



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 Pickering Nuclear
Generating Station A Operating Licence

Public Hearing
Dates February 17, 2010 and May 21, 2010

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INTRODUCTION

1. Ontario Power Generation Inc. (OPG) has applied to the Canadian Nuclear Safety Commission¹ (CNSC) for the renewal of the Nuclear Power Reactor Operating Licence for the Pickering Nuclear Generating Station A (Pickering NGS-A) located in Pickering, Ontario. The current operating licence PROL 04.17/2010 expires on June 30, 2010. OPG has applied for the renewal of this licence for a period of five years.
2. The nuclear facility consists of four CANDU pressurized heavy water reactors and their associated equipment. Two reactors (units 2 and 3) are not operating. They were defueled in 2008 and are currently being placed in a safe storage state until the eventual decommissioning of the Pickering NGS-A and Pickering NGS-B sites. Each of the two operating reactors (units 1 and 4) has a nominal electrical output of 515 megawatts (MW). Units 1 and 4 are operating, with numerous improvements to safety system components, after a return to service in 2005 and 2003 respectively. Pickering NGS-A shares the common vacuum building and parts of the emergency coolant injection system with the Pickering NGS-B, where four units are currently operating.
3. In addition to the Pickering NGS-A and NGS-B facilities, the Pickering Waste Management Facility (PWMF) is also located on the Pickering Nuclear site. The PWMF is licensed separately from the nuclear generation stations under a Class 1B Waste Facility Operating Licence.
4. CNSC staff has assessed the submitted application and concluded that OPG has met the legal requirements related to the facility and site description, design of the facility and the final safety analysis report, as set out in the *General Nuclear Safety and Control Regulations*² and *Class I Nuclear Facilities Regulations*³.
5. CNSC staff has revisited the results of its regulatory activities conducted throughout the current licence period (2005 – 2010), and reviewed OPG's program governing documents and the proposed station improvement plan for the proposed licence period (2010 – 2015). As part of the continuous improvements in CNSC's regulatory process, CNSC staff has reviewed the submitted documents applying a new safety and control framework that includes fourteen safety and control areas, compared to the previous nine safety areas. This new safety and control areas framework is outlined in the Table of Contents of this document.

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 Statutory Orders and Regulations, S.O.R./2000-202.

³ Statutory Orders and Regulations, S.O.R./2000-204

Issue

6. In considering the application, the Commission was required to decide, pursuant to subsection 24(4) of the *Nuclear Safety and Control Act*⁴ (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

7. The Commission, in making its decision, considered information presented for a public hearing held on February 17, 2010 (Day 1) in Ottawa, Ontario and on May 21, 2010, (Day 2) in Pickering, Ontario. The public hearing was conducted in accordance with the *Canadian Nuclear Safety Commission Rules of Procedure*⁵. During the public hearing, the Commission considered written submissions and heard oral presentations from CNSC staff (CMD 10-H6, CMD 10-H6.A, CMD 10-H6.B, CMD 10-H6.C, CMD 10-H6.D and CMD 10-H6.E) and OPG (CMD 10-H6.1, CMD 10-H6.1A, CMD 10-H6.1B, CMD 10-H6.1C, CMD 10-H6.1D and CMD 10-H6.1E). The Commission also considered oral and written submissions from 34 intervenors (see Appendix A for a detailed list of interventions).

DECISION

8. Based on its consideration of the matter, as described in more detail in the following sections of this *Record of Proceedings*⁶, the Commission concludes that OPG is qualified to carry on the activities that the licence will authorize. The Commission is of the opinion that OPG, in carrying on these activities, 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*, renews Ontario Power Generation's Nuclear Power Reactor Operating Licence for its Pickering Nuclear Generating Station A (NGS-A) located in the city of Pickering, Ontario. The renewed licence, PROL 04.00/2013, is valid from July 1, 2010 to June 30, 2013.

⁴ Statutes of Canada, S.C. 1997, c. 9.

⁵ Statutory Orders and Regulations, S.O.R./2000-211.

⁶ *Summary Record of Proceedings and Decision* was released on June 29, 2010.

9. The Commission approves the proposed draft licence and accepts the proposed *Licence Conditions Handbook* (LCH).
10. With this decision, the Commission requests that OPG prepare yearly reports on their activities regarding fish mortality. The reports should include results of conducted studies, efficiency of applied mitigation measures and all other relevant data, and should be presented at public proceedings of the Commission by the end of each calendar year. The Commission expects the first of the reports to be presented by December 2010.
11. The Commission exempts OPG from the requirement to conduct leak tests on the sealed sources that contain Cobalt-60 produced by Pickering NGS-B, as specified in Section 18(2)(d) of the *Nuclear Substances and Radiation Devices Regulations*⁷, having accepted OPG's alternative provisions for their safe storage. This exemption is granted in accordance with section 7 of the NSCA and section 11 of the *Nuclear Safety and Control General Regulations*⁸.
12. The Commission directs OPG to prepare, by the end of this licence period, the merging of licences for Pickering NGS-A and Pickering NGS-B. The Commission acknowledges the explanation by OPG regarding the end-of-life of the Pickering stations and dependence of functioning of Pickering NGS-A and Pickering NGS-B on common facilities and services, and directs OPG to submit an application for a one-site licence, focusing on the end-of-life of the facility, decommissioning (including a comprehensive plan on decommissioning strategies) and ageing management.
13. The Commission directs OPG to continue with improvements of its emergency preparedness response processes and follow recommendations regarding public alert systems and installation of additional sirens. The Commission expects to receive the first report on the progress related to this issue by December 2010.

ISSUES AND COMMISSION FINDINGS

14. 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.

Management

15. The Commission examined issues related to the program areas of Management System, Human Performance Management and Operating Performance in order to assess the adequacy of the programs and efficiency of their implementation.

⁷ Statutory Orders and Regulations, SOR/2000-207

⁸ Statutory Orders and Regulations, SOR/2000-202

Management System

16. CNSC staff stated that its evaluation of OPG's management system reflects its expectations related to the framework that establishes the processes and programs required to ensure that the organization achieves its safety objectives, continuously monitors its performance and fosters a healthy safety culture. This evaluation included the following review topics:
- Quality management;
 - Organization; and
 - Plant management.

Quality Management

17. OPG representatives and CNSC staff informed the Commission that OPG was revising its charter document N-CHAR-AS-0002 "Chief Nuclear Officer Expectations" and referenced program documents, to align it with the requirements of a management system manual and to reflect the requirements of the new CSA standard N286-05: "Management System Requirements for Nuclear Power Plants". In addition, N-CHAR-AS-0002 is being renamed "Management System Manual". CNSC staff said that they had reviewed the document and found that it complies with the requirements of the CSA standard.
18. CNSC staff expressed their opinion that the transition to the N286-05 requirements for a management system would not result in an increased risk to the safe operation of the plant. CNSC staff added that the documented processes used by Pickering NGS-A staff to operate the plant meet the CNSC's expectations regarding the level of compliance with the applicable CSA standards referenced in the licence.
19. Regarding the assessment of implementation of the Pickering NGS-A quality management program, CNSC staff informed the Commission that they had carried out a number of inspections during the current licensing period. CNSC staff is of the opinion that Pickering NGS-A has implemented the quality management program effectively.

