes. These activities ensure that the licensee has a sufficient number of staff, in all relevant fields, with the necessary knowledge, skills, procedures and tools in place to safely carry out their duties.

3.2.1 Training

47. OPG stated that it uses a Systematic Approach to Training (SAT) process to develop initial qualification training programs, as well as continuing/requalification training programs, for all key positions at the Pickering NGS. OPG explained that all of its station operations personnel, maintenance workers, engineers, chemistry technicians, and others are trained and qualified to do their jobs at the Pickering NGS using structured and challenging training programs. OPG noted that its training programs are relied upon for continuous improvement in station performance, and that they are systematically assessed each calendar quarter.
48. CNSC staff stated that its inspections have confirmed that the various training programs at both Pickering A and B have been designed, developed and managed in accordance with the many processes and procedures that constitute their SAT-based training system. CNSC staff noted, however, that OPG had some deficiencies with respect to the implementation of the training programs for some job families. CNSC staff noted that OPG was addressing these issues in accordance with a corrective action plan and that these issues did not represent an increased risk to nuclear safety. CNSC staff further stated that the corrective action plans developed by OPG to address these deficiencies have been implemented to the satisfaction of the CNSC.
49. CNSC staff stated that while OPG's emergency response organization training program at the Pickering NGS does not fully adhere to the requirements of their SAT-based training system, its good performance indicates that the significance of the training deficiencies is low. CNSC staff noted that full compliance with the SAT would ensure continuous improvement in response capability.

50. CNSC staff also provided information regarding a 2012 self-assessment conducted by OPG on its shift manager and control room shift supervisor training programs, which revealed a number of deficiencies with the training programs. CNSC staff stated that it was satisfied that OPG was implementing corrective actions to address the deficiencies.

3.2.2 Examination and Certification

51. To become a certified worker, a candidate must successfully complete the rigorous training courses and certification examinations described in the CNSC Regulatory Document RD-204⁸. The positions at the Pickering NGS requiring certification by the CNSC are the responsible health physicist, the authorized nuclear operator, the control room shift supervisor, and the shift manager. As part of the personnel certification program to become certified workers, trainees are required to complete initial certification examinations. OPG is responsible for the administration of these certification examinations for authorized nuclear operators and control room shift supervisors, and the CNSC administers the certification examinations for responsible health physicists. The CNSC then certifies the candidates who meet all regulatory requirements and who have demonstrated their competence to safely perform the duties of a certified position. Once certified by the CNSC, certified staff undergo continuing training and requalification testing to ensure they continue to have the knowledge and skills to safely perform their duties. CNSC staff reported that it was satisfied that all certified staff at the Pickering NGS are competent to safely perform the duties of their positions.
52. CNSC staff reported that, over the licensing period, deficiencies were identified in the personnel certification process used at Pickering B to train and test personnel to become certified workers. CNSC staff explained that, following the evaluation of three requests for initial certification submitted by Pickering B for authorized nuclear operator candidates in 2011, CNSC staff identified deficiencies with the on-the-job training program completed by these candidates. CNSC staff noted that these candidates were later certified after completing additional on-the-job training to address the deficiencies. CNSC staff further noted that OPG has since implemented a new on-the-job training program.
53. The Commission asked for follow-up information concerning OPG's issues related to initial certification. A representative from OPG responded that OPG has had success since implementing corrective actions, including a revision of its training program, in 2011. CNSC staff stated that it was satisfied with the measures taken by OPG to address these issues.

⁸ CNSC Regulatory Document RD-204, *Certification of Persons Working at Nuclear Power Plants*, 2008.

3.2.3 Minimum Shift Complement and Staffing

54. The minimum shift complement is the minimum number of qualified workers required at all times for safe operation and to ensure adequate emergency response capability. OPG stated that, during the licence period, it conducted a thorough analysis and validation exercises to determine the requirements for minimum staff complement for operations staff in accordance with CNSC Regulatory Guide G-323⁹, with the objective of confirming that a sufficient number of qualified staff for normal operations, as well as for events and emergency response, would be on site at all times. OPG stated that, based on this analysis, the existing minimum shift complement numbers and qualifications of workers were adequate and no changes were required. OPG noted that it would conduct further verification in 2013 to ensure that minimum shift complement requirements have been addressed.
55. CNSC staff noted that, in 2008 and 2009, both Pickering A and B received “below expectations” ratings for the human performance program due to issues with the minimum shift complement, but, since then, OPG has demonstrated compliance with requirements. CNSC staff noted that OPG now has processes in place to ensure compliance with its station shift complement document, and has adhered to the regulatory reporting requirements for staff relating to minimum shift complement.
56. OPG stated that sufficient qualified workforce personnel and leadership team members would be available to ensure that the station can be safely operated until the end of commercial operation and the transition to safe storage. CNSC staff noted that it expects to receive routine updates from OPG regarding organizational changes and staffing levels.
57. OPG indicated that it has implemented limits to hours of work for its employees, although OPG currently excludes contractors and casual construction trades persons from its hours of work limits. CNSC staff stated that OPG’s hours of work limits meet CNSC criteria, and that CNSC staff was in the process of producing a regulatory document on this subject that will provide clear requirements for hours of work for all workers, including contractors and casual construction trades persons. CNSC staff noted that the implementation of these requirements was scheduled for completion by the end of 2014. CNSC staff further stated that its expectations regarding hours of work limits for all workers performing safety-related tasks or working on safety-related systems were described in the proposed LCH.
58. The Power Workers’ Union, in its intervention, expressed the view that, while staffing was not an immediate concern for the proposed licence period, there was a need for OPG to have an open dialogue with workers regarding its staffing plans for the remaining operational life of the Pickering NGS. The Commission asked for more information in this regard. A representative from OPG noted that OPG had experience from closing its thermal plants and noted the importance of engaging and communicating with its

⁹CNSC Regulatory Guide G-323, *Ensuring the Presence of Sufficient Qualified Staff at Class I Nuclear Facilities – Minimum Staff Complement*, July 2007.

workforce as it plans for the future. The OPG representative further noted that OPG was changing to a 10-year planning outlook rather than a five-year one. The OPG representative added that this planning would be incorporated into OPG's future detailed decommissioning plan for the Pickering NGS. CNSC staff stated that safety, including the minimum shift complement, must be maintained at all times.

59. The Society of Energy Professionals, in its intervention, commented that the CNSC should engage the Ontario Energy Board (OEB) to ensure that staffing levels are not compromised in order to reduce operating costs. The Commission asked for more information on this subject. A representative from OPG explained that the OEB reviews OPG's operation and sets rates for the energy generated by the Pickering NGS, and that the OEB had commented on the number of staff employed at the Pickering NGS. The OPG representative noted that there had been no direction from the OEB to alter the number of staff and stated that OPG would continue to meet staffing requirements for safe operation. The OPG representative concurred that it may be useful for the CNSC to engage the OEB so that the OEB can better understand the CNSC's mandate and regulatory requirements.

3.2.4 Fitness for Duty

60. Fitness for duty is one factor that affects human performance. OPG stated that it has a fitness for duty program and provides training for supervisors and workers to assist them in identifying behaviours that are inconsistent with being fit for duty. OPG noted that rehabilitation and return-to-work support is available for staff returning to work. CNSC staff stated that it reviewed OPG's fitness for duty program and found that it meets the current regulatory requirements related to fitness for duty.
61. OPG stated that all supervisors must complete Continuous Behaviour Observation Program training, which trains supervisors by developing awareness to recognize and respond to behaviours that may include a risk to the security, safety or health of employees, facilities and the public. OPG noted that it also trains supervisors to be aware, through direct observation of changes in the behaviours of their employees, to assess risk that is posed by these changes, and to respond accordingly to the potential risk that is posed by these changes.
62. CNSC staff noted that the CNSC is considering additional regulatory requirements related to fitness for duty for nuclear power plants, particularly regarding the CNSC's position on alcohol and drug testing. CNSC staff noted that it has received comments from stakeholders on this matter, as outlined in a recent CNSC Discussion Paper.
63. The Commission asked for more information concerning the effectiveness of OPG's behaviour observation and screening activities. An OPG representative responded that its activities have been successful and effective in ensuring that workers are fit for duty.

3.2.5 Conclusion on Human Performance Management

64. Based on its consideration of the presented information, the Commission concludes that OPG has appropriate programs in place and that current efforts related to human performance management provide a positive indication of OPG's ability to adequately carry out the activities under the proposed licence.

3.3 Operating Performance

65. Operating performance includes operating policies, reporting and trending, and the application of operating experience that enables effective performance, as well as improvement plans and significant future activities.

3.3.1 Conduct of Operations

66. OPG stated that its operation activities are established by its *Operating Policies and Principles* (OP&P) document. OPG explained that the OP&P specify how it will operate, maintain and modify station systems to maximize nuclear safety and minimize risk to the public, as well as define boundaries, rules, and authorities. OPG noted that it is required to comply with the OP&P at all times, and that it must report to the CNSC and take immediate action to return the facility to within the boundaries of the OP&P, in a safe manner, should it operate outside the OP&P.
67. OPG described its reactivity management program, which ensures continued safe operation by monitoring reactivity at all times. CNSC staff commented that while the program is capable of performing its oversight role, improvements were needed to improve the reliability of the fuelling machines. CNSC staff noted that OPG has begun to make improvements in this regard and that CNSC staff would continue to follow-up on this area on a regular basis.
68. CNSC staff stated that OPG is not permitted to restart the reactor after a serious process failure without the prior written approval of the Commission, or prior written consent of a person authorized by the Commission. CNSC staff noted that OPG has complied with this licence condition and that there were no serious process failures during the licence period.
69. OPG provided information regarding its outages, including the once-in-a-decade vacuum building outage, during which all units had to be shut down, that was successfully completed in 2010. OPG further noted that it has tentatively scheduled 17 planned outages over the next five years. CNSC staff stated that OPG has complied with the outage management requirements of its licences. CNSC staff stated that it had no safety concerns regarding OPG's performance during the outages, and noted that it would continue to monitor the conducted outages.

70. The Commission asked for more information regarding OPG's performance with respect to reactor chemistry, which was below an industry benchmark. An OPG representative acknowledged that OPG's performance in this area was below that of other nuclear utilities, and stated that OPG had put an action plan in place to ensure that its performance would meet the industry benchmark. The OPG representative explained that the chemistry benchmark was related to the life management of components and did not reflect any safety-related consequences. CNSC staff noted that OPG is required to report on its chemistry performance and that OPG was compliant in this regard.
71. The Sierra Club, in its intervention, expressed concerns about OPG's operating performance, noting comments from the OEB concerning the Pickering NGS. The Canadian Nuclear Society also presented information concerning the performance of the Pickering NGS compared to other nuclear utilities. The Commission asked OPG to comment on the matter. OPG responded that the OEB's assessment was based on the operating performance of the Pickering NGS, including production capability and forced loss rate, and not the safety performance. The OPG representative noted that the business case for continuing to operate the Pickering NGS assumes that it would be operating around 75 percent capacity for its remaining life, and noted that its recent performance had exceeded its performance targets. CNSC staff agreed that OPG had improved its operating performance over the licence period.

3.3.2 Safe Operating Envelope

72. The safe operating envelope (SOE) represents the set of limits and conditions within which a nuclear generating station must be operated to ensure compliance with the safety analysis upon which reactor operation is licensed and which can be monitored by or on behalf of the operator and can be controlled by the operator. The licence condition for the operations program is being modified to include compliance to CSA Standard N290.15¹⁰, and the applicable version of the CSA Standard, revision 10, is referenced in the LCH. CNSC staff noted that the SOE implementation strategy, which requires full transition to CSA Standard N290.15-10 was described in the LCH. CNSC staff further noted that it performed a pilot Type-I compliance inspection to assess OPG's implementation of the SOE and transition to CSA Standard N290.15-10, and stated that it was satisfied with OPG's progress to date.
73. OPG stated that it updated its SOE program to better align with CSA Standard N290.15 10. OPG stated that its SOE governance and implementation meet the requirements of CSA N290.15-10. OPG noted that it would develop and provide SOE training to its workers by the end of 2013.
74. CNSC staff stated that OPG has continued to maintain the plant configuration in accordance with the design and licensing basis and operation within the SOE. CNSC staff noted that it would continue to monitor OPG's performance related to the SOE as part of its normal compliance activities.

¹⁰ CSA Standard N290.15, *Requirements for the Safe Operating Envelope for Nuclear Power Plants*.

75. Based on this information, the Commission is satisfied that OPG continues to maintain the plant configuration in accordance with the design and licensing basis and operation within the SOE.

3.3.3 Event Reporting

76. CNSC Regulatory Standard S-99¹¹ outlines the reporting requirements for operations that are consistent with the NSCA, and associated regulations. CNSC staff stated that, during the licence period, OPG operated in accordance with the standard and followed up with corrective actions and root cause analyses when appropriate. CNSC staff noted that it had followed up on implementation of corrective actions and raised no concerns.

3.3.4 Fukushima Action Plan and OPG Follow-up

77. CNSC staff described the Action Plan introduced by the CNSC to further improve the safety of the Canadian nuclear power plants, taking into consideration all lessons learned from the Fukushima Daiichi nuclear accident in Japan that occurred in March 2011. CNSC staff explained that the CNSC Action Plan addresses the findings and recommendations of the CNSC Fukushima Task Force Report published in October 2011 and discharges each within the prescribed timeframe set out in the management response to the Task Force Report. CNSC staff noted that the plan describes the action items to strengthen reactor defence-in-depth, enhance emergency response, improve the regulatory framework and processes, and enhance international collaboration.
78. CNSC staff further explained that, based on the CNSC Action Plan, up to 36 Fukushima Action Items and a timeline for completion were issued to licensees of nuclear power plants. CNSC staff noted that all short-term actions placed on the licensees were completed by December 2012 and that all long-term actions were to be addressed by December 2015. The Commission notes that the first annual progress update describing the status of the Fukushima Action Items applicable to all the nuclear power plant licensees was presented by CNSC staff to the Commission on August 15, 2012¹² and that another update was presented to the Commission at the October 24 and 25, 2012 Commission meeting¹³. A further update will be presented to the Commission at the August 21 and 22, 2013 Commission meeting.
79. OPG is required to take specific measures to confirm and, where necessary, strengthen the ability of the Pickering NGS to withstand accidents that are beyond its design basis to further reduce risk and improve safety as a result of the 2011 Fukushima nuclear accident. OPG described its response to the Fukushima accident and the CNSC Action Plan. OPG explained that it confirmed that the Pickering NGS is safe and robust, and

¹¹ CNSC Regulatory Standard S-99, *Reporting Requirements for Operating Nuclear Power Plants*, March 2003.

¹² Refer to the Minutes of the CNSC Meeting held August 14 and 15, 2012.

¹³ Refer to the Minutes of the CNSC Meeting held October 24 and 25, 2012.

made improvements and upgrades based on the lessons learned in order to improve safety margins, in accordance with the schedule established in the CNSC Action Plan.

80. In its CMD for Day 2 of the public hearing, CNSC staff reported that 19 of 32 Fukushima Action Items for Pickering A were closed and 26 of 35 Fukushima Action Items for Pickering B were closed. CNSC staff noted that OPG had completed all of the 18 short-term Fukushima Action Items due by December 31, 2012. CNSC staff stated that it was satisfied with the measures undertaken by OPG in responding to the Fukushima accident to date, and noted that it would provide a further update to the Commission during the August 2013 Commission meeting.
81. The Commission is satisfied that OPG has taken measures to confirm and, where necessary, strengthen the safety case of the Pickering NGS to further reduce risk and improve safety, in accordance with the timeline established by CNSC staff. The Commission notes that it expects OPG to complete all of the required actions by the end of December 2015.

3.3.5 Conclusion on Operating Performance

82. Based on the above information, the Commission concludes that the operating performance at the facility provides a positive indication of OPG's ability to carry out the activities under the proposed licence.

3.4 Safety Analysis

83. The Commission examined issues related to the program areas of Safety Analysis in order to assess the adequacy of the safety margins provided by the design of the facility. Safety analysis is a systematic evaluation of the potential hazards associated with the conduct of a proposed activity or facility and considers the effectiveness of preventive measures and strategies in reducing the effects of such hazards. It supports the overall safety case for the facility.
84. CNSC staff stated that OPG is required to conduct safety analyses for the Pickering NGS to demonstrate that the design continues to provide adequate prevention and mitigation to protect against postulated accidents, that there is no undue risk to the environment and that the plant meets safety requirements. CNSC staff reported that, over the licence period, OPG's performance in the area of Safety Analysis was satisfactory.

3.4.1 Hazard Analysis

85. Hazard Analysis demonstrates the adequacy of the facility design to withstand external and internal hazards.

86. OPG stated that it has specific analyses related to seismic qualification and fire safe shutdown. Regarding seismic hazards, OPG stated that the objective of the seismic qualification program is to ensure that the design of systems, structures and components for Pickering B is performed in accordance with CSA Standard N289.3¹⁴ requirements. For Pickering A, OPG stated that the common containment structures were designed to exceed the *National Building Code of Canada 1965* seismic design provisions, and were subsequently confirmed analytically to meet seismic design requirements.
87. Regarding fire analysis, OPG stated that the Fire Safe Shutdown Analysis is a deterministic analysis in accordance with CSA Standard N293-07¹⁵. OPG noted that the objective of the Fire Safe Shutdown Analysis is to demonstrate that there is at least one means of achieving nuclear safety objectives and performance criteria available in case of a fire. OPG stated that it completed the Fire Safe Shutdown Assessment in accordance with CSA N293-07. OPG stated that the Fire Safe Shutdown Assessments and the Fire Hazard Assessments for Pickering A and B were revised to reflect modifications that were installed since the previous issue of the standard, and in accordance with the requirements of CSA N293-07. CNSC staff stated that it was satisfied with OPG's progress in revising its fire safety analysis. CNSC staff noted that OPG generally meets the intent of the new standards, although CNSC staff's detailed review would not be completed until later in 2013.
88. Some intervenors, including individuals and the Provincial Council of Women of Ontario, expressed concerns that there may be seismic risk associated with the Pickering nuclear site. The Commission asked for more information concerning seismic risk. An OPG representative responded that, in response to the Fukushima nuclear accident, OPG conducted a seismic analysis and confirmed that the Pickering nuclear site is in an area of low seismic activity and that plant structures and systems are seismically robust in relation to the assessed risk. A representative from Natural Resources Canada (NRCan) provided an overview of seismicity in the region around the Pickering NGS, noting that there is a low seismic hazard in the area. CNSC staff stated that the seismic hazard in the area is well-understood and noted that recent design improvements would further ensure that the reactor would safely shut down and be maintained in the safe shutdown state in the event of a severe earthquake.

3.4.2 Deterministic Safety Analysis

89. CNSC staff stated that, under the proposed licence, OPG would be required to transition to a safety analysis program for the Pickering NGS that meets the requirements and expectations documented in CNSC Regulatory Document RD-310¹⁶, and CNSC Regulatory Guide GD-310¹⁷, which applies to new plants, and is being implemented in a

¹⁴ CSA Standard N289.3-M81, *Design Procedures for Seismic Qualification of CANDU Nuclear Power Plants*.