Organization

20. OPG representatives informed the Commission on Pickering NGS-A internal organization and presented a simplified organizational chart. They explained that, at the station level, the organization includes operations and maintenance, station engineering, work management, performance improvement and nuclear oversight, and business services and regulatory affairs. OPG representatives added that Pickering NGS-A is one of the three stations in OPG's nuclear fleet, which is supported by a central organization responsible for developing and maintaining programs, establishing standards of excellence and providing oversight and technical assistance.

21. CNSC staff informed the Commission that they have reviewed OPG's documents N-STD-AS-0020 - "Nuclear Organization Standard" and "Persons Authorized to Act on Behalf of OPG in Dealings with the CNSC". CNSC staff is of the opinion that the documentation contains sufficient information to demonstrate that the regulatory requirements are met, and rated the implementation of the program as "Satisfactory".
22. The Commission asked where safety organization fits in the organizational charts of the company, since it did not appear on that chart presented by OPG. OPG representatives responded that the safety organization reports through the human resources line of business and added that it is not part of Pickering A directly, but is part of the overall Pickering site organization and the personnel participate at all of the regular station forums. The Commission expressed its expectation that safety culture should find a visible place in the organizational scheme of the organization.
23. The Commission sought more information about OPG personnel who would be engaged in decommissioning of the facility, which was not presented on organizational charts. OPG representatives responded that the charts represent the personnel responsible for safe and reliable operation of the plant and explained that decommissioning efforts were handled by a separate organization within OPG, which was not presented on the organization chart that relates to the station organization.
24. The Commission asked for more detailed explanation about responsibility for end-of-life planning, reliable operation during that period and staff for decommissioning. OPG representatives responded that, similar to safe storage project on Units 2 and 3, there will be dedicated leadership assigned and staff and resources placed to this task. They also stated that the Pickering NGS-A Operational Plan is the responsibility of the site vice-president. They added that a broad decommissioning plan was being reviewed and updated under the responsibility of the Nuclear Waste Organization.

Plant Management

25. CNSC staff informed the Commission that they have reviewed OPG's documents OPG-HR-SFTY-PROG-001 "Safety Management System Program", which defines the overall process for managing safety and the responsibilities of the parties, and N-POL-0001 "Nuclear Safety Policy", to ensure that sound nuclear safety and defense-in-depth practices are achieved and sustained. CNSC staff added that it had reviewed the N-CHAR-AS-0002 "Chief Nuclear Officer Expectations", which describes programs that define management of the OPG nuclear facilities, as well as the N-STD-AS-0023 "Nuclear Safety Oversight", which summarizes internal and external processes used for oversight and assessment. CNSC staff stated that it was satisfied that OPG has adequate governance in place to manage the Pickering NGS-A safely.

26. CNSC staff noted that the implementation of the programs had been assessed in the 2008 NPP report, and rated as “Below Expectations”, because of issues related to safety culture. Since no new major issues that impact this rating were identified in 2009, and since safety culture will continue to impact the implementation until it is resolved, the implementation of the plant management is rated as “Below Expectations”. CNSC staff also noted that this area is improving, as OPG has an action plan to address the issues related to safety culture in the next licensing period.
27. CNSC staff also informed the Commission on the results of its independent organization and management assessment, the final report of which had been presented to OPG in October 2009. CNSC staff stated that Pickering NGS-A had provided an action plan to resolve the improvement issues identified in this assessment, and that OPG had developed an accountability model to address these issues.
28. CNSC staff added that it was satisfied with OPG’s improvement plans for the proposed licence period, which includes the following:
 - Improvement of safety culture based on findings from organization and management assessment;
 - Significant investment in equipment reliability and system health improvements;
 - Progressing towards units 2 and 3 for safe storage; and
 - Operating the plant reliably and ensuring plant, personnel and public safety.
29. The Commission sought more information on safety culture which has been one of the three areas rated as “Below Expectations”. The OPG representative responded that their own assessment of this area gave similar results as the assessment performed by CNSC staff, and that they were already addressing the issues. The Commission expects this issue to be addressed in the next annual report.
30. The Commission asked about OPG’s policy regarding whistleblowers. OPG representatives responded that OPG has a number of means for employees to express their concerns, such as condition reports, through an ombudsman and through their union representation. The Commission reiterated that CNSC staff’s report indicates that there is room for improvement in OPG staff reporting to management without fear of repercussion, and asked OPG for their comments. OPG representatives responded that they were using good feedback from the CNSC’s assessment in starting dialogues with workers and supervisors.
31. In their interventions, Safe Communities of Pickering and Ajax, North American Young Generation in Nuclear - Durham Chapter, Organization of CANDU Industries, Power Workers’ Union, Society of Energy Professionals, IFPTE Local 160 and Canadian Nuclear Workers’ Council emphasized OPG’s commitment to safe operation and protection of the environment.

Conclusion on Management System

32. Based on its consideration of the presented information, the Commission concludes that OPG has appropriate organization and management structures in place to adequately carry out the activities under the proposed licence.

Human Performance Management

33. OPG representatives presented the human performance program at Pickering NGS-A, which is defined in the program document NPROG-AS-0002 “Human Performance”. The representatives added that the overall effectiveness of the human performance program is measured through the Station Event Free Day Reset Target, and noted that the station has lowered the yearly target compared to previous years.
34. CNSC staff presented the results of their evaluation of the activities that enable human management of processes that ensure that licensee staff members are sufficient in numbers in all relevant job areas and have the necessary knowledge, skills and tools in place to safely carry out their duties. This evaluation included the following review topics:
- Training;
 - Examination and certification; and
 - Human factors.

CNSC staff has rated all three evaluated topics as “Satisfactory”.

Training

35. OPG representatives presented their training programs related to requalification, continuing training, shift supervision, Authorized Nuclear Operator in training, science fundamentals and equipment principle. They have also presented their training programs for non-licensed operators and shift supervisor certification program.
36. OPG representatives informed the Commission on planned improvements to the training programs regarding maintenance, engineering and operator certification.
37. CNSC staff informed the Commission that it had reviewed OPG’s governing document for training N-PROG-TR-0005 “Training”. The review areas included training process and procedures, non-certified staff training and facilities and support services. CNSC staff concluded that OPG’s training program meets regulatory requirements and is based on the systematic approach to training (SAT).

38. With respect to the implementation of the training program, CNSC staff acknowledged the successful completion of outstanding training deficiencies from past inspections of certification training programs. CNSC staff informed the Commission that it had conducted an inspection on the engineering training programs in 2009 and identified several positive aspects; however, CNSC staff have observed several deficiencies and OPG has submitted a corrective action plan to resolve them. CNSC staff added that they were satisfied with the corrective actions taken in this case, and that, in general, OPG staff at the Pickering NGS-A had made good progress addressing deficiencies identified by training program inspections during this licence period.
39. CNSC staff added that they were satisfied with OPG's continuous training plan for performance improvement until 2012, based on station performance gaps.

Examination and Certification

40. OPG representatives presented their examination and certification programs and showed the results of initial and re-certification examinations between June 2005 and November 2009.
41. CNSC staff explained that the evaluation of this review topic included examination of OPG's documents on personnel qualifications and capabilities, and documents on examination, standards and procedures for certified staff training. CNSC staff added that, according to the evaluations and inspections, OPG's examination and certification procedures have met CNSC's regulatory requirements. CNSC staff said that they were planning to verify the supporting programs and procedures.
42. With respect to implementation, CNSC staff reported that the two examinations conducted in 2009 were the first ones administered completely by the licensee. CNSC staff informed the Commission that they had conducted an inspection of the preparation, conduct and grading of the 2009 authorized nuclear operator simulator examination; CNSC staff found that CNSC requirements were met and that the examination was acceptable for the purposes of initial certification of personnel.
43. Commenting on the results of the re-certification exams, the Commission sought more information about workers who fail the exam. The OPG representatives responded that workers who fail the initial tests are re-admitted to the training program, and workers for which issues were identified during recertification are retested before they are allowed to return to their duties. OPG representatives noted that re-testing is a continuous activity and that there is no automatic re-certification of personnel. CNSC staff stated that they have no concerns regarding the certification methods applied at OPG.

Human Factors

44. OPG representatives explained that their approach to human factor management was integrated into OPG Nuclear Engineering Change Control process and presented a number of documents that govern their consideration of human factors. They stated that their human factors activities meet CNSC Regulatory Guides G-276 *Human Factors Engineering Program Plans* (Ref. 1), and G-278 *Human Factors Verification and Validation Plans*.
45. OPG representatives said that OPG plans to address the human performance rapid response process, observation and coaching and the corrective action process during the next licence period, and to review human performance components such as event free tools, three-way communication and pre- and post- job briefings.
46. OPG representatives added that a human factors specialist performs independent reviews and assists design engineers with the consideration of human factors in engineering changes. An additional expert support is also available from the Process Control Analysis and Human Factors Engineering Section in the Engineering Services Division.
47. CNSC staff informed the Commission that they had reviewed the following areas of this program: human performance (including hours of work, fitness for duty and minimum complement) and procedures and job aids. CNSC staff stated that OPG is expected to apply regulatory requirements regarding work hours and fitness for duty to all workers at nuclear power plants, including contractors and casual construction trades.
48. CNSC staff reported that, upon their advice, OPG had submitted an action plan and provided updates to demonstrate full compliance with the regulatory guidance documents G-323 "Ensuring the Presence of Sufficient Qualified Staff at Class I Nuclear Facilities - Minimum Staff Complement" and G-278 "Human Factors Verification and Validation Plans". CNSC staff said that they had conducted an inspection, in 2006, to verify compliance with the minimum shift complement requirements, and found that OPG did not control or monitor the status of minimum shift complement to ensure that qualified personnel are available for all of the work groups and emergency roles. CNSC staff noted that OPG had addressed the deficiencies issued in the original inspection report and had implemented the minimum complement coordination program.
49. CNSC staff further reported that, as a result of the review of governing document N-PROC-HR-0002 "Limits of Hours of Work", OPG was requested to identify steps to be taken to ensure compliance with all aspects of the document. CNSC staff added that OPG had recently addressed this issue and is making progress in resolving the identified deficiencies. CNSC staff expects that OPG will have completed the work on the hours of work and minimum complement projects during the next licensing period.

50. With respect to job aids, CNSC staff informed the Commission that they have reviewed the relevant program documents and had no major concerns. CNSC staff added that they monitor the implementation of procedures and that they had not identified any significant issues.
51. The Commission sought more information on the minimum shift complement issue where CNSC staff noted that OPG had not controlled or monitored the status of minimum shift complement to ensure that qualified personnel were available for all of the work groups and emergency roles. The OPG representative explained that the minimum shift complement had been controlled and monitored every shift through supervisory oversight. The issue has been the ability of OPG to demonstrate that all the movement of personnel inside and out of the station had been tracked. The issue had been resolved and OPG now has the minimum shift complement program that can be tracked and compliance demonstrated at all times. CNSC staff confirmed the explanation of the OPG representative.
52. The Commission asked how many overtime hours had been applied to the staff, and were there sufficient staff to fill every complement without extra work hours. OPG representatives responded that the staff worked overtime primarily to provide for vacation relief and unforeseen absences.
53. The Commission further asked if CNSC staff monitors the overtime so that safety is not jeopardized. CNSC staff responded that they had identified an hours-of-work requirement that had been exceeded in several occasions.
54. In response to the Commission's request, OPG identified the common mode event scenarios deemed to be the most resource intensive with respect to minimum shift complement. These scenarios included a seismic event, a loss of coolant and loss of electrical power event and a main steam-line break.
55. In their intervention, the Power Workers' Union (PWU) expressed concerns in regards to staffing and noted their ongoing discussions with OPG in this regard. The fact that the Pickering station would be closed within a decade creates an additional issue for the PWU since many of the workers are expected to start seeking employment in other areas, which could create additional operational and safety problems as the projected end-of-life approaches.
56. The Commission sought more information on OPG's plans for retention and recruitment of highly-qualified personnel as the end-of-life of Pickering stations approach, and on potential impact of this issue on the safe operation of the plant during its last decade. OPG responded that they were committed to prepare a detailed operational plan and submit it to the CNSC by the end of 2011. CNSC staff noted that they expect that OPG would address this issue in their end-of-life plan.

Conclusion on Human Performance Management

57. Based on its consideration of the presented information, the Commission concludes that OPG has appropriate programs in place and that the 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.

Operating Performance

58. CNSC staff presented the results of their evaluation of the activities that enable effective performance and ensure reliable, safe and secure plant operation, and effective event reporting. This evaluation included the following review topics:
- Conduct of operations;
 - Event reporting; and
 - Operating experience.

CNSC staff has rated all evaluated topics as "Satisfactory".

Conduct of Operations

59. OPG representatives informed the Commission about the objectives of their Conduct of Operations program and said that they were developing and leading several initiatives that had been identified to enhance operations performance in key areas identified during internal and external assessments. The target areas include procedural use and adherence, human performance improvements, work protection improvements, plant status control improvements, and reactivity management improvements.
60. In its submission, OPG provided information on systems for the chemistry control of the station and on the procedures for outage management. The information included explanation of performance indicators and laboratory quality index, as well as an outline of the OPG procedures N-PROC-MA-0013 "Planned Outage Management" and N-PROC-MA-0049 "Forced Outage Management". OPG also informed the Commission that the Pickering Chemistry Laboratory is accredited to the ISO 17025 quality standard for testing and calibration laboratories.
61. CNSC staff informed the Commission that they had reviewed the governing document related to operations N-PROG-OP-0001 "Conduct of Operations", which forms the basis to ensure that Pickering NGS-A operates so that the "Operating Policies and Principles" (OP&Ps) are followed, and concluded that operations of the Pickering NGS-A meet requirements.