¹⁵ CSA Standard N293-07, *Fire Protection for CANDU Nuclear Power Plants*.

¹⁶ CNSC Regulatory Document RD-310, *Safety Analysis for Nuclear Power Plants*, February 2008.

¹⁷ CNSC Regulatory Guide GD-310, *Guidance on Deterministic Safety Analysis for Nuclear Power Plants*, March 2012.

graduated manner for existing facilities. CNSC staff further noted that for Pickering A and B, any new safety analysis must comply with RD-310.

90. OPG stated that its deterministic safety analysis demonstrates compliance with public dose limits for design basis events, such as seismic events and events caused by equipment failure or operator error. CNSC staff reported that it did not identify any issues of major concern in the reviews it performed during the licensing period. CNSC staff stated that, overall, OPG has demonstrated a high level of safety, although certain outstanding action items remain to be completed.

3.4.3 Probabilistic Safety Assessment

91. Probabilistic Safety Assessment¹⁸ (PSA) for a nuclear power plant is conducted to complement traditional deterministic safety analysis. The assessment considers the probability, progression and consequences of equipment failures or transient conditions to derive numerical estimates that provide a measure of the safety of the plant or reactor. This risk perspective is used to evaluate and optimize the overall defence-in-depth strategy by identifying the design basis challenges to physical barriers and by judging their acceptability based on the derived acceptance criteria.
92. Licensees are required to conduct probabilistic safety assessments in accordance with CNSC Regulatory Standard S-294. These assessments must be periodically reviewed and updated, and are currently done every three years. The analysis, methodologies and updates are reviewed by CNSC staff against well-accepted international guidance, to ensure compliance with the requirements in S-294. CNSC staff stated that OPG was required by a licence condition to complete the Pickering A PSA by the end of 2013 and the Pickering B PSA by the end 2012. CNSC staff further noted that it had accepted to extend the completion date for certain elements of the Pickering A Probabilistic Risk Assessment to the end of 2014.
93. OPG stated that it was revising the PRA for the Pickering NGS to align with S-294. OPG noted that the PRA for Pickering B was completed at the end of 2012. OPG explained that the PRA for Pickering B assessed risk from internal events, i.e., events occurring within the plant systems, and external events, i.e., seismic, high winds, fires, floods and other hazards, and that the results demonstrated that the overall risk was low and acceptable. CNSC staff stated that it was satisfied with the methodology used by OPG to revise the Pickering B PSA submitted at the end of 2012. CNSC staff noted that the results demonstrated that the safety goals for the Severe Core Damage Frequency and the Large Release Frequency were met, indicating that the risk to the public was very low. CNSC staff further stated that the seismic PSA for Pickering B also confirmed that the Pickering B design is robust. CNSC staff noted that OPG's safety goals were established in accordance with the International Atomic Energy Agency (IAEA) safety goals for

¹⁸ A PSA may also be referred to as a probabilistic risk assessment (PRA). There is no difference between PRA and PSA. In Canada, the industry uses PRA, consistent with the United States, and the CNSC uses PSA, consistent with the International Atomic Energy Agency.

existing plants and were accepted by CNSC staff as the best international practice. CNSC staff stated that it would complete a detailed review of all Pickering B PSA reports by June 30, 2014.

94. OPG stated that it had submitted the 2009 Pickering A PRA to CNSC staff for review, and noted that it was updating the Pickering A PRA models to meet the standard S-294. CNSC staff reported that OPG was required to submit all Pickering A PSA reports, which includes both internal events and external events, by the end of December 2014, and that CNSC staff expected that it would complete a detailed review of all Pickering A PSA reports by June 30, 2015. CNSC staff stated that it was satisfied with OPG's progress in the development of the assessments.
95. OPG stated that the assessments for Pickering A and B demonstrated that the risk of the operation of the Pickering NGS to the population living and working in the vicinity is significantly lower than other risks to which they are normally exposed. OPG noted that the risk models were also used to ensure that the configuration of the plants due to operations, maintenance, or proposed design changes would not result in an unacceptable level of risk to members of the public.
96. Several intervenors, including individuals, CCNB Action and Greenpeace, expressed concerns regarding OPG's PRA results for Pickering B. Intervenors were concerned that the risks associated with the operation of the Pickering NGS were unreasonable. The Commission asked for more information regarding the safety goals and the risk assessments. CNSC staff responded that, while the PSA includes likelihood of initiating events and the consequences, the PSA is used as a tool to determine design vulnerabilities and potential safety improvements. CNSC staff explained that the safety goals are established to ensure that the likelihood of accidents with serious radiological consequences is extremely low, and to limit the potential for radiological consequences from serious accidents as far as practicable. CNSC staff noted that PSAs are not necessarily used for regulatory purposes, but if the PSA values are above acceptable limits then safety improvements would be required. CNSC staff further noted that if the values are between the limits and the targets, then safety improvements should be put in place if practicable. CNSC staff stated that the safety improvements in place as a result of the Fukushima Action Plan have further enhanced safety and reduced risk. CNSC staff further stated that it would be publishing an information document to explain PSA and risk to the public. CNSC staff added that its safety analysis is not based on PSA. CNSC staff explained that it conducts predominately deterministic analysis to ensure that the safety margins meet requirements, supported by many different reviews, including engineering assessments. CNSC staff noted that risk insights gained from PSA are used by CNSC staff to re-assess, more fully, the original deterministic framework.
97. Greenpeace raised concerns regarding the high-wind PRA for Pickering B, suggesting that the reactors were vulnerable to high winds. The Commission asked for more information on this subject. A representative from OPG discussed the methodology that OPG used to conduct the high-wind PRA and stated that OPG was satisfied in performing the analysis that the target safety goals were met. The OPG representative

noted that the large-release frequency was bounded by the severe-core damage frequency. The OPG representative further noted that OPG had identified improvements in the methodology, which it was using for the Pickering A PRA, and would further reduce the risk. CNSC staff stated that it accepted OPG's methodology and, based on its review of OPG's PRA, accepted that the target safety goals were met.

98. CCNB Action's third request for a ruling was a ruling that "the wind-large release frequency be considered the same as the wind-core damage frequency, unless OPG can prove otherwise." OPG stated that it agreed with this statement for the Pickering B probabilistic risk assessment. The Commission accepts this response from OPG.
99. CCNB Action further requested a ruling that the same or a revised wind-large release frequency be added to the large release frequency, so that the Commission can see if OPG's regulatory large release frequency limit is met. Regarding the question of adding the risks, OPG stated that the current state of the art of PRA methodology, particularly for fires and external events, does not support the simple addition of event frequencies corresponding to the different sources of external hazards to obtain a single value for either severe core damage frequency or large release frequency. OPG explained that each hazard was addressed with different methodologies with diverse assumptions, conservatisms, and computer codes, and different degrees of uncertainty. OPG noted that there is not yet an accepted methodology for calculating risk aggregation. OPG acknowledged that, ultimately, a total risk number ought to be derived and stated that it would be participating in the development of this area and would apply the methodology once it has been developed. The Commission accepts this response from OPG.
100. A representative from OPG stated that, based on OPG's analysis, the Pickering NGS meets the safety goals. The OPG representative noted that this analysis did not include the design improvements made in response to the Fukushima accident, which the OPG representative estimated could result in a further reduction in risk by a factor of 10. CNSC staff stated that, regardless of probability, CNSC staff must be satisfied that the reactor will shut down safely and be maintained in the safe shutdown state.
101. It is the Commission's understanding that PSA methodologies are being developed by the international community to account for the use of emergency mitigating equipment and human actions related to severe accident management, as well for the aggregation of PSA results on safety assessments with respect to external events. The Commission further understands that detailed guidelines are being prepared under the auspices of the IAEA for consistent and prudent use of the integration of results.
102. Greenpeace also suggested that there were deficiencies in the PRA because aging was not properly addressed. The Commission sought further information on this subject. A representative from OPG responded that the revised PRA used the actual condition and reliability of the Pickering NGS components.

103. Greenpeace, in its request for a ruling, recommended that the Commission should require CNSC staff to publish a site level risk assessment for both the Pickering A and B reactors by the end of 2013 if it renews the licence for Pickering NGS. Greenpeace expressed the view that a transparent total estimate of the large release frequency for the six operating Pickering reactors would provide objective information on the risk posed by the station to surrounding populations and the environment. Regarding this request, a representative from OPG stated that OPG had completed the Pickering B PRA in accordance with the methodology accepted by the CNSC and CNSC Regulatory Standard S-294, and that the Pickering A updated PRA, using accepted methodology, was underway and committed to be completed by the end of 2014, as required in OPG's licence. The OPG representative expressed the view that its licence conditions were sufficient to address this request and that no additional conditions were required.
104. The Commission, noting that OPG was required by its licence to complete the PSA for Pickering A by the end of 2013, questioned why OPG had not completed the Pickering A PSA as part of its licence renewal application. CNSC staff stated that the extension for the Pickering A PSA to the end of 2014 was accepted by CNSC staff so that OPG could focus on the Fukushima Action Plan. CNSC staff noted that the existing safety analysis for Pickering A was completed in 2009, although the scope of PSA had changed in order to include external hazards, as well as lessons learned from the Fukushima accident. CNSC staff further stated that the safety case for the Pickering NGS, which includes the design basis as well as the safety analysis, remains valid. CNSC staff acknowledged the Commission's concerns that the revised Pickering A PSA was not included in the licence renewal application, and suggested that this work be completed before OPG reaches the hold point in the proposed licence.
105. The Commission asked if OPG would be able to provide the revised Pickering A PSA before reaching the hold point in the proposed licence. A representative from OPG responded that OPG would endeavour to meet this deadline. OPG later confirmed its commitment to complete the Pickering A PRA before the proposed Pickering B 210,000 EFPH licence hold point is reached. The Commission's ruling on the request from Greenpeace is below.
106. Based on the information presented, the Commission is satisfied that the PSA for the Pickering NGS meets requirements for the purpose of OPG's licence renewal application. The Commission understands that OPG was not required by its licence to complete the PSA for Pickering A before the public hearing, but notes that, ideally, it would have been available. As such, the Commission directs OPG to provide the following, before the removal of the hold point can be approved:
- the revised PSA for Pickering A that meets the requirements of CNSC Regulatory Standard S-294;
 - an updated PSA for both Pickering A and Pickering B that takes into account the enhancements required under the Fukushima Action Plan; and
 - a whole-site PSA or a methodology for a whole-site PSA, specific to the Pickering NGS site.

107. The Commission understands that if the PSA values are between the limits and the targets, then safety improvements should be put in place if practicable, and that if the PSA values are above acceptable limits then safety improvements would be mandatory. As such, the Commission requests that OPG provide an action plan to address any identified issues should OPG exceed its targeted safety goals.
108. The Commission directs CNSC staff to review the PSAs and methodology, and provide its recommendation for the Commission's consideration at the time of OPG's request for the release of the hold point.

3.4.4 Robustness Analysis

109. Robustness analysis covers the adequacy of the analysis and consequence assessments related to a malevolent aircraft crash at a nuclear facility. CNSC staff discussed the new aircraft impact loading functions it had developed in 2011 and its request that OPG carry out a reassessment to resolve residual issues identified at the Pickering NGS. CNSC staff explained that OPG was also to assess beyond-design basis events, which may be bounded by aircraft impact scenarios. CNSC staff stated that OPG had responded that the Severe Accident Management Guidelines would address the mitigation of large commercial aircraft crash consequences, and noted that OPG's submission was under review by CNSC staff. CNSC staff stated that its overall assessment was expected to be finalized by December 2013.
110. The Commission is satisfied that the measures for managing a severe accident are acceptable and would properly mitigate an accident involving a large aircraft.

3.4.5 Criticality Safety

111. Criticality Safety deals with prevention of criticality accidents during operations with fissionable materials outside nuclear reactors. CNSC staff stated that it confirmed that accidental criticality cannot occur at the Pickering NGS, as the fuel does not contain enriched uranium and cannot go critical under normal or accidental conditions in air or water. CNSC staff noted that the fuel is stored in air and inside transportation containers, which ensure its safety, and that irradiated fuel is stored in light water in the used fuel pools.
112. The Commission is satisfied that accidental criticality cannot occur at the Pickering NGS.

3.4.6 Impact of Plant Aging on Safety Analysis

113. CNSC staff stated that it is satisfied with OPG's overall strategy to address the effects of an aging heat transport system on the existing safety analysis margins. CNSC staff noted

that OPG identified three accident scenarios as being those most affected by heat transport system aging, and that OPG had identified means by which the effects of aging would be managed to ensure that safety margins would be maintained. CNSC staff noted that it would continue to review OPG's analysis.

3.4.7 Conclusion on Safety Analysis

114. On the basis of the information presented, the Commission concludes that the systematic evaluation of the potential hazards and the preparedness for reducing the effects of such hazards is adequate for the operation of the Pickering NGS and the activities under the proposed licence.

3.5 Physical Design

115. Physical design relates to activities that impact on the ability of structures, systems and components to meet and maintain their design basis given new information arising over time, planned modifications to the facility, and taking changes in the external environment into account.

3.5.1 Plant Design

116. OPG provided information concerning its design programs, including engineering change control, configuration management, design management, fuel, and software programs. OPG explained that the purpose of these programs is to ensure that the Pickering NGS would continue to operate within its design basis and SOE, as well as in compliance with regulatory requirements. OPG further explained that its programs would ensure that any changes are planned and designed in accordance with these requirements.
117. OPG outlined a number of design and safety improvements that it had made to the Pickering NGS over the licence period, including passive autocatalytic hydrogen recombiners, which can prevent a hydrogen explosion, and enhancements to improve equipment reliability. CNSC staff stated that it was satisfied with OPG's performance in this regard.
118. Several intervenors, including individuals, Durham Nuclear Awareness, Greenpeace and the International Institute of Concern for Public Health expressed concerns regarding the consequences of a multi-unit accident. Intervenors also questioned the use of a single vacuum building as a shared safety system for the Pickering NGS. The Commission asked for more information on this subject. A representative from OPG stated that the vacuum building was put in place for design basis events for individual reactors, such as a loss of coolant accident, which are not likely to occur on multiple units simultaneously.

The OPG representative acknowledged that under a multi-unit accident, the benefit of the vacuum building would be limited. The OPG representative also noted that there are other mitigation measures in place, including independent safety systems for each reactor, as well as the new improvements following the CNSC Fukushima Action Plan, that would prevent the release of radionuclides in the event of a severe accident. CNSC staff responded that the vacuum building is an additional design feature beyond containment that can reduce the reactor containment pressure under accident conditions. CNSC staff stated that each reactor has its own containment structure, as well as redundant, independent containment and safety systems, and that the use of a single vacuum building in the design of the Pickering NGS was not a safety concern but rather an additional safety feature that increases the reactor's defence-in-depth.

119. The Commission asked for more information concerning OPG's response to a multi-unit accident. A representative from OPG discussed OPG's response to this type of accident, explaining that OPG has a number of back-up systems available on-site and off-site to ensure that OPG can cool the fuel and contain releases for an extended period following an accident. CNSC staff concurred with OPG, noting the improvements OPG had made in response to the Fukushima Action Plan. CNSC staff also noted that CANDU reactors have redundant and diverse safety systems for accident prevention and mitigation.
120. The Commission asked for more information about the reactor safety systems. A representative from OPG responded that there are independent fast-acting shutdown systems for each unit, as well as a shared emergency coolant injection system. The OPG representative noted that the Pickering B units have two independent, fast-acting shutdown systems (shutoff rod injection and poison injection into the moderator) and that the Pickering A units have one fast-acting system (shutoff rod injection) and one slower system (moderator dump). An OPG representative further noted that OPG had made enhancements to improve the performance of the Pickering A moderator dump system.
121. Some intervenors commented that the Fukushima Daiichi nuclear reactor design was perceived to have been safer than CANDU reactors and cautioned that severe accidents could occur despite the design. The Commission asked OPG to comment on this observation. A representative from OPG responded that each reactor design has its strengths compared to others and noted that an advantage of the CANDU design is that it uses a lot of water, which can be used to cool the fuel in the event of an accident. CNSC staff concurred, noting that the use of natural uranium fuel is also an advantage as there is less of a criticality concern, and that the location of the fuel pools is also different from those in Fukushima.
122. CCNB Action, in its intervention, suggested that OPG should be required to install emergency filtered vents. CCNB Action explained that filtered vents would help prevent over-pressurizing of the containment, and reduce the consequences of a severe accident by filtering out 99.9% of the radioactive contaminants released during a severe accident. The Commission asked for more information about this system. CNSC staff responded that it generally agreed with the view of the intervenor about the importance of preserving the integrity of the reactor containment but noted that emergency filtered

vents were not the only means to do so. A representative from OPG responded that, as part of the Fukushima Action Plan, OPG was reviewing ways to preserve containment in a severe accident. The OPG representative stated that OPG had already decided to utilize three separate means of recirculating water to cool the fuel and reduce containment pressure, and noted that OPG would be making a decision regarding passive filtered containment once it has completed its analysis under the Fukushima Action Plan.

123. CNSC staff noted that the specific technology recommended by the intervenor could not be implemented at the Pickering NGS because the technology requires a large pressure differential between the containment and outside the containment for the air to pass through the filters. CNSC staff explained that the pressure at the Pickering NGS would be reduced due to the presence of the vacuum building. As such, CNSC staff stated that OPG would have to review its options before deciding what technology to use. A representative from OPG stated that OPG was investigating options that included venting air through a filter following the use of the vacuum building.
124. CCNB Action's first request for a ruling was that the Pickering NGS "not be able to operate beyond its design life without the installation of a passive emergency filtered vent in addition to its current venting capabilities." CCNB Action later clarified its request that "an emergency filtered vent be added to each unit and not just one big one on the vacuum building." OPG's written response to this request was that the Pickering NGS has a Filtered Air Discharge System (FADS) that is dedicated to post-accident venting of containment. OPG stated that the purpose of this seismically-qualified system is to maintain containment pressure sub-atmospheric following a range of design basis accidents such as a Loss of Coolant Accident (LOCA) to more serious accidents that include a LOCA with failure of Emergency Coolant Injection. OPG further stated that it was assessing future enhancements to protect containment through its Fukushima Action Items. OPG stated that was on track for completion of the applicable Fukushima Action Items before the early committed date of December 2014, which is within the CNSC due date of December 2015. The Commission's ruling on this request is below.
125. The Commission notes that OPG will be considering filtered containment as part of its analysis of future enhancements to protect containment through its Fukushima Action Items. The Commission directs OPG to report on its analysis and way forward on this issue at the time of its request to remove the hold point to proceed beyond 210,000 EFPH.

3.5.2 Pressure Boundary

126. OPG stated that its pressure boundary program provides a managed process for performing repairs, replacements and modifications on pressure retaining systems and components. CNSC staff stated that it is satisfied that the Pickering NGS pressure

boundary program meets the requirements of CSA Standard N285.0-08¹⁹ and that OPG's pressure boundary program at the Pickering NGS is acceptable. CNSC staff stated that OPG's pressure boundary program was being implemented effectively and that the pressure boundary components would continue to perform satisfactorily.