Event Reporting

62. CNSC staff reported on their review of the OPG's reporting governing documents P-PROC-RA-0020 "Preliminary Event Notifications" and P-INS-00531-10000 "Processing Pickering S-99 Reportable Events" and on inspections during the licence period.
63. With respect to implementation, CNSC staff reported on non-compliances regarding reporting on routinely discharged radioactive effluents and hazardous substances, identified during CNSC's inspection. CNSC staff added that OPG has addressed the issue in a satisfactory manner. CNSC staff informed the Commission that the proposed new licence includes a new condition requiring OPG to control and monitor the releases of hazardous substances, which is explained in details in the LCH.
64. CNSC staff also reported that OPG had reduced the additional report backlog from 22 to 8 items and had made improvements in other areas of reporting.

Operating Experience

65. In its submission, OPG provided information on the results of improvements introduced after an independent assessment of the Operating Experience (OPEX) program performed in 2008, and on further improvements that are planned or in progress.
66. CNSC staff reviewed the documentation for the operating experience and informed the Commission on its assessment of the implementation of the program and governing document. CNSC staff noted that, during the current licence period, OPG had improved the continuous use of OPEX and that no gaps were identified in the use of OPEX in root cause investigations. CNSC staff added that they did not identify any issues that could affect the safe operation of the plant; however, they identified a need to improve the process documentation and its resulting implementation. OPG proposed measures to further improve the OPEX, and CNSC staff will monitor improvements made over the next licence period.

Conclusion on Operating Performance

67. Based on its consideration of the presented information, the Commission concludes that the operating performance at the facility provides a positive indication of OPG's ability to adequately carry out the activities under the proposed licence and to provide adequate protection to the health and safety of persons and the environment.

Facility and Equipment

68. The Commission examined issues related to the program areas of Safety Analysis, Physical Design and Fitness for Service in order to assess the adequacy of the safety margins provided by the design of the facility.

Safety Analysis

69. The OPG representatives informed the Commission on significant efforts in the area of safety analysis and safety report update improvement that OPG had made in response to CNSC specific action items. OPG presented the status and planned program improvements for safe operating envelope, margin management, risk and reliability, fuel management, fuel and fuel channels and heat transport system ageing.
70. The information on safe operating envelope included updates on instrument air system, inter-station transfer bus (ISTB) and remaining powerhouse environmental protection project modifications. The formal Margin Management program was initiated in early 2008 with the initial focus on the identification and tracking of a small number of high priority low margin issues through the Pickering Nuclear Safety Oversight Committee. The evaluation of this program by external peers has shown that the program has been effective in aligning station management around prioritization, resolution and tracking of high priority margin issues.
71. In its submission, OPG stated that Pickering NGS-A has been fully compliant with the intent of CNSC Regulatory Standard S-98 since the submission of the “2006 Pickering A Annual Reliability Report”. OPG added that their systems important for safety (SIS) had been derived in accordance with the recommendations of the CANDU Owner’s Group (COG) and that the list of these systems had been determined through deterministic and probabilistic methods.
72. With respect to risk assessment, OPG informed the Commission that the Pickering A Risk Assessment (PARA), first issued in 1995 and updated in 2006, had demonstrated that the risk to the health and safety of the population in the vicinity of Pickering NGS is significantly lower than other risks to which it is normally exposed. In addition to traditional deterministic assessment, the PARA operational model software Equipment Out Of Service (EOOS) has been used to ensure that the configuration of the plant due to operations, maintenance or proposed design changes do not result in an unacceptable level of risk to members of the public.
73. CNSC staff informed the Commission on its assessment of OPG’s approach to systematic evaluation of potential hazards associated with the conduct of the proposed activities, and on the effectiveness of measures for reducing such hazards. This assessment included the review of deterministic safety analysis and probabilistic safety assessment. Based on this assessment, CNSC staff has rated both the documentation and its implementation as “Satisfactory”.

Deterministic Safety Analysis

74. The OPG representatives informed the Commission that OPG's safety analysis program is governed by the N-PROG-MP-0014 "Reactor Safety Program" that includes all of the safety analysis governance and governance for safety report updates.
75. CNSC staff informed the Commission that they had reviewed documents and evaluated other relevant information pertaining to the condition of plant systems, structures and components, as well as their performance under normal and upset conditions. CNSC staff added that OPG submits an updated Safety Report, in accordance with Regulatory Document S-99 "Reporting Requirements for Operating Nuclear Power Plants" every 3 years.
76. CNSC staff further informed the Commission on issues and events related to the implementation of the program and listed generic action items that have remained open. The list includes the following items:
- Positive void reactivity – Treatment in large loss of coolant accidents (LOCA);
 - Moderator temperature predictions;
 - Replacement of reactor physics computer codes used in safety analysis of CANDU reactors;
 - Channel voiding during a large LOCA; and
 - Fuel management and surveillance software upgrade.

CNSC staff added that OPG was working on safety analysis and safety report update improvements.

Probabilistic Safety Assessment

77. CNSC staff reported to the Commission that they had evaluated for consistency with licensing documentation OPG's governing document N-PROG-RA-0016 "Risk and Reliability Program", and found it acceptable.
78. CNSC staff informed the Commission about OPG's document N-STD-RA-0034 "Preparation, Maintenance and Application of Probabilistic Risk Assessment", which is issued as a detailed standard to document the requirements for preparation, maintenance and application of probabilistic risk assessment at nuclear facilities.
79. CNSC staff said that the proposed operating licence for Pickering NGS-A included the requirement that OPG submit a strategy for the introduction of S-294: "Probabilistic Safety Assessment (PSA) for Nuclear Power Plants", as well as the implementation plan. CNSC staff added that OPG was performing activities to identify existing gaps and the strategy required for the closure of gaps between the Pickering-A Risk Assessment and S-294. Pickering NGS-A Risk Assessment is expected to be compliant with S-294 by December 31, 2013.

Conclusion on Safety Analysis

80. 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 facility and the activities under the proposed licence.

Physical Design

81. CNSC staff presented the results of their evaluation of the ability of systems, components and structures to meet and maintain their design basis given new information arising over time and taking into account changes in the external environment. The following review topics were covered by this safety and control area:
- Plant design;
 - Pressure boundary; and
 - Fire protection.

Based on this evaluation, CNSC staff has rated both the documentation and its implementation as “Satisfactory”.

Plant Design

82. OPG submitted to the Commission a summary of their plant design objectives and results. OPG stated that Plant Design Engineering is responsible for maintaining the design basis for Pickering NGS-A, which ensures that the station remains within the analyzed envelope. OPG added that all design changes were prepared and executed in accordance with OPG’s “Engineering Change Control” (ECC) process governed by programs and procedures written to ensure that the ECC process comply with the Canadian Standards CAN/CSA N286 series of standards, *Quality Assurance for Nuclear Power Plants*, and all relevant legal, statutory and regulatory requirements. OPG also stated that during this licensing period, performance with respect to quality and effectiveness of the ECC process had improved while the acceptance threshold was increased, holding staff to a higher standard.
83. OPG informed the Commission on several initiatives undertaken during this licensing period. The initiatives included the following topics:
- training delivered to Operations personnel on the ECC process and on Operations role in design modifications and configuration management;
 - programmatic approach for removing legacy Jumper Records, which will be completed by the end of the year 2010; and
 - modifications and changes regarding the ISTB, which had been identified as deficient in 2007.

84. OPG added that permanent ISTB modifications to replace the existing temporary modification was being designed and installed to restore the redundancy of supply and improve the reliability of the system.
85. OPG also informed the Commission about their activities on the safe storage project, which includes placing of Units 2 and 3 in a safe storage state until the beginning of the plant decommissioning activities. Related to this project, OPG provided information on the following:
- system end state determination;
 - environmental assessment;
 - defueling of Units 2 and 3;
 - draining and drying of Units 2 and 3;
 - isolation of Units 2 and 3 from the pressure relief duct;
 - isolation of Units 2 and 3 from the emergency coolant injection system; and
 - modification of electrical system.

OPG informed the Commission that they have almost completed placing Units 2 and 3 in the safe storage state, with the exception of Unit 1 where some outage work remained to be completed.

86. CNSC staff reported to the Commission that the main OPG governing document addressing the plant design is N-PROG-MP-0007 “Conduct of Engineering”. The main intent of this program is to maintain plant configuration consistent with its design and in accordance with the licensing basis, to support the safe and reliable operation of plant equipment, and to encourage continuous improvements for the safe and reliable operation of the whole facility.
87. CNSC staff informed the Commission that all design changes were prepared and executed in accordance with the N-PROG-MP-0001 “Engineering Change Control” process. This process is governed by OPG programs and procedures, which are compliant with the Canadian Standards CAN/CSA N286 series of standards, and all relevant legal, statutory and regulatory requirements.
88. CNSC staff further informed the Commission that they had used the Regulatory Guides G-276 “Human Factors Engineering Program Plans” and G-278, “Human Factors Verification and Validation Plans” as criteria to assess if human factors had been properly taken into account for plant design, and stated that no significant issues were found.
89. CNSC staff noted that they were satisfied with the corrective actions related to the ISTB, and with inspection results regarding engineering change control. CNSC staff added that they had recommended OPG to exercise more oversight to ensure that human factors are taken into account during engineering design changes.

90. The Commission sought more information on the potential influence of the closure of Pickering NGS-B on the functionality of Pickering NGS-A, with respect to the ISTB, where power support of Station A depends on Station B. The OPG representative responded that Station A is supplied from the Station B grid, but that supply does not depend on the functioning of the Station B. CNSC staff noted that they had reviewed the assessment and determined that the safe storage of Units 2 and 3 will not adversely impact the safe operation of Units 1 and 4. However, as OPG representatives remarked, Stations A and B share common safety systems, so that the operation of Station B is required; therefore, the shutdown of Station B would provoke a placement of the Station A into a safe shutdown state. To avoid this situation, a re-evaluation and possible design modifications would be required to allow these two stations to operate independently.

Pressure Boundary

91. OPG representatives informed the Commission that they had obtained the renewal of the Certificate of Approval for the Pressure Boundary Program, that implementation of the 2006 edition of the CSA standard N285.0 “General Requirements for Pressure-Retaining Systems and Components in CANDU Nuclear Power Plants” had been completed and that transition to the 2008 edition was in progress. They added that the preparation was underway to demonstrate that pressure boundary processes remain in compliance for the evaluation that will be carried out by the Technical Standards & Safety Authority (TSSA) during the next licensing period.
92. CNSC staff reported that, in order to meet the requirements of CSA standard N285.0, OPG had produced a quality assurance program for pressure boundary which had been reviewed and verified by the TSSA, and that OPG has a Certificate of Approval to perform pressure boundary related work at the Pickering facility.
93. CNSC staff informed the Commission that they had reviewed and accepted OPG’s pressure boundary program procedures for the classification and registration of pressure boundary design modifications, and that these would need to be updated during the next licensing period to comply with “CSA N285.0-08 Including 2009 Update”.
94. CNSC staff stated that there had been no serious pressure boundary failures during this licensing period.

Fire Protection

95. OPG informed the Commission on the objectives of their fire protection program and stated that their program is based on industry best practices and on CSA standard N293-05 “Fire Protection for CANDU Nuclear power Plants”. OPG added that the implementation plan has been prepared for the transition to the new edition of the CSA standard N293-07.

96. CNSC staff reported that they had performed a comprehensive review of OPG's fire protection program in 2007. Only minor deficiencies had been identified and the program was considered adequate to maintain an acceptable level of protection from fire at the facility.
97. CNSC staff informed the Commission that they had also reviewed OPG's fire emergency response and had concluded that it was in compliance with the licence requirements and with CSA standard N293.

Conclusion on Physical Design

98. On the basis of the information presented, the Commission concludes that the ability of systems, components and structures to maintain their design basis is adequate for the operation during the granted licence period.

Fitness for Service

99. CNSC staff presented the results of their evaluation of the physical condition of systems, components and structures to ensure that they remain effective over time. The following review topics were covered by this safety and control area:
- Maintenance;
 - Structural integrity;
 - Reliability; and
 - Environmental qualification.

Based on this evaluation, CNSC staff has rated both the documentation and its implementation as "Satisfactory".

Maintenance

100. OPG informed the Commission that, over the current licensing period, the Maintenance department had made improvements to Leadership, alignment around common goals, contractor oversight, and procedure quality. OPG noted that they were working to improve plant reliability and reduce elective and corrective maintenance backlogs. OPG added that they were planning to improve the oversight of contractors and the effectiveness of breakplan maintenance during the proposed licensing period.
101. CNSC staff informed the Commission that OPG has policies, processes and procedures in place that provide direction and support for its maintenance program. CNSC staff added that OPG also has the plant life management program that consists of a number of documents under the main program document N-PROG-MP-0008 "Integrated Ageing Management". CNSC staff stated that their opinion, after evaluating the programs, was that both programs meet requirements.

102. CNSC staff reported that Pickering NGS-A has kept its corrective maintenance backlog within best industry practice and were showing improving trends with other maintenance related indicators.
103. With respect to plant life management, CNSC staff noted that Units 1 and 4 are the oldest operating CANDU reactors in Canada, that replacement of the components had been extensive and that there is still a significant amount of original equipment which is subject to ageing. CNSC staff said that, while the project on plant life management was still in development, they were satisfied with the progress made and the response when an ageing related problem occurs.
104. The Commission inquired into ageing equipment at Pickering NGS-A and potential interference of recently announced investment of about \$ 300 million allocated to the Pickering NGS-B for its life extension. The OPG representative responded that, for Pickering NGS-A, all major components have a life cycle management program in place and that those systems were operated to meet all fitness for service requirements, so that the announcement about Pickering NGS-B has no impact on those management programs.
105. In its intervention, Greenpeace Canada requested that OPG and the CNSC release annually all studies used to rationalize the design life of the Pickering reactors, including information on the expected life-span of all life-limiting components. Greenpeace Canada also suggested that the Commission include a licence condition requiring OPG to develop an end-of-life plan for the entire Pickering station.
106. The Commission sought more information on the definition of end-of-life of a facility and about CNSC staff's efforts to prepare regulatory guidance for events of this kind. CNSC staff responded that they were preparing an end-of-life plan as part of the refurbishment regulatory guidance.