127. Some intervenors, including individuals and the Canadian Coalition for Nuclear Responsibility, expressed concerns regarding the minimum thickness of the pressure tubes in the CANDU design compared to other reactor designs. The Commission enquired about this issue. A representative from OPG responded that the pressure tubes and feeder tubes meet all the codes and standards for operation at high temperature and pressure. The OPG representative further noted that the tubes are routinely monitored and inspected to ensure that they remain above the minimum thickness required by the design.
128. Some intervenors, including individuals, the International Institute of Concern for Public Health and Durham Nuclear Awareness, expressed concerns regarding the possibility of a pressure tube pipe cracking or failing. The Commission asked OPG to explain how it would address this type of issue. An OPG representative stated that the pressure tube pipes and welds were inspected when the pipes were first installed to ensure that they met the proper design specifications. The OPG representative further stated that OPG conducts periodic inspections under its periodic inspection program in accordance with CSA Standards and that OPG has a monitoring program to detect leaks. CNSC staff concurred with OPG's description of its programs and noted that pressure tubes are designed to leak before they would break, as the leaks could be detected and action would be taken to address the situation. CNSC staff further noted that samples are taken on an ongoing basis to verify the integrity of the pipes, and that the pipes were not near a point at which they may leak or break. CNSC staff further noted that there are safety systems in place to ensure that there would be no impacts on the environment or the public in the event of an unexpected failure.
129. The Commission asked what the consequences of such a failure would be. CNSC staff responded that this would be considered a design basis event with no off-site releases, and that it would not affect worker or public safety. CNSC staff noted that such an event had occurred at the Pickering NGS in 1983 and that the reactor safely shut down under its normal operating systems without needing safety systems. CNSC staff further stated that there was no impact on fuel cooling.
130. The Commission also enquired about the tubes located in steam generators. A representative from OPG stated that OPG has procedures in place to inspect and remove steam generator tubes from service if they do not meet requirements. CNSC staff added that steam generator tubes are inspected in accordance with CSA Standards as part of OPG's periodic inspection program and stated that CNSC staff has no concerns regarding steam generator tube integrity.

¹⁹ Canadian Standards Association, N285.0, General Requirements for Pressure Retaining Systems and Components in CANDU Nuclear Power Plants, 2008.

131. Northwatch, in its intervention, noted an event that occurred in Pickering B, Unit 7 in which a small calandria tube leak developed. Northwatch expressed concerns regarding vibrations that could cause cracking in calandria tubes. The Commission enquired about this subject. A representative from OPG responded that the calandria tube is part of the moderator system of the reactor, which is a low-temperature, low-pressure system. OPG noted that the small leak was caused by the wear of garter spring against the calandria tube through vibration. The OPG representative noted that this issue was detected in the moderator chemistry, and that it did not affect the cooling of the fuel.
132. The Commission asked for more information concerning vibration. CNSC staff responded that there is a normal turbulence within the fuel channels that can cause acoustic excitation in the pressure tubes through resonant frequencies. CNSC staff noted that this phenomenon could cause pressure pulses that could affect the integrity of the fuel channels. CNSC staff further stated that CNSC staff was well aware of this phenomenon and noted that it is closely monitored. Based on this, CNSC staff stated that this phenomenon was not an issue at the Pickering NGS.

3.5.3 Fuel Design

133. OPG stated that routine fuel inspections found that some fuel bundles discharged from Unit 1 had an increasing number of “black deposits”. OPG explained that the deposits were mainly composed of iron and oxygen, were porous, easily removed by brushing, very thin, and did not affect fuel cooling. OPG further stated that no damage was observed on the fuel sheath beneath the deposit and no fuel defects were detected. OPG noted that it performed an evaluation and determined that the fuel and the unit remained safe to operate, as the fuel bundles with deposits have predominantly been from lower-power regions of the reactor core, and that there is adequate fuel cooling.
134. CNSC staff reported that it imposed a penalty of 3% reduction from full power to preserve the safety margin for operation until OPG is able to provide a better understanding of the cause and effects of the deposits.
135. OPG described its plan to monitor and document the location of fuel bundles discharged from Unit 1 in order to provide a comprehensive assessment of the heat transport system, including chemistry and purification improvements. OPG noted that the increased fuel bundle inspection campaigns and reviews would provide additional assurances that there was no impact on fuel cooling or nuclear safety. OPG stated that the cause of the black deposits was likely associated with the chemistry of the heat transport system. OPG explained its strategy to increase the pH of the heat transport system coolant, to enhance coolant purification during outage, and to inspect the fuel to monitor the impact of the chemistry strategy on the elimination of the deposits. OPG noted that it would present the results to the CNSC.

136. Some intervenors, including Northwatch and Sierra Club, expressed concerns about the black deposits. The Commission asked for more information on this matter. CNSC staff responded that OPG had implemented corrective measures to promote the dissolution of pre-existing fuel deposits while still maintaining acceptable chemistry in the heat transport system. CNSC staff noted that the measures taken by OPG appeared to be addressing the issue, although further confirmation was required before CNSC staff would allow the unit to return to full power. CNSC staff added that further observation and inspections would also be required to ensure that the chemistry in the heat transport system remains acceptable.
137. A representative from OPG confirmed that OPG was monitoring to ensure that the corrective measures have been effective and would arrest and reverse the condition. The OPG representative further stated that OPG was implementing an enhanced inspection program for the fuel and heat transport system.
138. Northwatch also raised concerns regarding the observed bowing of a fuel element in the spent fuel, which had also been noted in OPG's report to the CNSC about the black deposits. The Commission asked about this issue. CNSC staff responded that the perceived bowing was the primary reason for the derating of Unit 1 since an increasing number of "black deposits" manifested themselves only in the low power channels, where an almost 50% of margin to fuel dryout exists. CNSC staff further stated that when the fuel bundle was re-examined it was determined that the fuel element was not bowed. CNSC staff noted that it would provide a full report on this matter to the Commission at a future Commission meeting.
139. Based on the above information, the Commission is satisfied that the imposed 3% reduction from full power is an acceptable means to preserve the safety margin for operation until OPG is able to demonstrate to CNSC staff that it has adequately addressed the issues related to the black deposits.

3.5.4 Conclusion on Physical Design

140. On the basis of the information presented, the Commission concludes that the design of the Pickering NGS is adequate for the operation period included in the proposed licence.

3.6 Fitness for Service

141. Fitness for service covers activities that are performed to ensure the systems, components and structures at the Pickering NGS continue to effectively fulfill their intended purpose. OPG is required to implement a periodic inspection program, in accordance with applicable CSA Standards, to monitor the continued fitness for service of nuclear pressure boundary components, containment components and containment structures.

3.6.1 Maintenance

142. OPG stated that its Conduct of Maintenance Program, which includes preventive maintenance, establishes processes to ensure the safety of the public and site personnel, the protection of the environment, and availability of plant equipment for safe and reliable operation through effective implementation and control of maintenance activities. OPG noted that it successfully and safely completed six planned maintenance outages over the licence period, including the full-station vacuum building outage. OPG further noted that it had further maintenance outages planned for 2013 and 2014.
143. OPG discussed the dredging of the Pickering NGS intake channel to mitigate the impact of silting on station systems and return the intake channel to its nominal depth profile. OPG noted that the removal of this sediment was anticipated to reduce ingress of silt to station systems and associated wear on susceptible components, as well as reduced equipment unavailability, reduced maintenance costs and improved performance. OPG stated that it would continue to perform dredging on an ongoing basis.
144. CNSC staff stated that OPG's performance regarding maintenance was satisfactory. CNSC staff explained that OPG reduced its maintenance backlogs to be consistent with the industry benchmark target, and that both preventive maintenance and corrective maintenance activities were effectively carried out. CNSC staff noted that it conducted several maintenance related inspections over the licence period and determined that, overall, OPG met CNSC staff expectations as well as the requirements of CNSC Regulatory Document S-210²⁰.
145. CNSC staff noted that OPG had some issues with the maintenance and reliability of the fuel handling machines. CNSC staff stated that while the repeated break-down of the fuelling machines would lead to forced reactor derating, which could affect production targets, it would not affect nuclear safety. CNSC staff noted that OPG implemented a Fuel Handling Equipment Reliability Recovery Plan to address these issues.
146. The Commission asked for more information concerning OPG's plan to use days-based maintenance. A representative from OPG responded that days-based maintenance is advantageous because it allows OPG to have work crews assigned to specific areas of the facility, which allows them to complete tasks more efficiently. The OPG representative noted OPG would have the ability to perform around-the-clock maintenance should it be required in certain circumstances.
147. Several intervenors, including community organizations and the Organization of Canadian Nuclear Industries, expressed support for OPG's commitment to maintaining the Pickering NGS, citing the investment OPG had made to upgrade the facility. The Commission asked about OPG's budget for maintenance. A representative from OPG responded that OPG reviews its business plan every year and stated that OPG has sufficient funds for safety and maintenance.

²⁰ CNSC Regulatory Document S-210, *Maintenance Programs for Nuclear Power Plants*.

3.6.2 Periodic Inspections

148. OPG is required to implement a periodic inspection program, in accordance with CSA Standards, to monitor the continued fitness for service of nuclear pressure boundary components, containment components and containment structures.
149. OPG stated that it implemented a Buried Piping Program during the licence period, which has shown that, in general, the piping and protective coatings are in good condition. OPG noted that it also evaluated soil conditions and determined that the soil was not aggressive to the carbon steel piping. OPG also described its review of the fire protection system piping to meet the requirements of the *National Fire Code of Canada*. OPG noted that the failure mechanisms discovered to date on the buried piping were well understood and that it did not observe any trends. OPG stated that it provided detailed information on buried piping inspection results to the CNSC. CNSC staff stated that it was satisfied with OPG's inspection program and noted that only conventional piping was located underground and that there was no risk of radiological releases associated with these pipes.
150. OPG stated that periodic inspections and in-service inspections ensure pressure boundary integrity, fitness for service, and aging management of the nuclear plant systems and components in the Pickering NGS. OPG noted that specific periodic inspection program plans are documented with associated inspection schedules. OPG explained that its periodic inspections include a Major Components program to demonstrate ongoing fitness for service of fuel channels, feeders, steam generators and reactor components and structures. OPG noted that it developed long-term life cycle management strategies to ensure that the four major components will perform safely and reliably over the life of the station, maintaining design and licensing bases and operational safety requirements, while optimizing production and cost-effectiveness. OPG further noted that it implemented periodic inspection plans for steam generators, fuel channels and feeders, according to the requirements of CSA Standard N285.4-05²¹.
151. CNSC staff reported that its compliance monitoring activities included review and acceptance of OPG's periodic inspection documents, fitness-for-service guidelines and disposition of inspection findings that do not comply with acceptance criteria established in CSA N285.4-05. In addition, CNSC staff stated that it reviews OPG's inspection reports. CNSC staff stated that it was satisfied that OPG meets the requirements of CSA N285.4-05. CNSC staff further stated that OPG satisfactorily performed the required periodic inspections of the containment components in accordance with CSA Standard N285.5-M90²² and that no evidence of unacceptable degradation of the containment components was observed.

²¹ CSA Standard N285.4, *Periodic Inspection of CANDU Nuclear Power Plant Components*.

²² CSA Standard N285-5-M90, *Periodic inspection of CANDU nuclear power plant containment components*.

152. CNSC staff stated that OPG satisfactorily performed several inspection/testing campaigns in accordance with CSA Standard N287.7-08²³ and found the containment to be in acceptable condition. CNSC staff noted that OPG also completed reactor building leakage rate tests during the licence period, as well as the vacuum building outage in 2010 that included inspections, testing and maintenance work in the vacuum building, as well as its pressure relief duct and dousing water storage tank, among others. CNSC staff noted that the vacuum building outage frequency required by the standard is every ten years. CNSC staff further stated that there were no safety concerns associated with the concrete containment structures.
153. The Commission asked for more information concerning the work completed during the vacuum building outage. An OPG representative responded that some components were repaired or replaced, as necessary, and that OPG conducted assessments to ensure that the components would remain fit for service. An OPG representative noted that all of the work completed during the vacuum building outage was assessed to remain fit for service until the end of OPG's proposed operating period in 2020. CNSC staff noted that it would continue to conduct regulatory oversight to ensure that OPG will continue to demonstrate fitness for service.
154. Some intervenors, including Durham Nuclear Awareness and the Canadian Coalition for Nuclear Responsibility, expressed concerns that OPG would not be able to inspect certain reactor components that are inaccessible, such as underground cables and certain pressure tubes. The Commission asked about this matter. Regarding cables, an OPG representative responded that OPG has a cable management and surveillance program in order to inspect and test cables. Regarding the pressure tubes, CNSC staff responded that the periodic inspection program identifies the tubes that would be most affected by aging mechanisms. CNSC staff further stated that the pressure tubes are designed to leak before they would break so that leaks can be quickly identified and repaired.

3.6.3 Structural Integrity

155. CNSC staff stated that several components of OPG's Life Cycle Management / Aging Management Programs maintain the structural integrity of the major components and concrete containment structures to ensure that they would remain fit for service through the next licensing period and to ensure continued operation beyond the assumed design life of the Pickering NGS. CNSC staff stated that it was satisfied with OPG's performance in relation to structural integrity.
156. CNSC staff stated that OPG inspected the underwater concrete structure of all Pickering A and B units during outages in 2010 and 2011 to confirm their structural integrity and operational adequacy. CNSC staff noted that OPG confirmed that the structural integrity of Pickering A underwater concrete structure was good, although the Pickering B, Unit 7 inspection revealed local concrete degradation. CNSC staff noted that this degradation

²³ CSA Standard N287.7-08, *In-service examination and testing requirements for concrete containment structures for CANDU nuclear power plants.*

was further assessed and Unit 7 was determined to be structurally adequate for service up to 2020. CNSC staff stated that it reviewed and accepted OPG's assessment.

157. Sierra Club Ontario, in its intervention, expressed concerns regarding possible concrete degradation. Sierra Club Ontario also noted that OPG did not complete its planned water intake inspections during the vacuum building outage. The Commission asked OPG to comment on this matter. A representative from OPG responded that OPG conducted several inspections during the vacuum building outage, and noted that some, such as the intake structures, were not related to containment. The OPG representative explained that OPG's assessment confirmed that the structural integrity of the Unit 7 intake structure was intact and would be managed through OPG's aging management program. CNSC staff stated that it reviewed OPG's assessment and methodology regarding the Unit 7 intake channel, which included information from a previous inspection in 2000, and determined that the intake was fit for service in accordance with CSA Standard N291-08²⁴. CNSC staff noted that it applies a risk-informed approach to inspections, and that the intake structure is not safety significant.
158. Regarding concrete degradation, CNSC staff stated that licensees must be compliant with RD-334²⁵, concerning aging management for nuclear power plants, and CSA N287.7-08, concerning testing concrete structures for nuclear power plants. CNSC staff added that it is satisfied that OPG conducts regular inspections and testing of concrete and that it is confident that the Pickering NGS is structurally adequate for service up to 2020.

3.6.4 Reliability

159. OPG stated that the objective of its Equipment Reliability Program is to improve station equipment reliability and reduce forced loss rates by ensuring high levels of reliable performance of components important to nuclear safety and production. OPG noted that its forced loss rate performance was better than its target of 8.6% for 2012, and noted that was aiming to further improve equipment reliability to achieve a forced loss rate equal to 5.5% or better by 2015.
160. OPG also described its initiatives under the Equipment Reliability Improvement Plan, with focused improvement in maintenance backlogs on Units 1, 4, and 8, human performance, general reliability of turbine and auxiliary systems equipment, nuclear system pumps, valves and improvements in the preventive maintenance program.
161. CNSC staff stated that OPG meets the requirements of CNSC Regulatory Standard S-98²⁶, which includes setting reliability targets, performing reliability assessments, testing and monitoring, and reporting for plant systems whose failure would affect the risk of a release of radioactive or hazardous material. CNSC staff noted that OPG must also

²⁴ Canadian Standards Association N291-08, *Requirements for Safety-Related Structures for CANDU Nuclear Power Plants*, 2008.

²⁵ CNSC Regulatory Document RD-334, *Aging Management for Nuclear Power Plants*, June 2011.

²⁶ CNSC Regulatory Standard S-98, *Reliability Program for Nuclear Power Plants*.

ensure the reliability targets are met for all systems important to safety. CNSC staff stated that it was satisfied with OPG's performance regarding its reliability program.

3.6.5 Environmental Qualification

162. Environmental qualification ensures that all required equipment in a nuclear facility is qualified to perform their safety functions if exposed to harsh environmental conditions resulting from credited design basis accidents and that this capability is preserved for the life of the plant. CNSC staff reported that OPG's equipment qualification program at the Pickering NGS is satisfactory. CNSC staff noted that it is satisfied that OPG is compliant with CSA Standard N290.13²⁷.

3.6.6 Life Cycle and Aging Management

163. Aging management is comprised of engineering, operational, inspection, and maintenance actions that control, within acceptable limits, the effects of physical aging and obsolescence of structures, systems and components occurring over time or with use. CNSC Regulatory Document RD-334 sets out the CNSC's requirements for aging management.
164. OPG stated that it has an integrated, comprehensive and systematic framework of programs for managing aging of critical components. OPG explained that its Aging Management program is aligned with IAEA standards, specifically IAEA Safety Guide NS-G-2.12²⁸ and complies with CNSC Regulatory Document RD-334.
165. OPG noted that it had undertaken a coordinated set of initiatives to continue the safe and reliable operation of the Pickering NGS to 2020. OPG explained that its work was progressing by incorporating incremental life cycle management inspections and maintenance into the scope, cost and duration of the outage programs along with other plant equipment improvements. OPG noted that details on the continued operations work program were included in its COP.
166. CNSC staff stated that it is satisfied that OPG has life-cycle management plans for all major components and reported that OPG's Aging Management program meets requirements.

3.6.7 Conclusion on Fitness for Service

167. The Commission is satisfied with OPG's programs for the inspection and life-cycle management of key safety systems. Based on the above information, the Commission concludes that the equipment as installed at the Pickering NGS is fit for service.

²⁷ Canadian Standards Association, N290.13, *Environmental Qualification of Equipment for CANDU Nuclear Power Plants*, 2005.

²⁸ International Atomic Energy Agency Safety Guide NS-G-2.12, *Ageing Management for Nuclear Power Plants*, 2009.