Structural Integrity

107. CNSC staff informed the Commission about OPG's plans for the periodic inspection of the following components:
- containment;
 - pressure tubes;
 - steam generator tubes;
 - feeders;
 - relief valves; and
 - high energy non-nuclear components.

CNSC staff reported that they had reviewed documents related to the inspections of these components and ageing management plans, and had found that the documents meet requirements and that their implementation was satisfactory.

108. With respect to improvement plans, CNSC staff informed the Commission that the current periodic inspection program will be updated to close any gaps with the CSA standard N287.7: “In-service examination and testing requirements for concrete containment structures for CANDU nuclear power plants”, and that the implementation of the updates would start in 2011. CNSC staff added that a detailed implementation plan will be prepared in 2010.

Reliability

109. OPG informed the Commission about its Equipment Reliability program, the objective of which is to improve the station equipment reliability and reduce forced loss rate by identifying the necessary activities, execute the work through a Work Management process and to sustain equipment reliability by using the Preventative Maintenance program.
110. OPG further informed the Commission that, since the completion of the Return to Service Projects on Units 1 and 4, equipment reliability and forced loss rate had not met OPG’s expectations. To resolve the issue, the Equipment Reliability Restoration (ERR) Department was formed in July 2008 to integrate various equipment reliability initiatives across Pickering A under one umbrella organization. These initiatives are being executed over the period 2009-2011, and the ERR Department is coordinating several initiatives, such as fuel handling recovery, System Health recovery and Nuclear Integrated Supply Planning project.
111. CNSC staff informed the Commission that they had reviewed the key governing document related to reliability, and found it acceptable. CNSC staff added that Pickering NGS-A had developed a list of systems important to safety, using a methodology recommended by CANDU Owners Group, and had established acceptable reliability targets for these systems.
112. CNSC staff further informed the Commission about the implementation of the reliability program and provided their assessment of the following reliability issues:
- reliability failure data;
 - unavailability of special safety systems and systems important to safety;
 - mandatory safety system tests; and
 - reliability reporting.

CNSC staff also informed the Commission on their review of OPG’s improvement plans for reliability, which had been found acceptable.

Environmental Qualification

113. OPG stated, in its submission, that all required systems, equipment, components, protective barriers, and structures were qualified to perform their safety functions under the environmental conditions defined by the Pickering A design-basis accidents. OPG noted that overall conditions of the current Environmental Qualification (EQ) program have been good for the last two quarters.

114. CNSC staff informed the Commission that they had reviewed OPG's governing document that provides overall EQ program requirements and links to other EQ governance procedures important for various aspects of the EQ program.
115. CNSC staff reported that there were several EQ related events during this licensing period, which were reported in accordance with the reporting requirements of Regulatory Standard S-99. CNSC staff added that they had reviewed and monitored these events, that they were satisfied with the actions taken and with the overall implementation of EQ, as well as with the improvement plans for equipment qualification.

Conclusion on Equipment Fitness for Service

116. 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 and maintained at the facility is fit for service.

Core Control Process

117. The Commission assessed the adequacy of the programs and efficiency of their implementation and examined issues related to the following program areas:
- Radiation protection;
 - Conventional health and safety;
 - Environmental protection;
 - Emergency management and response;
 - Waste management;
 - Security;
 - Safeguards and non-proliferation; and
 - Packaging and transport.

Radiation Protection

118. CNSC staff informed the Commission that OPG had revised its radiation protection program documentation to better meet their management system requirements. CNSC staff has evaluated all of the program elements and rated both the documentation and its implementation as "Satisfactory".
119. The OPG representatives informed the Commission that they are considering several dose reduction initiatives and that they have identified a number of future improvements to their radiation protection program, including a five-year As Low As Reasonably Achievable (ALARA) plan and a project undertaken to install new fixed area gamma monitors.

120. CNSC staff confirmed that the ALARA principle was applied to minimize doses to the workers and that Pickering NGS-A had implemented several dose reduction strategies to minimize the exposure to radiation in cases where a source term could not have been eliminated.
121. CNSC staff further informed the Commission that there were no recordable doses that exceeded the prescribed dose limits or OPG's administrative limits during the current licensing period. The analysis of the submitted data on collective doses has shown that fluctuations in dose from year to year are directly related to the number of maintenance outages and the scope of work performed during these outages.
122. CNSC staff reported that, during the current licence period, the OPG action levels had been exceeded twice, but remained significantly lower than the regulatory limit of 50 mSv (millisieverts). In 2006, the tritium in bioassay action was exceeded once, resulting from one unplanned tritium uptake with an estimated committed effective dose of 5 mSv. In 2007, one event resulted in one individual exceeding the tritium in bioassay action level with an estimated committed effective dose of 4 mSv. CNSC staff added that in 2008 and 2009 no action level were exceeded at OPG Pickering NGS-A.
123. CNSC staff further reported that a common cause root cause analysis of tritium uptakes at all OPG facilities, performed in 2006, had resulted in program changes that include the creation of a new tritium protection planning review form and the computer assisted learning element, which has to be completed by all personnel involved in radiation work.

Conclusion on Radiation Protection

124. The Commission is of the opinion that, given the mitigation measures and radiation protection programs that are in place or will be in place to control hazards, OPG will provide adequate radiation protection to the health and safety of persons and the environment.

Conventional Health and Safety

125. OPG submitted information on their non-radiological health and safety program stating that they monitor the following indicators:
- All Injury Rate (AIR);
 - Accident Severity Rate (ASR);
 - High Maximum Reasonable Potential for Harm (MRPH) Events; and
 - Industrial Safety Accident Rate (ISAR).

The data show that ASR and accident frequency were at the industry average and that the Pickering NGS-A performance had been comparable with other NPPs over the current licence period.

126. CNSC staff informed the Commission that they had reviewed OPG's conventional safety program N-PROG-HR-0004 "Occupational Health and Safety" and concluded that it is aligned with OPG's policy on management systems. CNSC staff rated the program and its implementation as satisfactory.
127. CNSC staff added that OPG had demonstrated adequate conventional health and safety performance at Pickering NGS-A, with accident frequency and accident severity that are approximately at the industry average. CNSC staff added that, during 2009, three lost time accidents had occurred at the Pickering NGS.
128. The Commission asked about management of injured employees. OPG representatives responded that OPG has a program for injured employees where a person is assisted by both wellness and human resources in terms of return-to-work provisions, modified duties and accommodation of that employee.
129. The Commission is of the opinion that OPG will continue to provide adequate protection to the health and safety of its personnel.

Environmental Protection

130. CNSC staff informed the Commission that they had reviewed and confirmed that OPG's governing document for the environmental management program, N-PROG-OP-0006 "Environmental Management", conforms to ISO 14001-2004 "Environmental Management Systems" and satisfies CNSC staff's expectations. CNSC staff added that the Pickering NGS had been re-certified to the ISO 14001 standard by an external agency in November 2008.
131. CNSC staff further informed the Commission that they had reviewed and approved the derived release limits (DRLs) and environmental action levels (EALs). CNSC staff added that OPG intends to update the DRLs according to a revision of CSA standard N288.1: "Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities".
132. OPG informed the Commission that, during the current licence period, radiological and conventional emissions remained well below all regulatory limits and action levels, and that a number of improvements had been completed or initiated. These initiatives include the following:
- replaced sampling and monitoring equipment;
 - installed spill abatement measures;
 - reduced low level radioactive waste;
 - installed a barrier net to reduce fish impingement; and
 - resolved all remaining issues from the Environmental Action Plan.
133. OPG also informed the Commission on planned improvements that include continued clean up, replacement of chillers on both the Service Wing and Administration Building, further reducing of chlorofluorocarbons emissions, as well as the evaluation of the effectiveness of the fish barrier net.

134. Reporting on other environmental protection issues, CNSC staff informed the Commission that the reported dose to the public due to both Pickering NGS-A and NGS-B in 2008 had been 4.1 μSv , well below the public dose limit of 1000 μSv . Gaseous and aqueous releases of nuclear substances from Pickering have been below environmental action levels during the current licence period. CNSC staff added that there had been no reported unplanned releases of nuclear substances or hazardous substances from Pickering NGS-A that posed a risk to the environment.

Fish Loss: Impingement and Thermal Pollution

135. CNSC staff reported that, in 2007, OPG had requested an “approval in principle” for the removal of the “Pickering A Return to Service Environmental Assessment Follow-Up Monitoring Program” as a license condition, due to the completion of the project. CNSC staff added that they had accepted the request and that the licence had been amended; however, CNSC staff found that Pickering NGS-A had not been in compliance with the licence condition for follow-up monitoring. OPG had not monitored and reported the environmental effects of the condenser cooling water system in accordance with the environmental assessment follow-up monitoring program. After reviewing the data provided by OPG, CNSC staff concluded that the on-going fish mortality, due to impingement and entrainment (IE) in the cooling water intake of both Pickering NGS-A and NGS-B, constituted an unreasonable risk to the environment. CNSC staff said that Fisheries and Oceans Canada had expressed concerns with the scale of IE losses of fish, and had also concluded that OPG had not implemented available mitigation measures. Consequently, CNSC staff had requested that OPG implement IE mitigation measures in accordance with a strict timetable.
136. CNSC staff further reported that OPG complied with the CNSC’s request and had installed a barrier net surrounding the water intake, as an interim impingement mitigation measure, and a monitoring program to evaluate its effectiveness. Longer term impingement and entrainment reduction options have been the subject of a cost-benefit analysis, including consultation with CNSC staff, Department of Fisheries and Oceans, Environment Canada, Ontario Ministry of Environment, Ministry of Natural Resources and Toronto Region Conservation Authority.
137. CNSC staff informed the Commission that they had responded to OPG’s proposed solution by endorsing OPG’s cost-effective solution. In addition to the barrier net already installed, the following actions were recommended:
- creation and enhancement of fish habitat in local coastal wetlands;
 - contingency plan for intake fish mitigation technology option in case of inadequate barrier net performance; and
 - annual reporting on the progress including performance data.

CNSC staff added that, after re-examining the timeline, a decision on the long-term mitigation for intake and thermal discharge fish mortality was expected to be made by the end of 2011.

138. With respect to replacement of the temporary net and implementation of permanent mitigation measures, CNSC staff noted that, according to the plan from 2008, detailed engineering plans for implementing impingement and entrainment mitigation was expected for 2012.
139. The Commission sought more information on the net used for fish barrier, and what were the other measures considered for fish protection. CNSC staff responded that there were two aspects to the fish mortality issue. One was the intake fish loss, and OPG's interim measure was the use of barrier net, and the other was the temperature effect of the thermal plume. CNSC staff added that they were evaluating the effects of the net barrier with respect to cost-benefit report, and, regarding the thermal plume effects, OPG had developed a plan to study it, to determine if there were adverse effects that would require mitigation.
140. In its intervention, Lake Ontario Waterkeeper (LOW) expressed concerns regarding Pickering station's impact on the integrity of Lake Ontario as an aquatic and fish habitat, a place of recreation and a source of drinking water for a large population. LOW pointed out that cooling water from Pickering NGS-A has negative effects on fish and fish habitat, and stated that OPG had not made adequate provision to protect the environment. LOW recommended that the Commission include in the licence terms and conditions a requirement that OPG take timely and effective actions to stop the unacceptable fish kills through impingement, entrainment and thermal pollution.
141. The Commission inquired about identified species at risk and efficiency of the net barrier compared with other potential solutions, and asked for the opinion of Fisheries and Oceans Canada (FOC). The FOC representative responded that they were working with the Ministry of Natural Resources, Toronto and Region Conservation Authority, OPG and CNSC on the issue of fish mortality, and that, based on the information provided, the use of the net barriers seems to be a promising solution. After assessing the efficiency of the net, a decision would be made on whether more measures, such as fish bypass, rotating nets or screens, are required to be put in place.
142. The Commission expressed its concerns regarding the timeline for implementation of permanent mitigation measures, especially taking into account the end-of-life plans and approaching decommissioning. OPG responded that they would re-examine the overall timelines along with CNSC staff.

Conclusion on Environmental Protection

143. 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 environment. The Commission requests that OPG prepare yearly reports on their activities regarding fish impingement, the first report to be presented by December 2010.

Emergency Management and Response

144. OPG submitted information about its Emergency Preparedness program and stated that there is a comprehensive Consolidated Nuclear Emergency Plan (CNEP) for Pickering NGS-A that outlines OPG's nuclear emergency response capability and defines response capability and preparedness. OPG added that this plan had been effectively implemented, updated twice during this licence period and regularly tested through drills and exercises.
145. OPG noted that it monitors performance of the program using an internal set of performance measures, which are derived from the Institute of Nuclear Power Operations (INPO) and the World Association of Nuclear Operators (WANO) performance objectives and criteria.
146. CNSC staff informed the Commission that they were satisfied with Revision 9 of the governing document for emergency preparedness, N-PROG-RA-0001 "Consolidated Nuclear Emergency Plan", submitted by OPG for review and approval, and concluded that the emergency preparedness program exceeds CNSC's requirements.
147. With respect to implementation of the program, CNSC staff reported that they had conducted one program evaluation inspection in 2008, an inspection in 2006 and an inspection in November 2007, and that all actions raised by these inspections were closed. CNSC staff added that the implementation of emergency management and response at Pickering NGS-A meets CNSC requirements.
148. The Commission inquired about the installation of 26 sirens that had been originally recommended. OPG representatives responded that four sirens had been installed and tested, and that the City of Pickering was reviewing the report on additional needs for sirens and potential location for them. The Commission requested that the additional sirens be installed and requested that OPG prepare a progress report by December 2010.