3.7 End-of-Life Strategy

168. OPG stated that its business plan for the Pickering NGS outlines the station's objectives, performance targets, generation plan, funding and station risks. OPG stated that it would continue to invest in the Pickering NGS to ensure safe and reliable operation until the end of commercial operations.
169. OPG stated that its long-term business planning strategy integrated the following needs:
- requirements for safe, reliable power production until all units are shut down at the end of 2020;
 - ending commercial operations at the end of 2020;
 - maintenance of appropriate staffing skill and employee relations up to and beyond 2020; and
 - ensuring implementation of strategies to ensure major component fitness for service and reliability.
170. OPG stated that, according to its plans, all Pickering B units would enter the continued operations phase between 2014 and 2016, and be operated until the end of 2020 or until the limit of 247,000 EFPH is reached for the fuel channels. OPG noted that it would manage the operation of the units to ensure that at least two units from Pickering B would be able to support the operation of Pickering A Units 1 and 4. OPG stated that it would continue its planned in-service inspections to demonstrate ongoing fitness for service.
171. CNSC staff stated that it developed a regulatory oversight plan that would allow it to closely monitor OPG's End-of-Life strategy to ensure that safety would remain the main priority. CNSC staff explained that OPG will be required to manage an "End-of-Life Consolidated Actions Log" document. CNSC staff further stated that it expects to establish a protocol with OPG to manage the end-of-life of the Pickering NGS.
172. CNSC staff explained that the End-of-Life Consolidated Actions Log includes activities related to the following four key issues that will ensure the continued safe operation of the Pickering NGS:
- up-keeping fitness for service of structures, systems and components important to safety;
 - maintaining the validity of the safety case to End-of-Life;
 - sustaining effective organizational and administrative provisions; and
 - inclusion of results of improvement projects.
173. CNSC staff also provided an update on the progress made to date by OPG and CNSC staff regarding the management of the end-of-life of the Pickering NGS. CNSC staff reported that it was satisfied with OPG's progress regarding the development of the end-of-life strategy and expressed confidence that, given the safety and control measures in place, the activities associated with the end-of-life of the Pickering NGS would be performed safely.

174. Based on the above information, the Commission is satisfied with the progress made to date regarding the development of the end-of-life strategy. The Commission directs CNSC staff to provide annual updates to the Commission as part of CNSC staff's annual *Integrated Safety Assessment of Canadian Nuclear Power Plants*.

3.8 Operation Plans

175. OPG provided information regarding its plans to guide the operation of the Pickering NGS to the end of commercial operation by year-end 2020, to transition the facility into a safe storage state, through to the eventual deconstruction, demolition and site restoration. OPG provided information regarding the following plans it had submitted to the CNSC:
- the Pickering B COP, which identifies actions required to support the technical basis for the five-year life extension period for Pickering B;
 - the Pickering SOP, which is a plan to ensure the safe and reliable operation of the Pickering NGS (Pickering A and B) for the last five years of operation and which recognizes the new challenges as the end of commercial operation approaches; and
 - the Preliminary Decommissioning Plan (PDP), which provides a long-term vision for the eventual site restoration and provides assurance of adequate financial resources to complete the decommissioning effort.
176. OPG explained that the COP and SOP are structured around the 14 CNSC Safety & Control Areas, and would continue to be updated annually and submitted to the CNSC for review. OPG noted that the COP actions are specific to Pickering B since past re-tube and return to service activities on Pickering A Units 1 and 4 would support their operation beyond 2020. OPG further noted that Pickering A Units 1 and 4 would be shutdown coincident with the last two Pickering B units.
177. OPG explained that completion of the COP actions would provide the technical basis for the continued operation of Pickering B for the incremental life extension from approximately 2015, or 210,000 EFPH, to approximately 2020, or 247,000 EFPH. OPG noted that the most significant potential life-limiting issue at Pickering B was the fitness for service of the pressure tubes, and that it would continue to work to ensure that the life of the Pickering B pressure tubes could be extended to at least 247,000 EFPH. OPG stated that, to date, it had completed more than half of the COP actions and that the remaining actions were on track for completion in December 2015, as scheduled.
178. OPG explained that the SOP is a life cycle and business planning document that describes the arrangements and activities to support the safe and reliable operation of the Pickering NGS for the period up to the end of commercial operation in 2020. OPG explained that the SOP would mature as the end of commercial operation approaches, and that it identifies the unique constraints and risks associated with the approach to the end of commercial operation, as well as new strategies, direction and actions specific to the last five years of commercial operation. OPG noted that most of the SOP actions

currently pertain to the Human Performance, Fitness for Service, and Management Systems Safety and Control Areas, and that preliminary planning information has also been provided in the SOP to ensure readiness for the stabilization activities or transition into safe storage, and the storage with surveillance life cycle stages.

179. OPG explained that the PDP, which was last submitted to the CNSC in 2012, describes the activities required to decommission Pickering NGS and restore the site. OPG noted that the PDP demonstrates that decommissioning is feasible with existing technology and provides a basis for estimating decommissioning costs. OPG noted that the PDP includes schedules and cost estimates based on the assumptions that form the basis for this plan, and also provides assurance that sufficient funding would be available for decommissioning activities. OPG further noted that, in accordance with the applicable regulatory requirements, the PDP would be superseded by a Detailed Decommissioning Plan (DDP).
180. Many intervenors, including individuals, Greenpeace, the Provincial Council of Women of Ontario, Durham Nuclear Awareness and the Canadian Coalition for Nuclear Responsibility, expressed concerns about the possibility of the Pickering NGS operating beyond 210,000 EFPH. The Commission asked about OPG's decision to operate beyond 210,000 EFPH. An OPG representative responded that 210,000 EFPH was not life-limiting but rather an engineering target to economically justify the original construction of the Pickering NGS. The OPG representative noted that no design limits would be exceeded by 2020. The OPG representative explained that OPG conducted a fuel channel lifecycle management project, which included extensive research, experiments and modelling, to determine that the Pickering NGS could be operated to 247,000 EFPH. The OPG representative further noted that OPG would provide its complete assessment to the CNSC for acceptance before being allowed to proceed with operation beyond 210,000 EFPH.
181. The Canadian Coalition for Nuclear Responsibility submitted a 2005 report regarding the deterioration mechanisms of pressure tubes and feeder pipes in CANDU reactors. The Canadian Coalition of Nuclear Responsibility suggested that, given the uncertainties regarding deterioration mechanisms outlined in the report, Pickering B should be refurbished if it is to be allowed to operate beyond 210,000 EFPH. OPG submitted a response to this submission advising the Commission that the information from 2005 pre-dated the knowledge and understanding gained through the fuel channel life management research provided in Pickering's licence renewal application on the technical basis for continued operation of Pickering B. OPG explained that the research has led to a good understanding of fuel channel degradation and updated models which have been used to predict future degradation and component condition. OPG further stated that there were no new issues contained in the supplementary information submitted by the intervenor that have not been addressed by current research and knowledge of both pressure tube and feeder pipe degradation.
182. The Commission asked for more information concerning the fuel channel lifecycle management project. An OPG representative explained that the project included research

of 18 different aspects of pressure tube life, and stated that the research project methodology was approved by CNSC staff, including all requirements to demonstrate that each aspect will have been completed successfully. The OPG representative provided an example of one of the aspects of the research. The OPG representative explained that one pressure tube aging mechanism is that they accumulate hydrogen during operation, which can weaken the tubes. The OPG representative noted that the design limit codified in the CSA Standard is 100 parts per million of hydrogen, and stated that the Pickering NGS was currently at 53 parts per million of hydrogen. The OPG representative further stated that this is expected to be around 80 parts per million by the end of 2020, which is still well below the design limit. The OPG representative noted that the experiments included burst tests with simulated aging that showed that even at 120 parts per million there was still a significant safety margin.

183. The Commission asked about CNSC staff's analysis of OPG's fuel channel lifecycle management project. CNSC staff responded that it would continue to review the results of OPG's fuel channel lifecycle management project and noted that it would use analytical models to confirm OPG's results.
184. The Commission asked for more information from OPG concerning its confidence in continued operation. A representative from OPG responded that every time a reactor unit is returned to service following an outage, it must be demonstrated that the reactor is fit for service. The OPG representative stated that this practice would continue.
185. The Commission asked CNSC staff to describe its regulatory oversight of OPG's plans. CNSC staff responded that OPG must demonstrate that the pressure tubes meet all design requirements in order to be allowed to proceed with operation beyond 210,000 EFPH, and explained that the COP for Pickering B and the SOP for Pickering A and Pickering B would form the basis of CNSC staff's regulatory oversight of the Pickering NGS. CNSC staff noted that the proposed licence included a hold point that has clear criteria that OPG must meet before being allowed to proceed with operation beyond 210,000 EFPH. CNSC staff noted that the criteria included the condition and fitness for service of the pressure tubes, and that the CNSC would have to completely evaluate and approve the safety case supporting the continued operation of Pickering B before the hold point could be lifted. CNSC staff further noted that, based on unit operating history, Unit 6 was expected to reach 210,000 EFPH during the first quarter of 2014.
186. Several intervenors expressed the view that the Pickering NGS should be decommissioned once it reaches its original expected design life of 210,000 EFPH. Some intervenors were of the opinion that OPG should accelerate its decommissioning plan. The Commission sought further information regarding OPG's decommissioning strategy. A representative from OPG responded that OPG's plan would be to apply a deferred decommissioning strategy with an approximately 30-year safe storage period before dismantling and demolishing the Pickering NGS, followed by site restoration.
187. The Commission asked for more information concerning CNSC staff's review of the COP, SOP and Decommissioning Plan. CNSC staff responded that OPG would submit

the plans for CNSC staff review on an annual basis, and that CNSC staff would track the implementation of the plans and actions once they have been accepted. CNSC staff further stated that it would provide annual updates to the Commission as part of CNSC staff's annual *Integrated Safety Assessment of Canadian Nuclear Power Plants*.

188. Based on the above information, the Commission is satisfied with OPG's operation plans. The Commission is satisfied that OPG will submit the plans for CNSC staff review on an annual basis, and that CNSC staff will provide annual updates to the Commission as part of CNSC staff's annual *Integrated Safety Assessment of Canadian Nuclear Power Plants*.

3.9 Radiation Protection

189. As part of its evaluation of the adequacy of the provisions for protecting the health and safety of persons, the Commission considered the past performance of Pickering NGS in the area of radiation protection. The Commission also considered OPG's program to ensure that both radiation doses to persons and contamination are monitored, controlled, and kept as low as reasonably achievable (ALARA), with social and economic factors taken into consideration.

3.9.1 Public Radiation Exposure

190. Using environmental monitoring results, the public dose rate is determined for a hypothetical member of the public (critical receptor) living near the facility who would receive the maximum exposure to radiation. OPG stated that, over the licence period, the highest estimated radiation dose to the public from all detectable site-related nuclear substances ranged from 0.0009 to 0.0041 millisieverts per year (mSv/y), with the maximum dose of 0.0041 mSv in 2008. These values are well below the public dose limit of 1 mSv/y. CNSC staff noted that background dose around the Pickering NGS from natural radiation sources is about 1.4 mSv/y.
191. Many intervenors, including individuals, Ontario Chapter - Canadian Voice of Women for Peace, and the International Institute of Concern for Public Health, expressed concerns about radiation risks, including the potential health effects associated with exposure to radiation. Some intervenors were of the opinion that the existing regulatory limits were too high and others suggested that there is no safe dose of radiation. Some intervenors, including Sierra Club Canada and Ontario Chapter, and the Canadian Association of Physicians for the Environment, cited studies, such as the German KiKK²⁹ study, suggesting that there is an increased risk of leukemia in children living around nuclear power plants.

²⁹ Epidemiological Study of Childhood Cancer and Nuclear Power Plants (KiKK Study), 2007.

192. The Commission asked for more information regarding the regulatory limits for radiation releases and associated health effects. CNSC staff responded that the radiation protection requirements in Canada are based on international requirements and are well within the safe limits of any exposure to radiation. CNSC staff stated that it uses the linear, no-threshold model as the basis for the dose limits and the ALARA requirements in its *Radiation Protection Regulations*³⁰, and noted that doses to workers and members of the public from the operation of the Pickering NGS were well below the regulatory limits. CNSC staff further stated that the regulatory limits are far below levels where health effects have been observed in studies and are protective of all members of the public, including infants. CNSC staff explained that there is a good understanding of the health effects of radiation due to the combination of epidemiological studies of human populations exposed to radiation and laboratory studies on cells and molecules. CNSC staff stated that these studies have shown that health risks in people exposed to radiation doses of 100 mSv/y or less are low, and that cancer rates in people exposed to these radiation doses have not been observed to be higher than cancer rates from non-radiological causes in the general population. CNSC staff noted that an epidemiological study of 42,000 Canadian nuclear power plant workers found that there is no increased risk to workers, who are more exposed than members of the public, from their radiation exposures.
193. Furthermore, CNSC staff noted that it had recently completed a recent study, titled *Radiation and Incidence of Cancer Around Ontario Nuclear Power Plants From 1990 to 2008 (The RADICON Study)*³¹, which concluded that public radiation doses resulting from the operation of nuclear power plants in Ontario are 100 to 1,000 times lower than natural background radiation and that there is no evidence of childhood leukemia clusters around the three Ontario nuclear power plants. The study further concluded that all cancers for all age groups were well within the natural variation of the disease in Ontario and that radiation was not a plausible explanation for any excess cancers observed within 25 km of any Ontario nuclear power plant.
194. Some intervenors, including individuals, Sierra Club, and the International Institute of Concern for Public Health, disagreed with the results and conclusions of the RADICON study. Intervenors noted that while the study concludes that “doses are a minor risk factor compared to the high prevalence of major risk factors like tobacco, poor diet, obesity and physical inactivity, which account for about 60% of all cancer deaths in developed countries,” these factors should not account for cancers to children. The Commission asked CNSC staff to further explain the results of the study. CNSC staff responded that the study was conducted in 2011, using reliable and validated data sources, including information from the nuclear power plants in Ontario, as well as nuclear facilities in Port Hope and Chalk River, and information from the Canadian and Ontario cancer registries. CNSC staff stated that the study concluded that the incidence of cancer in Ontario was within the natural variation, and noted that there was no increase in leukemia or childhood cancers in the vicinity of the Pickering NGS. CNSC

³⁰ SOR /2000-203.

³¹ Canadian Nuclear Safety Commission *Radiation and Incidence of Cancer Around Ontario Nuclear Power Plants From 1990 to 2008 (The RADICON Study)*, Summary Report, May 2013.

staff further stated that the Port Hope aspect of the RADICON study had already been peer-reviewed, and noted that the entire study would also be peer-reviewed and subject to public consultation.

195. The Commission asked for more information regarding international health studies. Regarding the KiKK study, CNSC staff explained that an expert committee had reviewed the study and determined that there was no relationship between the cluster of childhood leukemia near the Krümmel power plant and radiation exposure, noting that other childhood leukemia clusters were identified in areas that were not near nuclear power plants. CNSC staff referred to other studies, including ones from Finland, Switzerland, France and the UK, that found that there was no relationship between childhood leukemia and radiation exposure near nuclear power plants.
196. Based on the information provided during the hearing, and the Commission's understanding of studies conducted by the United Nations Scientific Committee on the Effects of Atomic Radiation and other international and peer-reviewed scientific publications and research, the Commission is satisfied that the existing regulatory limits are protective of all members of the public, including infants. The Commission is satisfied that there is no increased risk to a member of the public from radiation exposure resulting from the operation of the Pickering NGS.

3.9.2 Worker Radiation Exposure

197. OPG described the radiation protection program at the Pickering NGS and provided a summary of the doses to workers over the licence period. OPG stated that, over the licence period, there were no radiation exposures that resulted in an individual dose that exceeded the regulatory effective dose limits for nuclear energy workers of 50 mSv/y and 100 mSv in a five-year period. OPG stated that the maximum individual annual doses over the licence period ranged from 13.11 mSv/y to 18.06 mSv/y.
198. OPG explained that its radiation protection program includes procedures, training, instrumentation, oversight and metrics to ensure worker safety. OPG noted that its ALARA strategy for the Pickering NGS identifies initiatives, actions and programs that will support achieving these objectives, and the means by which the effectiveness of these initiatives are measured. OPG further noted that the radiation protection program contains extensive contamination control measures to ensure that radioactive contamination is prevented from leaving the plant, and that the spread of contamination within the plant is minimized. OPG also highlighted the improvements it made regarding Alpha monitoring and dosimetry as a result of operating experience from another nuclear facility in Canada.
199. CNSC staff stated that OPG has an effective radiation protection program that protects the health and safety of persons inside the facility and that ensures that occupational

exposures are below regulatory dose limits and are maintained ALARA. CNSC staff stated that OPG's radiation protection program meets regulatory requirements.

200. The Commission noted that OPG had reduced the number of unplanned tritium uptakes in workers over the licence period and requested more information concerning OPG's plans in this area. A representative from OPG responded that the plan was to sustain and improve on this performance, and continue to reduce tritium uptakes. CNSC staff explained that each facility sets its own targets but noted that there are industry benchmarks as well. CNSC staff stated that it was satisfied with OPG's performance in this regard and noted that it would continue to track OPG's performance. The Commission suggested that CNSC staff should include this benchmark as part of its annual reporting on the performance of all Canadian nuclear power plants.
201. The Commission, noting that OPG's collective radiation exposure increased over the licence period, asked for more information concerning OPG's expectations for the proposed licence period. Sierra Club, in its intervention, also noted the increased collective dose. A representative from OPG stated that while collective doses had increased due to the nature of the work conducted over the licence period and the number of workers required to perform this work, doses remained well below regulatory limits. The OPG representative affirmed OPG's commitment to ensure that doses would remain ALARA through to the end of the operating life of the Pickering NGS. A representative from OPG responded that OPG has taken steps to reverse the trend and reduce doses, including a review by its ALARA committee, improved shielding, work planning and removing dose hotspots. The OPG representative stated that OPG's goal and expectation for the next licence period would be to reduce doses to the industry benchmark.
202. Some intervenors, including individuals and the International Institute of Concern for Public Health, suggested that the dose limits for workers were too high and represented an unreasonable health risk. Intervenors explained that, using the regulatory dose limit of 50 mSv/y in the linear, no-threshold model would result in an unreasonable risk for workers. The Commission asked CNSC staff to comment on this interpretation of the dose limits and the linear, no-threshold model. CNSC staff disagreed with the intervenors' interpretation and suggestion that the regulatory limits were an allowable exposure limit. CNSC staff explained that the *Radiation Protection Regulations* require that doses to workers are to be maintained ALARA. CNSC staff noted that the CNSC has requirements in place for all licensees to have radiation protection programs that meet ALARA requirements. CNSC staff reiterated that studies have shown that health risks in people exposed to radiation doses of 100 mSv/y or less are low and that an epidemiological study of 42,000 Canadian nuclear power plant workers found that there is no increased risk to workers.

3.9.3 Conclusion on Radiation Protection

203. The Commission is of the opinion that, given the mitigation measures and safety programs that are in place or will be in place to control hazards, OPG will provide

adequate protection to the health and safety of persons, the environment and national security.

3.10 Conventional Health and Safety

204. Conventional health and safety covers the implementation of a program to manage workplace safety hazards. This program is mandatory for all employers and employees in order to reduce the risks associated with conventional (non-radiological) hazards in the workplace. This program includes compliance with Part II of the *Canada Labour Code*³² and conventional safety training.
205. The Commission notes that the employees involved in the nuclear aspect of energy production employed by former-Ontario Hydro (OPG) fall under federal jurisdiction, and the jurisdiction over Occupational Health and Safety (OHS) for these employees will therefore be federal. The OHS of OPG workers that are not involved in the nuclear aspect of energy production will fall under provincial jurisdiction³³. In some provinces, however, federal legislation has incorporated by reference provincial labour laws, and it is therefore the provincial requirements that apply to employees at nuclear works and undertakings. It is necessary to look at the individual instances of nuclear energy workers to determine whether federal or provincial OHS laws will apply. In Ontario, the Ontario Hydro Nuclear Facilities Exclusion from Part II of the Canada Labour Code Regulations (Occupational Health and Safety), made pursuant to s. 159 of the *Canada Labour Code*, has incorporated by reference the provincial legislation respecting OHS. This regulation was made by the Governor in Council, on the recommendation of the Minister of Labour after consultation with the CNSC³⁴.
206. It is therefore the provincial requirements that apply to these facilities, but only because the federal legislation has incorporated them by reference for these facilities. It is the federal legislation (i.e., Part II of the *Canada Labour Code*) that remains the governing legislation. In 1998, Human Resources and Skills Development Canada (HRSDC) entered into a Memorandum of Agreement with the Ontario Ministry of Labour (MOL) by which the latter exercises regulatory oversight over OHS matters at nuclear power plants on behalf of HRSDC. The jurisdiction over OHS at power plants in Ontario remains federal. It is however governed by the provincial requirements as a result of their incorporation into federal legislation and administered by the province because of the administrative arrangement between HRSDC and the MOL.

³² R.S.C., 1985, c. L-2.

³³ SOR/98-180. The labour relations and working conditions (labour standards) at power reactors in Ontario are also subject to the provincial regime pursuant to Ontario Hydro Nuclear Facilities Exclusion from Part I of the Canada Labour Code Regulations (Industrial Relations) (SOR/98-179) and Ontario Hydro Nuclear Facilities Exclusion from Part III of the Canada Labour Code Regulations (Labour Standards) (SOR/98-181).

³⁴ Section 123 of the *Canada Labour Code* provides that it applies to and in respect of employment “on or in connection with the operation of any federal work undertaking or business...” This legislation comes under the responsibility of the Labour Program of Human Resources and Skills Development Canada (HRSDC).

207. OPG stated that the goal of its conventional safety program is to ensure that workers work safely in a healthy and injury-free workplace by managing the risks associated with the activities, products and services of OPG's operations. OPG noted that it reduces risks by following operational controls that were developed using risk assessment and safe work planning. OPG further stated that it has two Joint Health and Safety Committees that work to identify and recommend solutions to health and safety problems in the workplace. OPG explained that it evaluates all conventional safety-related events through its corrective action process to identify potential trends and areas for improvement. OPG also provided information regarding its occupational health and safety performance over the licence period, noting that it had two lost-time injuries during the licence period, in May 2008 and March 2012.
208. CNSC staff reported that OPG's conventional health and safety program, as well as its implementation, were compliant with the *Canada Labour Code*. CNSC staff noted that the CNSC and the MOL signed a Memorandum of Understanding in July 2011 to establish a formal mechanism for cooperation and for the exchange of information and technical expertise related to their respective areas of jurisdiction, such as occupational health and safety practices at nuclear facilities. CNSC staff further stated that OPG's performance regarding occupational health and safety has exceeded regulatory requirements.
209. OPG also provided information regarding the management of asbestos hazards in the Pickering NGS, noting that it has an asbestos management program that has identified opportunities for improvement in the protection of workers. CNSC staff stated that it was working with the MOL to address this matter.
210. The Commission asked for more information regarding OPG's management of asbestos. A representative from the MOL commented that the Pickering NGS is relatively safe regarding its management of asbestos and noted that OPG had closed all but one order, which pertained to training. A representative from OPG stated that OPG had provided training to ensure that its employees were aware of the hazards of asbestos and noted that it was planning to carry out additional training to address the MOL's concerns.
211. The Commission, noting that OPG had five critical injuries over the licence period, asked for more clarification regarding the distinction between a 'critical injury' and a 'lost-time injury'. A representative from OPG responded that an injury that is classified as a critical injury is a type of accident that is defined in Ontario regulations but does not necessarily reflect the consequences of the accident, such as whether an employee would have to miss work. A representative from the MOL stated that OPG's performance in this area was satisfactory.
212. The Commission is of the opinion that the health and safety of workers and the public was adequately protected during the operation of the Pickering NGS for the current licence period, and that the health and safety of persons will also be adequately protected during the continued operation of the facility.

3.11 Environmental Protection

213. Environmental Protection covers OPG's programs to identify, control and monitor all releases of nuclear substances and to minimize the effects on the environment which may result from the licensed activities. It includes effluent and emissions control, environmental monitoring, and estimated doses to the public.
214. OPG stated that its environmental protection programs include both radiological protection to maintain doses to the public ALARA, and protection of the environment and the public from conventional hazards. OPG further stated that its approach to environmental protection is in accordance with the elements of ISO 14001 Environmental Management Systems standard, as well as the CNSC Regulatory Standard S-296³⁵.
215. CNSC staff reported that OPG's performance regarding environmental protection for the licence period was satisfactory.

3.11.1 Effluent and Emissions Control

216. OPG provided information regarding its effluent and emissions control. OPG stated that estimated doses to the public decreased over the licence period due to station improvements to lower tritium emissions. OPG noted that there were no Derived Release Limit or Action Limit exceedances for Tritium, Beta/Gamma or Carbon-14 emissions to water on an annual basis during the current license period. OPG further stated that reported emissions for tritium and carbon-14 were relatively constant, and less than 1% of the Derived Release Limits over the past 3 years. In addition, OPG stated that beta-gamma emissions to water ranged between 1-4% of its Derived Release Limit.
217. OPG noted that there was one monthly Action Level exceedance on Pickering B for a release of Beta/Gamma to water that occurred in June 2010. CNSC staff stated that it was satisfied with OPG's response to this event and that it had closed the Action Item associated with the event.
218. Some intervenors, including Sierra Club and individuals, expressed concerns regarding releases of Iodine-131 and the possible links to thyroid cancer in the region. The Commission asked for more information concerning these releases. CNSC staff responded that the levels of radioactive iodine released by the Pickering NGS were not detectable and that there was no link to thyroid cancer at these levels.
219. Some intervenors, including individuals and Citizens for a Safe Environment and the Committee for Safe Sewage, noted that the limit for tritium in drinking water in Ontario is set at 7,000 Becquerels per litre (Bq/L), which is higher than in some countries in Europe and the United States. Intervenors also noted the 2009 Ontario Drinking Water

³⁵ CNSC Regulatory Standard S-296, *Environmental Protection, Policies, Programs and Procedures at Class 1 Nuclear Facilities and Uranium Mines and Mills*, 2006.

Advisory Council recommendation that Ontario reduce the limit for tritium in drinking water from 7,000 Bq/L to 20 Bq/L. The Commission sought further information on this matter. CNSC staff responded that the 7,000 Bq/L limit was set by Health Canada based on a recommendation from the World Health Organization, and corresponds to a dose of 0.1 mSv/y, which is 10% of the annual dose limit, for an average consumption of two litres per day. CNSC staff further noted that many of the lower limits cited by intervenors were design objectives or screening values used to indicate the possible presence of other radionuclides, rather than regulatory limits.

220. The Commission enquired about the levels of tritium in drinking water around the Pickering NGS during the licence period. CNSC staff responded that they ranged from 7 to 18 Bq/L in Pickering drinking water supply plants and up to 11 Bq/L in Toronto.
221. One intervenor expressed concerns regarding coastal jet currents in Lake Ontario transporting contaminants from the Pickering NGS to Toronto. The Commission asked for more information on this subject. A representative from Environment Canada explained that the direction and intensity of the flow of coastal jet currents are dependent on thermodynamic conditions in the lake, wind conditions and Coriolis force, which is associated with the rotational rotation of the Earth. The Environment Canada representative noted that while the current does have the potential to transport contaminants either east or west from the Pickering NGS, Environment Canada was satisfied that, based on environmental monitoring results, releases are not at levels that would pose a concern, even when observed under spill conditions.

3.11.2 Environmental Monitoring

222. OPG provided information regarding its monitoring programs, including the groundwater monitoring program and the Radiological Environmental Monitoring Program (REMP).
223. OPG stated that its groundwater monitoring program addresses the predominant on-site groundwater flow characteristics of the Pickering site, monitors changes to on-site groundwater quality to ensure timely detection of inadvertent releases of nuclear and hazardous substances to groundwater, and ensures that there are no adverse off-site impacts from contaminants in groundwater. OPG explained that it takes and analyzes samples from wells located throughout the Pickering Nuclear site on a quarterly basis, at a minimum, and assesses the data against the objectives of the program. OPG stated that its on-site groundwater quality has had no adverse impact to the drinking water quality as the nearby water supply plants had tritium results significantly lower than the Ontario Drinking Water Limit for tritium of 7000 Bq/L.
224. OPG stated that its REMP is designed to demonstrate, independent of effluent monitoring, that nuclear site emissions of radioactive materials are properly controlled and to estimate annual doses to the public based on environmental data to confirm compliance with the public dose limit.

225. OPG noted that it also monitors and controls water effluent for non-radiological discharges to meet the requirements of the provincial Municipal Industrial Strategy for Abatement (MISA) regulation, O. Reg. 215/95³⁶.
226. Several intervenors, including individuals and Lake Ontario Waterkeeper, expressed the view that monitoring data should be made available to the public more frequently. The Commission asked for more information on this matter. A representative from OPG responded that OPG makes its emissions data available to the public through the publication of an annual REMP report, which is posted on the OPG Web site. The OPG representative noted that OPG also communicates information regarding spills to the Ontario Ministry of the Environment Spills Action Centre and the CNSC, as well as to the municipality and to the public, as appropriate.
227. The Commission asked for more information concerning the CNSC's oversight of OPG's monitoring practices. CNSC staff noted that CNSC regulations require effluent and emission monitoring, as well as environmental monitoring. CNSC staff explained that OPG is required to have a detailed environmental monitoring program, including air monitoring, milk, drinking water, forage, vegetables, and groundwater. CNSC staff noted that stack emissions are also monitored, modelled and incorporated in conservative public dose models. CNSC staff further stated that it conducts detailed inspections and audits and reviews all aspects of OPG's monitoring programs to ensure that they are carried out appropriately.
228. The Commission asked for more information concerning OPG's monitoring practices and enquired about the possibility of releasing raw monitoring data to the public. An OPG representative explained that OPG conducts continuous monitoring on a daily basis with low thresholds for investigation and Action Levels. The OPG representative noted that OPG conducts its environmental monitoring in accordance with CSA Standards. The OPG representative stated that while OPG does not regularly publish its monitoring data, it provides quarterly reports to the CNSC and publishes an annual report. CNSC staff noted that it was in the process of launching an independent monitoring program that would provide information on the CNSC Web site. CNSC staff further noted that it would also be working to include independent monitoring data from Health Canada and the MOL.
229. The Commission acknowledges the intervenors' concerns regarding the availability of monitoring data. The Commission recommends that OPG make environmental monitoring data accessible to the public on a more frequent basis.

³⁶ Ontario Regulation 215/95, *Effluent Monitoring and Effluent Limits – Electric Power Generation Sector*.

3.11.3 Fish Impingement and Entrainment, and Thermal Effects

230. OPG provided information regarding the improvements it made to the once-through cooling water system used at the Pickering NGS in order to minimize fish impingement, entrainment and thermal effects. OPG explained that it installs a Fish Diversion System (FDS) in front of the Pickering water intakes from the spring to the fall, which has reduced fish mortality by approximately 90%. OPG stated that its monitoring programs have shown that the current performance of this system is consistent with its original design expectation and that it is effective at protecting fish populations, and noted that it would continue to monitor fish impingement and FDS performance to ensure ongoing success.
231. OPG stated that, as Northern Pike are mostly impinged over the winter when the barrier net is not in place, it would secure funding for a wetland restoration project in the nearby Duffins Creek Marsh in order to improve the local Northern Pike population and benefit other wetland species. OPG noted that it has also implemented initiatives to offset any entrainment effects, including sponsorship of the Atlantic Salmon Restoration Program. CNSC staff reported that OPG is adequately managing the effects of its operational activities on aquatic biota. CNSC staff agreed with OPG that there is no cost-effective technology or operational measures to directly mitigate entrainment.
232. Regarding thermal effects, OPG stated that it had completed several studies on the effects of the thermal plume on whitefish embryo survival, as well as a review of potential mitigation options. OPG stated that its studies concluded that while the thermal plume from Pickering B presented a potential but small risk to round whitefish, there were no direct mitigation measures that were cost-effective and feasible given the existing facility design, high costs and the short period of remaining operating life. CNSC staff noted that it would continue to work with OPG regarding round whitefish thermal risk management.
233. The Métis Nation of Ontario (MNO), in its intervention, stressed the importance of fish and fish habitat and suggested that the MNO should be included in discussions regarding the implementation of mitigation measures. The Commission asked for more information in this regard. A representative from the MNO explained that the MNO could provide information concerning its use of fish and that the MNO would like to ensure that its values were brought forth. A representative from OPG stated that OPG was committed to exploring ways to actively involve the MNO in its mitigation efforts.
234. Lake Ontario Waterkeeper, in its intervention, expressed concerns that OPG had not met the impingement and entrainment targets that had been set by the CNSC in 2008. Lake Ontario Waterkeeper recommended that OPG keep the barrier net in place year-round in order to protect Northern Pike. Lake Ontario Waterkeeper also recommended that OPG should cease operating if it is not able to meet the entrainment targets. Lake Ontario Waterkeeper also expressed a preference for mitigation rather than using habitat offsets. Lake Ontario Waterkeeper also suggested that cumulative impacts to fish in Lake

Ontario should be considered when determining whether the Pickering NGS is affecting the lake-wide population of fish species.

235. The Commission asked OPG to explain its rationale for not using the barrier net year-round. A representative from OPG responded that it was not safe for workers to operate and maintain the net during the winter months. The OPG representative further stated that ice could damage the net and that it could affect the safety of the Pickering NGS. The OPG representative noted that it is a common practice for other utilities, not just nuclear power plants, to remove such nets during the winter months.
236. The Commission asked for more information regarding the determination that there were no cost-effective and feasible mitigation measures for entrainment given the short period of remaining operating life. CNSC staff explained that the impingement and entrainment targets that had been set by the CNSC in 2008 were based on work that had been done in the United States by the U.S. Environmental Protection Agency (U.S. EPA). CNSC staff responded that while there are a number of technologies that could be used to mitigate entrainment, the one that the U.S. EPA determined was the most likely for use at power stations would not be effective at the Pickering NGS because the survival rate for the most entrained species, the Alewife, would still be low, and such a technology would also require several years of fine-tuning. CNSC staff further noted that the U.S. EPA was in the process of revising its requirements to remove the need to reduce entrainment by 60 to 90 percent and instead make a site-specific decision. CNSC staff stated that, taking the revised requirements into consideration, the site-specific solution for habitat offset was appropriate.
237. The Commission sought the opinion of Fisheries and Oceans Canada (DFO) and Environment Canada regarding OPG's performance. A representative from DFO responded that DFO was satisfied with OPG's performance regarding impingement and noted that DFO would continue to provide support and advice to the CNSC regarding entrainment. The DFO representative noted that while DFO's preference is to mitigate before offsetting, it was satisfied that the creation of habitat could be used to offset entrainment losses and added that a benefit of habitat offset was that the habitat could continue to produce new fish beyond the operating life of the facility. The DFO representative expressed the view that, ultimately, habitat offset would be a better option than mitigation given the relatively short remaining life of the Pickering NGS. A representative from Environment Canada commented that Environment Canada was satisfied with OPG's proposed mitigation measures and ongoing monitoring for thermal effects.
238. The Commission asked for more information concerning the lake-wide impact that the Pickering NGS was having on fish populations. The representative from DFO commented that it is possible to look at lake-wide impacts for a species such as Alewife, because it is a homogenous, lake-wide species that does not have a specific spawning habitat. The DFO representative noted that the number of Alewife entrained by the Pickering NGS is very small compared to the very large lake-wide population. Lake Ontario Waterkeeper noted that the Pickering NGS entrains species besides Alewife,

including the Round Whitefish and the American Eel, and that these species do not have the same spawning behaviour or distribution as Alewife. Lake Ontario Waterkeeper stressed the need to look at cumulative impacts when discussing lake-wide populations, rather than individual stressors.

239. Based on the above information, including the advice from DFO and Environment Canada, the Commission is satisfied with the measures in place at the Pickering NGS to address fish impingement and entrainment, and thermal effects.

3.11.4 Conclusion on Environmental Protection

240. Based on the above information, the Commission is satisfied that, given the mitigation measures and safety programs that are in place to control hazards, OPG will provide adequate protection to the health and safety of persons and the environment.

3.12 Emergency Management and Fire Protection

241. Emergency management and fire protection covers the provisions for preparedness and response capabilities which exist for emergencies and for non-routine conditions at the Pickering NGS. This includes nuclear emergency management, conventional emergency response, and fire protection and response.

3.12.1 Emergency Management

242. Emergency Management includes the on-site requirements for the licensee, as well as the off-site measures to protect the public in the event of an emergency.

3.12.1.1 On-site Emergency Management

243. On-site emergency response encompasses both conventional and nuclear emergency preparedness programs and licensee staff performance during emergency exercises and response to emergencies. OPG described its emergency management program. OPG noted that it conducts regular emergency drills, which provide an opportunity for its emergency response crews to improve and sustain their emergency response capability, in accordance with the emergency procedures established at the Pickering NGS. OPG stated that it is in full compliance with CNSC Regulatory Document RD-353³⁷. OPG further noted that its emergency preparedness procedures were revised to incorporate Severe Accident Management Guidelines requirements and that it would continue to review the adequacy of its emergency management program on an ongoing basis, including the incorporation of lessons learned from the Fukushima Daiichi nuclear accident.

³⁷ CNSC Regulatory Document RD-353, *Testing the Implementation of Emergency Measures.*, October 2008.

244. CNSC staff stated that it is satisfied that OPG has an effective emergency management program that provides for preparedness and response capability to mitigate the effects of accidental release of nuclear substances and hazardous substances. CNSC staff noted that OPG's emergency response plan meets the expectations detailed in CNSC Regulatory Guide G-225³⁸.
245. The Commission sought further information regarding the storage of the emergency equipment. A representative from OPG responded that the equipment is stored on high ground in a building that is lightweight to ensure that the building would not damage the equipment in the event that it were to collapse on the equipment. The OPG representative noted that this would ensure that the equipment would remain accessible in the event of an accident.
246. The Canadian Nuclear Workers Council expressed support for OPG's emergency preparedness. The Commission asked about the involvement of workers in implementing improvements based on the lessons learned from Fukushima. A representative from OPG responded that many OPG workers were involved in the development of procedures that outline the details of emergency response. An OPG representative further noted that workers developed plans and training for the deployment of emergency equipment, and that OPG conducts drills to ensure that the workers are able to execute the procedures. The OPG representative also noted that workers train with and test the emergency response equipment.
247. The Commission asked OPG if its emergency plans would cover a worst-case accident. A representative from OPG responded that they do, noting that OPG's plans provide the capability to respond to any type of scenario. The OPG representative noted that severe accidents are explicitly covered in its plans.

3.12.1.2 Off-site Emergency Management

248. OPG stated that off-site emergency response encompasses both conventional and nuclear emergency preparedness programs and licensee staff performance during emergency exercises and response to emergencies. OPG noted that off-site response capabilities to protect the public have been in place since start of operations at the Pickering NGS, and that the Province, Region, Municipality and OPG were working on continuous improvements. OPG stated that it has continued to provide full support to municipalities and Emergency Management Ontario (EMO) in their planning and preparedness activities, including financial and technical support.
249. OPG described the off-site emergency management measures around the Pickering NGS. OPG explained that, under the 2009 Provincial Nuclear Emergency Response Master Plan (PNERP), OPG is required to provide resources and assistance to the Regional Municipality of Durham to enable it to establish and maintain a public alerting system.

³⁸ CNSC Regulatory Guide G-225, *Emergency Planning at Class I Facilities and Uranium Mines and Mills*, August 2001.

OPG noted that, within the Contiguous Zone (0 to 3 kilometres (km)) around the Pickering NGS, the public alerting system must provide, within 15 minutes, warning to “practically 100% of the people, whether they are indoors or outdoors, and irrespective of the time of day or year.” OPG stated that it had purchased indoor tone alert radios for the Durham Emergency Management Office (DEMO) as part of DEMO’s requirement to meet indoor alerting responsibilities under the PNERP. For outdoor public alerting, OPG stated that 9 sirens were installed within the 3 km zone around the Pickering NGS and that 11 additional sirens would be installed in 2013. OPG further explained that the Legends Centre in the City of Oshawa was made operational for use as a Reception Centre, including equipment and procedures for monitoring and decontamination, during a nuclear emergency.

250. OPG noted that EMO and municipal partners were working to enhance outdoor public alerting systems for the 10-km zone to meet revised provincial requirements. OPG explained that DEMO was working to ensure that the auto-dialler system in place can meet the 15-minute standard for the 3 to 10 km zone.
251. OPG stated that it consults and meets regularly with the Province and local municipalities to review the status of off-site preparedness, training, exercises and ongoing improvements. OPG noted that it schedules annual drills and exercises to test regional emergency worker centres and reception centres. OPG stated that annual drills and training sessions are routinely scheduled with both the City of Pickering Fire Department and the Durham Emergency Medical Services.
252. OPG also provided information regarding potassium iodine (KI) tablets. OPG explained that an inventory of 325,000 KI tablets was available for residents of the 10-km zone around the Pickering NGS, and that the tablets are stocked at five local pharmacies and are available to residents at any time. OPG noted that additional KI tablets are stocked in schools, daycares, nursing homes, hospitals, evacuation reception centres and emergency worker centres. OPG further noted that the KI tablets were restocked in 2012, and that the current inventory would not expire until 2019.
253. Regarding public evacuation, OPG provided information regarding an evacuation time estimate that showed that the 10-km primary zone around the Pickering NGS could be evacuated in approximately 5 to 6.5 hours, depending on the weather conditions. OPG noted that the evacuation time study also used projected regional data to provide estimations for primary zone evacuation in 2025, with a maximum evacuation time of the 10-km primary zone being projected as nine hours in 2025. CNSC staff stated that it had an independent expert review the OPG evacuation time estimate study, who generally supported OPG’s results, indicating a worst case error of 50%. Based on this review, CNSC staff stated that it can be conservatively estimated that the 10-km zone could be evacuated in less than 13.5 hours using 2025 projected regional data.
254. At the request of the Commission, CNSC staff presented clarification regarding the roles and responsibilities of all the applicable agencies and organizations during a nuclear emergency. CNSC staff presented an integrated emergency response overview describing

the relationship between emergency plans of the nuclear power plants, the Municipality, Region, Province, Health Canada and Public Safety Canada, with a particular focus on the first 24 to 72 hours of the emergency response.

255. CNSC staff further stated that all key stakeholders would join under CSA sponsorship to develop CSA Standard N1600, *General Requirements for Emergency Management for Nuclear Facilities*. CNSC staff explained that this new standard would provide a means to achieve consistency in nuclear emergency response in different provinces. CNSC staff further explained that CSA Standard N1600 would focus on consequence management and consider all hazards that can impact a nuclear power plant. CNSC staff noted that the standard would include on-site and off-site considerations. CNSC staff stated that the Technical Committee with representation from all sectors of nuclear emergency management included the CNSC, licensees, Public Safety Canada, Health Canada, EMO, DEMO, Environment Canada, community stakeholders and professional services, and began work in January 2013. CNSC staff noted that the draft for 60-day industry/public review was targeted for August 30, 2013, with the final document expected to be published in June 2014.
256. The Commission asked for more information concerning the integrated response. OPG provided a detailed overview of the roles and responsibilities of each government department and organization. OPG further noted that the new CSA Standard was being developed and that a large-scale exercise was planned for 2014. OPG explained that the large-scale exercise would incorporate all of the applicable agencies at all levels of government. CNSC staff stated that detailed plans and provisions were in place that have been reviewed and are adequate, and noted that improvements could always be made.
257. EMO, DEMO and OPG also presented information regarding integrated emergency response in Ontario. EMO, DEMO and OPG explained the notification and response responsibilities of OPG, the Province, and municipalities, including the Durham Region and the City of Toronto. EMO, DEMO and OPG also provided information regarding monitoring, public alerting and the communication of emergency information, protective actions, including evacuation, and recovery. EMO, DEMO and OPG also provided a summary event response timeline.
258. The Commission asked if DEMO had adequately informed the public of the emergency plans for the Durham Region. A representative from DEMO stated that a pamphlet was delivered to the residents of the 10-km zones for the Pickering NGS and the Darlington NGS.
259. The Commission asked for more information concerning the Joint Traffic Control Centre, which would be used in the event of an evacuation. A representative from the Ontario Ministry of Transportation responded that the Joint Traffic Control Centre is a mechanism under the Ministry of Transportation's Emergency Planning Office. A representative from EMO noted that the Joint Traffic Control Centre was activated and tested during the 2012 "Huron Challenge" exercise for the Bruce Power NGSs located in Bruce County, Ontario.

260. Many intervenors, including individuals and the CELA, expressed concerns regarding the availability of KI tablets in the region. The Commission asked for more information on this matter. A representative from DEMO stated that DEMO provided information about the KI tablets in its recent pamphlet and noted that the designated pharmacies could obtain more from OPG if required. The DEMO representative further stated that KI tablets would be available in reception centres in the event of an emergency. The DEMO representative further noted that the requirement is that there be a sufficient amount of KI tablets for everyone within the 10-km zone, and affirmed that this was the case. A representative from EMO stated that the requirements for KI tablets beyond the 10-km zone had not yet been established, but noted that they would be informed by the forthcoming Radiation Health Response Plan by the Ontario Ministry of Health. CNSC staff stated that Health Canada would also manage the distribution of KI tablets as part of the Federal Nuclear Emergency Plan.
261. Some intervenors stressed that KI tablets need to be ingested as early as possible in order to be most effective. CNSC staff agreed and noted that, based on the measures in place to prevent and mitigate accidents at the Pickering NGS, there would be sufficient time to alert the public before any releases. The Commission agreed that the strategy for KI tablet distribution needs to be well-understood.
262. Several intervenors, including individuals, the Provincial Council of Women of Ontario and the CELA, expressed concerns regarding evacuation. The Commission asked for more information on this subject. CNSC staff responded that a conservative estimate for the worst-case accident scenario was that there would be 18 hours before any releases from the facility, and that this would provide sufficient time for EMO and the Ministry of Transport to evacuate the area, as necessary. A representative from OPG stated that OPG's evacuation time estimates were conservative, and took the harshest weather conditions, time of day, and human behaviour into consideration. A representative from EMO noted that a decision to evacuate would be made through consultation by emergency management stakeholders within two to four hours. The EMO representative further noted that OPG would provide its first notification to EMO within 15 minutes of an event.
263. Some intervenors, including individuals and the CELA, highlighted the need for credible information in the event of an emergency. The Commission asked if the CNSC and OPG had this capacity. CNSC staff responded that, as part of its review of lessons learned from Fukushima, the CNSC ensured that it had a proper communication strategy, which includes the ability to provide information in plain language. CNSC staff further noted that it developed a Web site that would become active in the event of an emergency. A representative from OPG stated that OPG has a 24-hour media line and spokespeople who can provide information to the public in an emergency.
264. The CELA, in its intervention, presented a thorough review of emergency management in Ontario. The CELA was of the view that the level of emergency planning and preparedness around the Pickering NGS was insufficient, and suggested that the population in the vicinity of the Pickering NGS, including Toronto, should be more

engaged, informed, and involved in all aspects of emergency planning. The CELA submitted 30 recommendations. The CELA recommended that the Commission not renew the licence for the Pickering NGS due to insufficient emergency preparedness, and suggested that the Commission has the authority under the NSCA to impose terms and conditions in respect of emergency planning and preparedness as condition of licensing nuclear plants.

265. The Commission asked EMO, DEMO, the CNSC and OPG how they would address the recommendations from CELA. A representative from EMO stated that EMO would review the CELA's presentation and discuss it with its stakeholders such as DEMO, OPG and the City of Toronto. The EMO representative stated that EMO would adjust its plans as necessary to cover any identified gaps. The DEMO representative concurred with EMO and stated that DEMO would review the document and ensure that any identified gaps are covered. The DEMO representative noted the seriousness of emergency planning and public safety, and stated that there are many factors that provide input into its plans, including legislative requirements, regional requirements and input from the public.
266. A representative from OPG noted the plan in place to address nuclear emergency management in the new CSA Standard N1600. The OPG representative explained that the standard is intended to provide guidance to licensees, as well as off-site agencies and host communities, on how to respond in an emergency, including protective actions, such as sheltering. The OPG representative noted that many of the recommendations from the CELA would be covered in the new standard. CNSC staff noted that the public, including the CELA, would also have the opportunity to participate in the CSA process.
267. CNSC staff stated that the new CSA Standard could become part of the licence requirements in the LCH once the standard has been finalized. CNSC staff noted that there were already requirements for emergency management in the LCH. A representative from OPG stated that OPG met the existing licence requirements and noted that OPG would work to meet any new requirements that would be established by the new standard. The OPG representative further noted that OPG would also meet the emergency management requirements of the CNSC's Fukushima Action Plan.
268. The Commission asked if KI tablet distribution would be addressed in the new CSA Standard. A representative from OPG responded that it would. The Commission recommended that it be considered on a broad scale, beyond the 10-km zone and taking the possibility of pre-distribution into account. OPG committed to thoroughly review this issue.
269. The Commission asked CNSC staff to comment on the licence renewal application given the recommendations from the CELA and concerns from intervenors. CNSC staff responded that OPG is required to meet its licence conditions, and stated that, given the qualifications, measures and plans in place from OPG, EMO and DEMO, CNSC staff recommended that the licence be renewed. CNSC staff noted that EMO's plan would cover a beyond-design basis accident scenario. CNSC staff acknowledged the submission from the CELA and noted that there may be areas that can be improved or

refined, but stated these were not an impediment to licence renewal. CNSC staff further stated that it would continue to present annual updates to the Commission regarding the status of the Fukushima Action Plan, including emergency management integration.

270. The Commission is satisfied that OPG meets requirements for off-site emergency management. The Commission also acknowledges the concerns of intervenors regarding the communication of off-site emergency plans. The Commission recommends that OPG, EMO, DEMO, CNSC staff and the Technical Committee reviewing CSA Standard N1600, consult with the affected communities to ensure that there is adequate public involvement in the development of the CSA Standard.
271. Despite the good work that has been done, the Commission is very concerned that, based on what it heard from intervenors, the emergency plan in place does not appear to be well-understood by members of the public. The Commission strongly encourages EMO, DEMO, OPG and CNSC staff, among others, to strive to ensure that there is an integrated, well-understood emergency plan with accountabilities and timelines in place, and that this plan be clear and understandable for members of the public. The Commission directs OPG to ensure the production of an emergency management public information document, to be distributed to all households in the Pickering area, summarizing the integrated emergency response plan of all involved organizations, including all key roles and responsibilities. This document should also include information on potassium iodide (KI) tablet distribution and information included in CSA Standard N1600. This document is expected to be produced by the end of June 2014.

3.12.2 Fire Protection

272. OPG provided information regarding its fire protection program. OPG explained that it completed several assessments to ensure compliance with CSA Standard N293-07³⁹, to which it had transitioned over the licence period. OPG stated that it carries out training, drills and testing as part of its fire protection program. OPG explained that its Fire Brigade is supported municipally by Pickering Fire Services through a Memorandum of Understanding, which is updated annually and documents the elements of mutual aid between the parties. OPG noted that its partnership with Pickering Fire Services incorporates joint Incident Command training, live fire training, and drills. OPG also noted several enhancements it made to its fire protection capability over the licence period, including the acquisition of multiple fire pumpers and the installation of a dedicated water supply and pumps, as well as improvements related to lessons learned from the Fukushima nuclear accident.
273. CNSC staff reported that OPG's fire response is in compliance with the requirements of CSA Standard N293-07 for an industrial fire brigade, and that OPG's fire protection program is adequate to maintain an acceptable level of protection from fire at the facility.

³⁹ CSA Standard N293-07, *Fire Protection for CANDU Nuclear Power Plants*, 2007.

274. The Commission is satisfied that OPG's fire protection program is adequate to maintain an acceptable level of protection from fire at the facility.

3.12.3 Conclusion on Emergency Management and Fire Protection

275. Based on the above information, the Commission concludes that the fire protection measures and emergency management preparedness programs in place, and that will be in place, at the facility are adequate to protect the health and safety of persons and the environment.
276. The Commission is satisfied that the emergency response measures in place are acceptable to respond in the event of an accident at the Pickering NGS. The Commission stresses the importance of the various levels of government working well in an integrated fashion. The Commission encourages DEMO and EMO to improve their public communication regarding the nuclear emergency plans in place, particularly within the 10-kilometre zone around the Pickering NGS. The Commission recommends that OPG, EMO, DEMO, CNSC staff and the Technical Committee reviewing CSA Standard N1600, consult with the affected communities to ensure that there is adequate public involvement in the development of the CSA Standard.

3.13 Waste Management

277. Waste management covers the licensee's site-wide waste management program. CNSC staff evaluated OPG's performance with regards to waste minimization, segregation, characterization, and storage.
278. OPG stated that it limits the production of low and intermediate level radioactive waste at the Pickering NGS to minimum practical levels. OPG noted that it introduces new waste reduction initiatives whenever feasible to further reduce produced and stored volumes. OPG further noted that its used fuel is managed and stored in the separately-licensed Pickering Waste Management Facility.
279. With regards to chemical waste, OPG stated that it tracks the volume of chemical waste drums on site to ensure that the Pickering NGS remains in compliance with provincial regulations regarding the storage and disposal of conventional chemical wastes. OPG noted that it continues to meet federal and provincial requirements in processing and disposing of hazardous and chemical wastes.
280. CNSC staff stated that it is satisfied that OPG takes the necessary steps to minimize, segregate and characterize the radioactive wastes generated as a result of operating the Pickering NGS, and that OPG complies with provincial waste regulations for conventional solid waste. CNSC staff further stated that OPG has demonstrated consistent and compliant management and control of waste storage throughout its operations.

281. Some intervenors, including Northwatch, expressed concerns that additional waste volumes would be generated by the proposed extended operation of the Pickering NGS. The Commission asked OPG to address this issue. A representative from OPG stated that OPG has adequate facilities to store and manage the waste that would be generated for the proposed continued operation through to 2020. The OPG representative explained that OPG is well aware of the waste it generates and manages, and noted the strategies it has in place to improve and reduce waste generation.
282. Northwatch, in its intervention, expressed concerns regarding OPG's long-term storage of nuclear waste. Northwatch noted that OPG has proposed to construct and operate a deep geologic repository for low and intermediate-level radioactive waste (DGR), and that all of Canada's high level (used fuel) waste, is expected to be managed through the Nuclear Waste Management Organization's Adaptive Phased Management process. Northwatch pointed out that while OPG has not explicitly stated its plans regarding decommissioning waste from the Pickering NGS, OPG's licence renewal application contained a reference to a possible third repository.
283. The Commission sought clarification regarding OPG's plans for the long-term storage of waste. A representative from OPG responded that the proposed DGR would be for operational waste and that the environmental assessment currently underway for the DGR did not include decommissioning waste. The OPG representative noted that the proposed DGR is planned to have sufficient storage space to accommodate operational and decommissioning waste and that the possibility exists that the DGR may be used for decommissioning waste in the future. The OPG representative further noted that, for financial planning purposes, OPG must set aside sufficient funds to properly dispose of all of its wastes. CNSC staff concurred with OPG that the environmental assessment for the DGR did not include decommissioning waste and noted that this arrangement could be revisited in the future. CNSC staff stated that while OPG currently does not have an explicit plan for the decommissioning waste, OPG would be required to demonstrate that it can safely manage all decommissioning waste in the short and long term, prior to decommissioning. CNSC staff further noted that decommissioning is a separate licensed activity and would have its own separate hearing process.
284. The Commission asked for more information regarding OPG's management of used fuel waste, including packaging requirements. A representative from OPG responded that once fuel bundles have been removed from the reactor they are placed in a pool that cools the fuel and provides shielding from the radiation until they are ready to be placed in dry storage fuel containers. The OPG representative noted that fuel bundles are typically left in the pool for eight to 10 years, but noted that OPG was examining the safety case for the possibility of removing them after six years to ensure that there would be sufficient space in the pool once the Pickering NGS ceases operation. Regarding the dry storage fuel containers, a representative from OPG responded that the dry storage fuel containers are made of carbon steel that is painted and vacuum dried to prevent corrosion. The OPG representative noted that OPG inspects its containers as if they were pressure vessels, in accordance with CSA Standards. CNSC staff stated that it is satisfied that the dry storage containers are robust and provide safe storage for used fuel.

285. Based on the above information and considerations, the Commission is satisfied that OPG is safely managing waste at the Pickering NGS. The Commission acknowledges the confusion noted by intervenors regarding OPG's long-term plans for waste management. As such, the Commission directs OPG to clarify its long-term plan for waste management, by June 30, 2017, at the time of OPG's notification to the Commission of the end date of commercial operations of all Pickering NGS units.

3.14 Security

286. OPG provided information regarding its security program, including a description of the physical barriers it has in place at the Pickering NGS, including a security fence and robust doors. OPG noted that the Pickering NGS is patrolled by Nuclear Security Officers, which are required to meet conditions set out in the *Nuclear Security Regulations*⁴⁰, CNSC Regulatory Document RD-363⁴¹, and CNSC Regulatory Standard S-298⁴². OPG noted that it transitioned from using the Durham Regional Police Service to OPG Armed Nuclear Security Officers during the licence period.
287. OPG stated that it has a program in place to provide ongoing training for Nuclear Security Officers, with a focus on continuously improving performance. OPG noted that it conducts integrated drills involving the Durham Regional Police Service and the Toronto Police Service. OPG further noted that it regularly conducts security drills to validate security practices, ensure regulatory compliance, and to identify security improvements.
288. OPG stated that it implemented a cyber security program to protect the computers and software used to monitor and control the Pickering NGS. OPG noted that the program is risk-based, enabling resources to be applied to minimize threats to those cyber assets that have the highest impact on plant safety and reliability. OPG explained that its real-time process computers are architecturally segregated from other information systems, in order to minimize the threats from external sources, and noted that it has provided training and guidance to its staff.
289. CNSC staff stated that OPG's security program is subject to annual inspections and biennial security exercises, and reported that OPG's implementation of the security program at the Pickering NGS meets regulatory requirements and makes adequate provision for the maintenance of national security.

⁴⁰ SOR/2000-209.

⁴¹ CNSC Regulatory Document RD-363, *Nuclear Security Officer Medical, Physical and Psychological Fitness*, November 2008.

⁴² CNSC Regulatory Standard S-298 *Nuclear Response Force Standard*, 2003.

290. CNSC staff noted that under the proposed new licence, OPG would be required to comply with two new CNSC Regulatory Documents, RD-321⁴³ and RD-361⁴⁴. CNSC staff stated that OPG was already compliant with RD-321 and RD-361.
291. Some intervenors raised concerns regarding cyber security, noting the importance of maintaining safe systems. The Commission asked OPG to discuss the measures it had taken to address this issue. OPG provided additional information in its supplementary CMD 13-H2.1B and explained that OPG follows the industry standards, including separation of its business systems and its safety systems, as well as having quality assurance programs for its software. CNSC staff stated that OPG meets cyber security requirements, noting that OPG implemented improvements over the licence period.
292. Some intervenors expressed concerns regarding the possibility of a physical threat to the Pickering NGS. The Commission asked OPG to comment on this matter. A representative from OPG responded that OPG has a defence-in-depth approach to security at its facilities, which includes an intelligence network and threat assessments, robust structures and a security program that meets all CNSC requirements.
293. The Commission is satisfied that OPG's performance with respect to maintaining security at the facility has been acceptable. The Commission concludes that OPG has made adequate provisions for ensuring the physical security of the facility, and is of the opinion that OPG will continue to make adequate provisions for security during the proposed licence period.

3.15 Safeguards

294. The CNSC's regulatory mandate includes ensuring conformity with measures required to implement Canada's international obligations under the Treaty on the Non-Proliferation of Nuclear Weapons. Pursuant to the Treaty, Canada has entered into safeguards agreements with the IAEA. The objective of these agreements is for the IAEA to provide credible assurance on an annual basis to Canada and to the international community that all declared nuclear material is in peaceful, non-explosive uses and that there is no undeclared nuclear material or activities in this country.
295. OPG stated that it has established and implemented a safeguards program to support compliance with the safeguards agreements with the IAEA. OPG noted that it is fully compliant with CNSC Regulatory Document RD-336⁴⁵, requirements for foreign origin and foreign obligations tracking and reporting. OPG also described the compliance activities carried out during the licence period, including verification inspections by the IAEA and CNSC staff, noting that no compliance issues were identified.

⁴³ CNSC Regulatory Document RD-321, *Criteria for Physical Protection Systems and Devices at High- Security Sites*, December 2010.

⁴⁴ CNSC Regulatory Document RD-361, *Criteria for Explosive Substance Detection, X-ray Imaging, and Metal Detection Devices at High-Security Site*, December 2010.

⁴⁵ CNSC Regulatory Document RD-336, *Accounting and Reporting of Nuclear Material*, June 2010.

296. CNSC staff stated that OPG has an effective safeguards program at the Pickering NGS that conforms to measures required by the CNSC to meet Canada's international safeguards obligations.
297. Based on the above information, the Commission is satisfied that OPG has made and will continue to make adequate provisions in the areas of safeguards and non-proliferation at the Pickering NGS that are necessary for maintaining national security and measures necessary for implementing international agreements to which Canada has agreed.

3.16 Packaging and Transport

298. Packaging and transport covers the safe packaging and transport of nuclear substances to and from the Pickering NGS. OPG must adhere to the *Packaging and Transport of Nuclear Substances Regulations*⁴⁶ and Transport Canada's *Transportation of Dangerous Goods Regulations*⁴⁷ for all shipments leaving the site. The *Packaging and Transport of Nuclear Substances Regulations* apply to the packaging and transport of nuclear substances, including the design, production, use, inspection, maintenance and repair of packages, and the preparation, consigning, handling, loading, carriage and unloading of packages containing nuclear substances.
299. OPG described its radioactive material transportation program, which establishes the necessary controls for safe and efficient transportation of radioactive material. OPG explained that the program includes the handling, packaging, shipment, carriage and receipt of radioactive materials, and ensures safe transportation, including emergency response.
300. OPG stated that it transports radioactive materials on a daily basis and that it conducts regular emergency response drills to ensure that it can respond in the case of an accident. OPG noted that it had no dangerous occurrences reportable under the *Packaging and Transport of Nuclear Substances Regulations* for consignments shipped from the Pickering NGS during the licence period.
301. CNSC staff reported that OPG's packaging and transport program adheres to the *Packaging and Transport of Nuclear Substances Regulations* and the *Transportation of Dangerous Goods Regulations*. CNSC staff further stated that it is satisfied that the implementation of the packaging and transport program meets regulatory requirements.
302. Based on the above information, the Commission is satisfied that OPG is meeting regulatory requirements regarding packaging and transport.

⁴⁶ SOR/2000-208.

⁴⁷ SOR/2001-286.

3.17 Application of the *Canadian Environmental Assessment Act*

303. Before making a licensing decision, the Commission must be satisfied that all applicable requirements of the *Canadian Environmental Assessment Act, 2012*⁴⁸ (CEAA 2012), if applicable, have been fulfilled.
304. OPG has applied for the renewal of its operating licence for the Pickering NGS until June 30, 2018. OPG is not applying for any new physical works or activities in this licence renewal application, and there are no proposed changes to the licensed activities at the Pickering NGS.
305. CNSC staff reported that it had completed an Environmental Assessment (EA) determination under the CEAA 2012. CNSC staff stated that a licence renewal is not classified as a “designated project” pursuant to the *Regulations Designating Physical Activities*⁴⁹ made under paragraph 84(a)(i) of the CEAA 2012. Therefore, no federal EA is required for the licence renewal application.
306. The Commission noted that the CEAA 2012 had only recently come into force and asked for clarification regarding its applicability to the licence renewal application. Some intervenors, including Sierra Club Ontario and individuals, also raised this issue. CNSC staff responded that it had received the licence renewal application from OPG on July 4, 2012 and noted that the CEAA 2012 had come into force on July 6, 2012. CNSC staff stated that, from a legislative perspective, the applicability of the CEAA 2012 was not based on the date of the application but on the date that the EA determination was made. CNSC staff further stated that, because the CNSC’s EA determination was made after July 6, 2012, it fell under the CEAA 2012. In addition, CNSC staff noted that, in any event, an EA would not have been required under the now-repealed *Canadian Environmental Assessment Act, 1992*⁵⁰, as a license renewal was not a trigger for an EA under that legislation.
307. The Commission sought confirmation that the environmental effects of the Pickering NGS were well-understood. CNSC staff responded that it has a very good understanding of the effects of the Pickering NGS and noted that it has extensive environmental monitoring information on the Pickering NGS from its decades of operation. CNSC staff also noted that the Pickering NGS site has been subject to EAs under the CEAA and environmental risk assessments under the NSCA in the past.
308. Some intervenors, including Sierra Club Ontario and Just One World, suggested that an EA was required in order to address international agreements, such as the Canada-US Great Lakes Water Quality Agreement⁵¹ and the Canada-US Air Quality Agreement⁵².

⁴⁸ S.C. 2012, c. 19, s.52.

⁴⁹ SOR /2012-147.

⁵⁰ S.C. 1992, c. 37.

⁵¹ *Agreement Between Canada and the United States of America on Great Lakes Water Quality*, 1978.

⁵² *Agreement Between the Government of Canada and the Government of the United States of America on Air Quality*, 1991.

The Commission sought further information on this matter. A representative from Environment Canada stated that Environment Canada is the government agency responsible for providing notification to the United States under these agreements. Regarding the Air Quality Agreement, the representative from Environment Canada stated that the trigger for notification to the United States is the likelihood of significant trans-boundary air pollution, and noted that there is no obligation under the agreement to assess actions, activities and projects that are not likely to cause trans-boundary air pollution. The Environment Canada representative further stated that, based on Environment Canada's review, the Pickering NGS licence renewal was not likely to result in trans-boundary pollution.

309. Regarding the Great Lakes Water Quality Agreement, which was recently amended, the Environment Canada representative stated that the processes and procedures were still being developed by Canada and the United States as per the agreement. The Environment Canada representative noted that, currently, there were no thresholds for notification requirements, and explained that the notification process would be intended to provide information about a given activity and allow opportunities for the public to provide input, if applicable. The Environment Canada representative noted that this would be similar to how the public was participating in the CNSC hearing for OPG's licence renewal application.
310. Based upon the above assessment, the Commission is satisfied that an environmental assessment under the CEAA 2012 is not required for OPG's application for licence renewal. The Commission notes that the NSCA provides a strong regulatory framework for environmental protection. Whether an EA is required or not, the CNSC regulatory system ensures that adequate measures are in place to protect the environment and human health in accordance with the NSCA and its Regulations.

3.18 Aboriginal Consultation

311. The common law Duty to Consult with Aboriginal communities and organizations applies when the Crown contemplates actions that may adversely affect established or potential Aboriginal or treaty rights.
312. CNSC staff provided information concerning the Aboriginal consultation activities it conducted in conjunction with OPG's licence renewal application. CNSC staff explained that, upon receipt of the licence application from OPG, CNSC staff conducted research that led to a preliminary list of Aboriginal groups that may have interest in the licensing decision.
313. CNSC staff explained that the identified Aboriginal groups and organizations were mailed information regarding OPG's application, including a timeline of coordinated activities, instructions on how to receive announcements, contact information, and an overview of the CNSC public hearings process. CNSC staff provided information

concerning the CNSC's Participant Funding Program, noting that the MNO applied for and were granted funding under the program.

314. CNSC staff stated that no adverse impacts to established or potential Aboriginal and treaty rights associated with the proposed licence renewal were identified. CNSC staff explained that the licence application made no request for changes to operational activities. CNSC staff further noted that it would continue to engage with and provide all the identified Aboriginal groups with information regarding the operation of the Pickering NGS.
315. OPG also provided information regarding its relations with Aboriginal communities. OPG explained that it has a First Nation and Métis Policy, which includes community relations and outreach. OPG noted that it also participates in a number of working groups, including the Aboriginal Relations Steering Committee, the Aboriginal Relations Working Committee, and the Aboriginal Relations Nuclear Working Committee.
316. The Métis Nation of Ontario, in its intervention, discussed an Information Exchange event that it had held with OPG. The MNO commented that while OPG's presentation at this event provided an appropriate amount of information and level of detail, one Information Exchange event was not sufficient. The MNO stated that additional dialogue between OPG and Métis citizens would be of benefit, as it would allow the community to adequately evaluate the effects of the Pickering NGS on the environment in relation to the Métis way of life and Métis interests, and better reflect their concerns and recommendations. The Commission asked OPG to comment on its long-term involvement with the Métis Nation of Ontario. An OPG representative stated that OPG would welcome continued involvement and engagement, and stated that OPG was committed to building a long-term relationship with the MNO.
317. The Mississaugas of the New Credit First Nation, in their intervention, expressed disappointment that the participant funding review committee did not accept the Mississaugas of the New Credit First Nation's request for participant funding and disagreed with the review committee's rationale for this determination. The Commission asked for more information regarding the administration of the Participant Funding Program. CNSC staff responded that the Participant Funding Program uses a review committee independent from the CNSC to review all applications and then make recommendations for funding based on eligibility. CNSC staff stated that, in this case, the funding review committee made a recommendation that the application by the Mississaugas of the New Credit First Nation did not meet the criteria. CNSC staff noted that the funding review committee's determination does not mean that the CNSC does not recognize the Mississaugas of the New Credit First Nation's historic use and interest in the Pickering area. CNSC staff further expressed the wish to continue to work and build a positive relationship with the Mississaugas of New Credit First Nation.
318. The Commission asked about the existing communications between the Mississaugas of the New Credit First Nation and OPG. An OPG representative responded that OPG has met with the Mississaugas of New Credit First Nation a number of times and provided

information regarding its projects. The OPG representative noted OPG's commitment to continue to develop their relationship.

319. The Commission acknowledges the efforts made in relation to the CNSC's obligations regarding Aboriginal consultation and the Legal Duty to Consult. The Commission is satisfied that the proposed licence renewal will not cause any adverse impacts to any potential or established Aboriginal or treaty rights and that the consultation activities undertaken for this licence renewal were adequate, given that there are no changes to the licensed activities at the Pickering NGS.⁵³

3.19 Public Information Program

320. A public information program is a regulatory requirement for licence applicants and licensed operators of Class I nuclear facilities, such as the Pickering NGS. Paragraph 3(j) of the *Class I Nuclear Facilities Regulations*⁵⁴ requires that licence applications include "the proposed program to inform persons living in the vicinity of the site of the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from the activity to be licensed."
321. OPG provided information regarding its community relations and public information program. OPG stated that it regularly and proactively provides information to the public on its on-going facility activities, effects on the environment and the health and safety of persons, and the transportation program, and consults with key stakeholders and the public on future planned activities. OPG explained that it communicates with community stakeholders and residents through various means, including personal contact, community newsletters, speaking engagements, educational outreach, an information centre, and the Internet. OPG noted that it annually posts a REMP report detailing all emissions and spills, as well as quarterly performance reports on facility operations, on its Web site.
322. CNSC staff stated that OPG's public information program for the Pickering NGS meets regulatory requirements. CNSC staff noted that, with the recent publication of CNSC Regulatory Document RD/GD-99.3⁵⁵, OPG is required to revise its documentation and meet the new requirements. OPG stated that it currently meets many of the expectations described in the RD/GD-99.3 and added that it would be reviewing its public information and disclosure policies to ensure compliance with the requirements. CNSC staff stated that it was satisfied with OPG's implementation strategy to transition to RD/GD-99.3.
323. Several intervenors, including the Pickering Nuclear Community Advisory Council and the Ajax-Pickering Board of Trade, expressed support for OPG, noting that OPG has a

⁵³ Rio Tinto Alcan v. Carrier Sekani Tribal Council, 2010 SCC 43, [2010] 2 S.C.R. 650 at paras 45 and 49.

⁵⁴ SOR/2000-204.

⁵⁵ CNSC Regulatory Document RD/GD-99.3, *Public Information and Disclosure*, March 2012.

robust public information program. Intervenors stated that OPG also provides information to the public and responds to questions when asked.

324. Other intervenors, including Northwatch and Lake Ontario Waterkeeper, expressed concerns that they could not obtain all of the information they were requesting. The Commission asked for OPG to comment on this matter. A representative from OPG explained that certain documents contain sensitive or proprietary information and may require screening before they can be released to the public.
325. An individual suggested that OPG should be required to generate more publicity about its licence renewal applications to ensure that the general public is more aware of OPG's plans and activities. The Commission asked for more information on this subject. An OPG representative stated that, as part of its licence renewal process, OPG undertook several communication activities, such as participating in community meetings, distributing a newsletter, and advertising in local newspapers, on the Internet, and in GO Trains and transit shelters. OPG noted, however, that it does not specifically advertise in Toronto. The Secretary of the Commission noted that the CNSC published notices of hearings in local newspapers, as well as in the wider Toronto area, and that the CNSC has an email distribution list so that subscribers can be informed of CNSC hearings.
326. Based on this information, the Commission is satisfied that OPG's public information program meets regulatory requirements and is effective in keeping the public informed on the facility operations.

3.20 Decommissioning Plans and Financial Guarantee

327. The Commission requires that the licensee has operational plans for decommissioning and long-term management of waste produced during the life-span of the facility. In order to ensure that adequate resources are available for a safe and secure future decommissioning of the Pickering NGS, the Commission requires that an adequate financial guarantee for the realization of the planned activities be put in place and maintained in a form acceptable to the Commission throughout the licence period.
328. The current operating licence for the Pickering NGS contains a condition relating to decommissioning, which requires that OPG maintain an acceptable decommissioning plan that sets out the manner by which the facility will be decommissioned in the future. The decommissioning plan must be kept current to reflect any changes in the site or facility, and meet the requirements of CSA Standard N294-09⁵⁶ and the guidance of CNSC Regulatory Guide G-219⁵⁷. The decommissioning plan and the associated cost estimate form the basis of the financial guarantee.
329. OPG stated that the decommissioning plan for the Pickering NGS is revised on a five-year cycle and noted that it had submitted an updated decommissioning plan and

⁵⁶ CSA Standard N294-09, *Decommissioning of Facilities Containing Nuclear Substances*

⁵⁷ CNSC Regulatory Guide G-219, *Decommissioning Planning for Licensed Activities*, June 2000.

proposed financial guarantee for the Commission's approval in the context of a public hearing on October 24, 2012, which was accepted by the Commission⁵⁸. CNSC staff stated that it was satisfied that OPG has effectively maintained its decommissioning plan and financial guarantee for the Pickering NGS.

330. Based on this information, the Commission is satisfied that the preliminary decommissioning plans and related financial guarantee are acceptable for the purpose of the current application for licence renewal.

3.21 Nuclear Liability Insurance and Cost Recovery

331. The *Nuclear Liability Act*⁵⁹ requires a nuclear power plant to have coverage for nuclear liability insurance. OPG stated that it has a nuclear liability insurance coverage totalling \$75 million for the Pickering NGS, as required under the *Nuclear Liability Act*. CNSC staff stated that it is satisfied with OPG's provision to fulfill its liability obligation with respect to the Pickering NGS under the *Nuclear Liability Act*.
332. Several intervenors, including individuals, Go Solar Canada, Just One World, and CCNB Action, expressed the view that the current liability amount of \$75 million in the *Nuclear Liability Act* would not be sufficient to cover the costs of a severe accident. The Commission asked for more information concerning the *Nuclear Liability Act*. A representative from NRCan provided an overview of the *Nuclear Liability Act*, explaining that the purpose of the legislation is to clarify the liability and compensation regime in the event of a nuclear accident. The NRCan representative stated that the *Nuclear Liability Act* establishes that the operator, in this case OPG, would be absolutely liable for any damages associated with the accident. The NRCan representative acknowledged the concerns from intervenors that the amount of \$75 million was not consistent with the liability limits in other countries, and stated that the legislation was under review. The representative from NRCan noted that although recent attempts to pass new legislation were not successful due to prorogation and the dissolution of Parliament, NRCan was in the process of preparing new recommendations for consideration in Parliament. A representative from OPG expressed support for NRCan's efforts to revise the *Nuclear Liability Act*.
333. The *Cost Recovery Fees Regulations*⁶⁰ (CRFR) set out the specific cost recovery requirements based on the activities to be licensed. CNSC staff reported that OPG is in good standing with respect to CRFR requirements for the Pickering NGS.
334. The Commission is satisfied that OPG has the coverage required under the *Nuclear Liability Act*. The Commission acknowledges the intervenors' concerns about this issue and notes that it is not the responsibility of the CNSC to administer the *Nuclear*

⁵⁸ Refer to the Record of Proceedings and Reasons for Decision on the Financial Guarantee and Licence Amendments for OPG's Class I Nuclear Facility Licences in Ontario, hearing date October 24, 2012.

⁵⁹ R.S.C., 1985, c. N-28.

⁶⁰ SOR/2003-212.

Liability Act, or to make policies in respect of nuclear liability or the *Nuclear Liability Act*.

335. The Commission is satisfied that OPG is in good standing with respect to CRFR requirements for the Pickering NGS.

3.22 Licence Length and Conditions

336. The Commission considered information pertaining to the proposed licence length and conditions, including a regulatory hold point.

3.22.1 Licence Length

337. OPG has applied for the renewal of its operating licence for the Pickering NGS for a period of five years, until June 30, 2018. OPG applied for a one-site licence, covering both Pickering A and Pickering B.
338. CNSC staff recommended that the Commission accept and grant the proposed five-year term. CNSC staff stated that OPG is qualified to operate for the proposed licence period, and that there is adequate management and oversight in place for all processes.
339. Many intervenors, including non-governmental organizations and individuals, opposed the licence renewal. Intervenors were of the view that there was too great a risk associated with the operation of nuclear power plants, including financial cost, the possibility of severe accidents and radiation risks. Some intervenors recommended that OPG be granted a temporary licence with instructions to prepare for the closure of the Pickering NGS by the end of 2014.
340. Other intervenors, including municipal and regional government representatives, unions and individuals, expressed support for the licence renewal. These intervenors were of the view that OPG has safely operated the Pickering NGS and would continue to do so over the life of the facility.

3.22.2 Licence Conditions

341. CNSC staff presented a proposed licence in CMD 13-H2.A. CNSC staff explained that the proposed licence incorporates the use of a LCH and is meant to strengthen regulatory oversight, increase regulatory effectiveness and efficiency, and reduce administrative efforts. CNSC staff explained that the LCH consolidates compliance verification criteria, provides interpretations and clarifies how the licensee must be in compliance with the licence.

342. CNSC staff provided information about a site-specific licence condition regarding Cobalt-60. CNSC staff stated that no changes to the existing licence condition were required, except for minor clarifications, as OPG would continue to produce Cobalt-60 following the same procedure and within the operational safety case that was previously approved by the Commission.
343. CNSC staff further stated that licence condition 16.2 in the proposed licence would establish a regulatory requirement for OPG to implement and maintain a COP for Pickering B and a SOP for both Pickering A and B. CNSC staff noted that OPG would also be required to provide confirmation regarding the end date of commercial operations of all Pickering units by June 30, 2017, as the transition to safe-storage activities will require cautious planning and preparation.
344. The Commission asked for clarification regarding the language in the LCH. CNSC staff explained that conditions labelled 'shall' refer to mandatory requirements or compliance verification criteria, whereas conditions labelled 'should' are for guidance purposes. The Commission noted that the language in the licence and LCH must be clear and direct.
345. The Commission asked whether the LCH would form part of the licensing basis. A representative from OPG responded that this would be the case. The OPG representative stated that OPG would continue to ensure that it is meeting the requirements of the licence and seek clarification from CNSC staff, if necessary.
346. CCNB Action's second request for ruling was that "between the time that the draft Licence Conditions Handbook has been presented to the Commission in the staff CMDs and when the licence is granted, that no changes to the draft Licence Conditions Handbook be made unless it is noted in the Commission's Reasons for Decision." The Commission does not agree with this request. The Commission notes that the LCH can be modified by CNSC staff at any time, without the need to refer the change to the Commission, provided that any new or revised compliance verification criteria remain within the licensing basis. The Commission is satisfied that CNSC staff will provide an update to the Commission on any changes made to the LCH on an annual basis.

3.22.3 Regulatory Hold Point

347. As a technical basis is required to support the continued operation of the Pickering NGS beyond the assumed design life of the pressure tubes, CNSC staff proposed a licence condition with a specific hold point to ensure appropriate regulatory oversight regarding the activities and commitments required to safely manage this technical issue. CNSC staff noted that, in terms of aging management, the pressure tubes are the dominant life-limiting component with a current licensing basis assumed design life of 210,000 EFPH. As such, CNSC staff recommended that the Commission impose a hold point on the lead Pickering B unit, when it reaches 210,000 EFPA. CNSC staff noted that, based on unit operating history, Unit 6 was expected to reach 210,000 EFPH

during the first quarter of 2014. CNSC staff explained that this licence condition would establish a regulatory requirement for OPG to complete work on new or improved tools it will need to demonstrate fitness for service.

348. CNSC staff proposed that OPG must obtain the written approval of the Commission, or written consent of a person authorized by the Commission, prior to the removal of the regulatory hold point. Many intervenors, including individuals and the Canadian Coalition for Nuclear Responsibility, expressed the view that the removal of the hold point is a matter of great importance and should not be delegated to CNSC staff.
349. In their request for a ruling, the CELA, along with Greenpeace, Durham Nuclear Awareness, Northwatch and CCNB Action, requested that “OPG not be granted permission to operate the Pickering NGS beyond its design life without an additional public hearing once all of the missing data from the safety case can be made public.”
350. Given the importance of the regulatory decision to remove the regulatory hold point to allow OPG to proceed beyond 210,000 EFPH, the Commission does not delegate this authority to CNSC staff. The Commission will consider this matter in a future proceeding of the Commission with public participation. The Commission will allow written comments only.

3.22.4 Delegation of Authority

351. CNSC staff also described its proposed delegation of authority. In order to have adequate regulatory oversight of the changes that occur during the licence period but do not require amendment to the licence, CNSC staff recommended that the Commission delegate certain approval authority to the following CNSC staff:
 - Director, Pickering Regulatory Program Division;
 - Director General, Directorate of Power Reactor Regulation; and
 - Executive Vice-President and Chief Regulatory Operations Officer.
352. CNSC staff recommended that the delegation of authority for the safety area of safeguards, including nuclear material accounting, be delegated to the following positions:
 - Director, International Safeguards Division;
 - Director General, Directorate of Security and Safeguards; and
 - Vice-President, Technical Support Branch.
353. The Commission accepts the above-discussed CNSC staff recommendations regarding the delegation of authority. As previously stated, the Commission does not accept CNSC staff’s proposed delegation of authority to remove the regulatory hold point.

3.22.5 Conclusion on Licence Length and Conditions

354. Based on the above information and considerations, the Commission is satisfied that a five-year licence with annual reporting is appropriate. The Commission notes that, as OPG's licence was extended by the Commission, through amendment, until August 31, 2013, the new licence will be valid until August 31, 2018. The Commission accepts the licence conditions as recommended by CNSC staff. The Commission does not accept CNSC staff's proposed delegation of authority to remove the regulatory hold point to allow OPG to proceed beyond 210,000 EFPH. The Commission will consider this matter in a future proceeding of the Commission with public participation. The Commission will allow written comments only. The Commission accepts all other CNSC staff recommendations regarding the delegation of authority, and notes that CNSC staff can bring any matter to the Commission as applicable.

4.0 CONCLUSION

355. The Commission has considered the information and submissions of CNSC staff, OPG and all participants as set out in the material available for reference on the record, as well as the oral and written submissions provided or made by the participants at the hearing.
356. The Commission concludes that an environmental assessment of the proposed continued operation of the facility, pursuant to the *Canadian Environmental Assessment Act, 2012* is not required.
357. The Commission is satisfied that OPG meets the requirements of subsection 24(4) of the *Nuclear Safety and Control Act*. That is, the Commission is of the opinion that OPG is qualified to carry on the activity that the proposed licence will authorize and that OPG will make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.
358. Therefore, the Commission, pursuant to section 24 of the *Nuclear Safety and Control Act*, issues a one-site Power Reactor Operating Licence to Ontario Power Generation Inc. for the operation of the Pickering Nuclear Generating Station, located in Pickering, Ontario. The licence, PROL 48.00/2018, will be valid from September 1, 2013 to August 31, 2018.
359. The Commission includes in the licence the conditions as recommended by CNSC staff and set out in the draft licence attached to CMD 13-H2.A. The Commission instructs CNSC staff to modify the relevant sections of the LCH to include the direction detailed below.
360. The Commission does not accept CNSC staff's proposed delegation of authority to remove the regulatory hold point to allow OPG to proceed beyond 210,000 EFPH. The

Commission will consider this matter in a future proceeding of the Commission with public participation. The Commission will allow written comments only. The Commission accepts all other CNSC staff recommendations regarding the delegation of authority, and notes that CNSC staff can bring any matter to the Commission as applicable.

361. The Commission directs OPG to provide the following, before the removal of the hold point can be approved:
 - the revised PSA for Pickering A that meets the requirements of CNSC Regulatory Standard S-294;
 - an updated PSA for both Pickering A and Pickering B that takes into account the enhancements required under the Fukushima Action Plan; and
 - a whole-site PSA or a methodology for a whole-site PSA, specific to the Pickering NGS site.
362. The Commission understands that if the PSA values are between the limits and the targets, then safety improvements should be put in place if practicable, and that if the PSA values are above acceptable limits then safety improvements would be mandatory. As such, the Commission requests that OPG provide an action plan to address any identified issues should OPG exceed its targeted safety goals.
363. The Commission notes that OPG will be considering filtered containment as part of its analysis of future enhancements to protect containment through its Fukushima Action Items. The Commission directs OPG to report on its analysis and way forward on this issue at the time of its request to remove the hold point to proceed beyond 210,000 EFPH.
364. The Commission also directs CNSC staff to review the Pickering PSA methodology, and provide its recommendation for the Commission's consideration at the time of OPG's request for the release of the hold point.
365. The Commission directs OPG to ensure the production of an emergency management public information document, to be distributed to all households in the Pickering area, summarizing the integrated emergency response plan of all involved organizations, including all key roles and responsibilities. This document should also include information on potassium iodide (KI) tablet distribution and information included in CSA Standard N1600. This document is expected to be produced by the end of June 2014.
366. The Commission directs OPG to clarify its long-term plan for waste management, by June 30, 2017, at the time of OPG's notification to the Commission of the end date of commercial operations of all Pickering NGS units.

367. The Commission recommends that OPG make environmental monitoring data accessible to the public on a more frequent basis than its current annual report.
368. With this decision, the Commission directs CNSC staff to provide an annual report on the performance of the Pickering NGS, as part of the annual *Integrated Safety Assessment of Canadian Nuclear Power Plants*. CNSC staff shall present these reports at public proceedings of the Commission. The public will have an opportunity to participate, in writing, in these proceedings.



AUG 0 9 2013

Michael Binder
President,
Canadian Nuclear Safety Commission

Date

Appendix A – Intervenors

Intervenors	Document Number
Ajax - Pickering Board of Trade, represented by B. Zolis and D. Ryan	13-H2.2
Safe Communities of Pickering and Ajax, represented by J. McKinnon	13-H2.3
Edward Moeck	13-H2.4
Whitby Chamber of Commerce	13-H2.5
Durham Nuclear Health Committee	13-H2.6
Black & McDonald	13-H2.7
Donald (Tim) Seitz	13-H2.8
David Foster	13-H2.9
Andrew Hill	13-H2.10
Pickering Nuclear Community Advisory Council, represented by F. Gillis, N. Drummond, J. Dike and D. Shire	13-H2.11
Brenda Stevenson	13-H2.12
Ann E. Short	13-H2.13
Dorian Douma	13-H2.14
Big Brothers & Big Sisters of Ajax-Pickering	13-H2.15
Marilyn McKim	13-H2.16
Kylie Brooks	13-H2.17
Hydro Pensioners of Ontario, Georgian Bay District Pensioners Association, Bruce Sub Group	13-H2.18
Maria Kasstan	13-H2.19
Environmental Earth Angels	13-H2.20
Town of Ajax	13-H2.21
Ajax and Pickering Rotary Clubs	13-H2.22
Durham College	13-H2.23
Marsh Instrumentation Ltd.	13-H2.24
University of Ontario Institute of Technology, represented by G. Bereznai	13-H2.25 13-H2.25A
Go Solar Canada, represented by D. Holtl	13-H2.26
Brenda Thompson	13-H2.27
Veridian Connections	13-H2.28
Lake Ontario Waterkeeper, represented by J. Bull	13-H2.29
Norma Dickinson	13-H2.30
Hydro Pensioners Association of Ontario, Toronto District	13-H2.31
The Miller Group	13-H2.32
Mary Fish	13-H2.33
Kathleen Chung	13-H2.34
Don and Heather Ross	13-H2.35
Provincial Council of Women of Ontario, represented by G. Janes	13-H2.36 13-H2.36A
Women in Nuclear – Canada, represented by C. Cottrill and	13-H2.37

S. Smith	
Victor Sgro	13-H2.38
Clarington Board of Trade and Office of Economic Development, represented by S. Hall	13-H2.39
Organization of Canadian Nuclear Industries, represented by R. Oberth	13-H2.40 13-H2.40A
Just one World	13-H2.41
Klaus Dohring	13-H2.42
Valerie Fredenburgh	13-H2.43
Regional Municipality of Durham, represented by P. Reid	13-H2.44
Tania Szablowski	13-H2.45
Municipality of Clarington	13-H2.46
Dick O'Connor	13-H2.47
Alison Petten	13-H2.48
Nicole Corrado	13-H2.49
Rodger Brunning	13-H2.50
David Lean	13-H2.51
Friends of the Farewell and Black Creeks, represented by L. Racansky and S. Racansky	13-H2.52 13-H2.52A
Randi Luster	13-H2.53
Michael Cooke	13-H2.54
Louisette Lanteigne	13-H2.55
Colin King	13-H2.56
Monica Whalley	13-H2.57 13-H2.57A
Jo Hayward-Haines	13-H2.58
David and Sheela Lloyd	13-H2.59
Kelly Masterson	13-H2.60
Canadian Nuclear Society, represented by J. Roberts and C. Hunt	13-H2.61
Friends Indeed	13-H2.62
Canadian Association of Physicians for the Environment, represented by C. Vakil	13-H2.63 13-H2.63A
Canadian Nuclear Association, represented by H. Kleb	13-H2.64
Darlington Nuclear Community Advisory Council	13-H2.65
Rolls-Royce Civil Nuclear Canada Ltd., represented by N. Alexander	13-H2.66 13-H2.66A
Darlene Buckingham	13-H2.67
Pickering Naturalists	13-H2.68
Kelly Clune	13-H2.69
Durham District School Board	13-H2.70
Aecon Industrial	13-H2.71
Power Workers Union, represented by B. Walker and D. Trumble	13-H2.72 13-H2.72A
Linda Gasser	13-H2.73
Voice for Women for Peace - Ontario Chapter, represented by	13-H2.74

L. Adamson	
Corneliu Chisu, M.P., Pickering - Scarborough	13-H2.75
David C. Reid	13-H2.76
Joe Dickson – M.P.P., Ajax-Pickering	13-H2.77
Jill Lennox	13-H2.78
Barbara Feldman	13-H2.79
Durham Chinese Culture Centre	13-H2.80
Babcock Wilcox Canada Ltd.	13-H2.81
Belinda Cole	13-H2.82
Karen Loch	13-H2.83
Ysabeault d'Valar-Alba	13-H2.84
Pickering Auxiliary Rescue Association	13-H2.85
Canadian Nuclear Workers Council, represented by H. Phorson and J. Usher	13-H2.86 13-H2.86A
Mississaugas of the New Credit First Nation, represented by C. King	13-H2.87
Michelle Simeunovich	13-H2.88
Ontario Federation of Anglers and Hunters	13-H2.89
Greater Oshawa Chamber of Commerce, represented by B. Malcolmson	13-H2.90
Spark Centre	13-H2.91
Durham Economic Prosperity Committee	13-H2.92
Dorothy Goldin Rosenberg	13-H2.93
Durham Strategic Energy Alliance, represented by M. Kobzar	13-H2.94
Rouge Valley Health System	13-H2.95
Chris Alexander, MP for Ajax- Pickering	13-H2.96
William Shore	13-H2.97
Durham Tamil Association	13-H2.98
CCNB Action, represented by C. Rouse	13-H2.99 13-H2.99A
Norah Chaloner	13-H2.100
Marie Roulleau	13-H2.101
North American Young Generation in Nuclear, Durham Chapter, represented by G. Shah, E. Zhang, L. Corkum and A. Au	13-H2.102
A.J. Hehoe	13-H2.103
Gail Cockburn	13-H2.104
Terrey J. Price, Ray Mutiger, Mason Verkruijsen and Eugene Saltanoff, represented by R. Mutiger	13-H2.105
Green Party of Ontario	13-H2.106
Citizens for a Safe Environment and the Committee for a Safe Sewage, represented by K. Buck	13-H2.107
Linda Hicks	13-H2.108
Michel Duguay	13-H2.109
Sue Buckhorn	13-H2.110
Brenda Cross	13-H2.111

Jutta Spletstoeser	13-H2.112
Durham Catholic School Board	13-H2.113
Barbara Pulst	13-H2.114
Sheila Mary Richardson	13-H2.115
Sarah Sackville-McLauchlan	13-H2.116
Corina Psarrou-Rae	13-H2.117
Carrie Lester	13-H2.118
Greenpeace, represented by S.P. Stensil	13-H2.119 13-H2.119A
Canadian Coalition for Nuclear Responsibility, represented by G. Edwards	13-H2.120 13-H2.120A
PESCA, represented by K.Falconer, D. Amos and K. McCafferty	13-H2.121
Louis Bertrand	13-H2.122
Northwatch, represented by B. Lloyd	13-H2.123 13-H2.123A 13-H2.123B 13-H2.123C
Pickering Soccer Club	13-H2.124
Indo-Canadian Cultural Association of Durham	13-H2.125
Society of Energy Professionals, represented by S. Travers and J. Fierro	13-H2.126 13-H2.126A
International Institute of Concern for Public Health, represented by A. Tilman	13-H2.127 13-H2.127A
Brad Blaney	13-H2.128 13-H2.128A
Sierra Club Ontario, represented by C. Elwell and B. Cheng	13-H2.129 13-H2.129A 13-H2.129B
The Métis Nation of Ontario, represented by M. Bowler and H. Rowlinson	13-H2.130
Zach Ruiter	13-H2.131
Canadian Environmental Law Association, represented by T. McClenaghan	13-H2.132 13-H2.132A
Durham Nuclear Awareness, represented by E. Gunderson	13-H2.133
Steve Dick	13-H2.134
Janet McNeill	13-H2.135
Alexis Jakubiec	13-H2.136