Conclusion on Emergency Management and Response

149. The Commission is of the opinion that OPG will provide adequate protection to the health and safety of persons, the environment and national security in cases of emergency and unplanned events.

Waste Management and Decommissioning

150. This safety and control area covers internal waste-related programs regarding management of the waste before it is removed from the facility to a separate waste management facility. The Commission also requires that the licensee has operational plans for decommissioning and long-term management of waste produced during the life-span of the facility.

Waste Management

151. CNSC staff informed the Commission that they were satisfied with OPG's waste management program document, N-PROC-OP-0043 "Waste Management".
152. CNSC staff further informed the Commission that all low and intermediate level wastes generated during day-to-day operations and during planned or unplanned outages have been transferred to OPG's Western Waste Management Facility for processing and storage. The Retube Components Storage Facility (RCSF), located on site at the Pickering Waste Management Facility and developed for a refurbishment project, has been completed and closed. CNSC staff added that the used nuclear fuel has been transferred to the irradiated fuel bays and dry containers and, after a cooling down period of a minimum of ten years, transferred for long term storage in the Pickering Waste Management Facility (separately licensed). CNSC staff noted that Pickering NGS-A has undertaken a number of waste volume reduction initiatives throughout the current licensing period.

Decommissioning

153. CNSC staff informed the Commission that the Preliminary Decommissioning Plan (PDP) was set out in OPG's document "Preliminary Decommissioning Plan, Pickering Nuclear Generating Stations A and B". They reviewed and assessed the document in 2007 following Regulatory Guide G-219: "Decommissioning Planning for Licensed Activities", and concluded that the PDP was acceptable. The Commission accepted the document in November 2007.
154. CNSC staff further informed the Commission that, as a result of the 2005 decision of the OPG Board of Directors, Units 2 and 3 at the Pickering NGS-A have not been returned to service, but instead are being placed into safe storage. The units would proceed through several phases prior to the onset of physical dismantling of the facilities; the first, "Preparation for Safe Storage Phase", would be followed by the "Safe Storage Phase" which would last for a nominal period of 30 years, to allow for the decay of short-lived fission and activation products.
155. CNSC staff noted that, due to the shared nature of support equipment that is common to Units 1 through 4, a completion of the "Preparation for Safe Storage Phase" may not be conducted for all aspects of shared services as set out in the PDP; consequently, the goal of the safe storage project would be to defuel the units, remove heavy water, and separate Units 2 and 3 from Units 1 and 4 so that they could remain in safe storage until Units 1 and 4 are permanently shut down.
156. In order to physically separate Units 2 and 3 from Units 1 and 4, while maintaining essential systems for the safe operation of Units 1 and 4, OPG submitted in 2007 a project description for the Guaranteed Defueled State (GDS). An environmental assessment (EA) was required prior to authorizing OPG to proceed, and the Commission issued EA guidelines for this project in June 2008. OPG submitted its EA study report and the Commission approved the EA Screening Report in November 2008.

157. CNSC staff reported that Units 2 and 3 were defueled and drained while drying of the moderator and primary heat transport systems, along with modifications of various systems and components, was under way. CNSC staff added that they were reviewing OPG's proposed modifications to separate the containment of Units 2 and 3 from the pressure relief duct, as well as OPG's safety assessment of the impact of the safe storage of Units 2 and 3 on Units 1 and 4.
158. The Commission sought more information on how the licensing of Pickering NGS-A is affected by the ongoing development of Pickering NGS-B and, in more general terms, by the issues of new bills of decommissioning, waste disposal and other issues around the nuclear industry development in Ontario. The OPG representative responded that the recent announcement regarding the end-of-life for Pickering NGS-B was an issue around economics of potential refurbishment of that station. With the decision not to refurbish Pickering NGS-B, which is a reliable station and operates well, the focus on Pickering NGS-A during the proposed licence period would be continued improvement in operation and higher equipment reliability. OPG emphasized the importance of a reliable production of about 3000 MW (megawatts) of energy at the Pickering site, which would permit for the refurbishment of other reactors in the province.
159. The OPG representative also emphasized that Pickering NGS-A would go through the same reliability improvement initiative, using the same methods and techniques, that had been applied to Pickering NGS-B, so that two reactors could be a reliable source of energy for the next decade.
160. The Commission asked about the nature of equipment required once the units are in a safe storage state. The OPG representatives explained that the major equipment on Units 2 and 3, which supports at the same time the safe operation of Units 1 and 4, is the electrical distribution system.
161. In its intervention, the Greenpeace Canada requested that the Commission require that OPG prepare a full and detailed decommissioning plan for the planned end-of-life of the Pickering station.
162. The Commission inquired about the appropriate time during the licensing process to consider licence renewal in a wider context of a facility life-time, and start considering all aspects of approaching decommissioning and end-of-life of a facility. CNSC staff responded that OPG is expected to submit its end-of-life plan for Pickering NGS-B by September 2010. CNSC staff added that, even though OPG had announced that refurbishment for Pickering B station will not be pursued, the condition of main components that govern the end-of-life of the plant had been assessed and their life expectancy is not expected to exceed the next decade. For Pickering A, all units have an assumed design life until the middle 2020s; however, because of inter-reliance on Pickering B, both stations would have the same end of operating life, and OPG recently announced that Pickering B was entering its final decade of operation.

163. The Commission inquired on existing experience regarding shutting down and decommissioning of nuclear power plants, and on methods to maintain maximum safety of operations during that period. OPG responded that they were preparing themselves to use the experience developed through shutdown of their thermal operations, and were considering transfer of staff, moving of resources and looking to the industry-wide experience throughout North America and elsewhere.

Conclusion on Waste Management and Decommissioning

164. Based on the information provided, the Commission concludes that OPG has made adequate provisions regarding waste management and decommissioning. The Commission also concludes that a detailed decommissioning plan is not required at this time, since an acceptable PDP is already in place.

Security

165. With respect to site security issues, the Commission was provided with a separate, confidential CMD, which was considered in a closed session.
166. 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 during the proposed licence period.

Safeguards

167. OPG submitted information regarding safeguards and non-proliferation programs, with outlined plans for regular self-assessments, training and qualification for staff and updated operating manuals in their licence application. These plans address the current Safeguards priorities for the CNSC for Pickering NGS-A.
168. OPG informed the Commission that their Safeguards program includes the following elements:
- a communication protocol between the International Atomic Energy Agency (IAEA), the CNSC, and OPG;
 - obligations to meet applicable regulatory requirements and the requirements of Safeguards agreements; and
 - reporting to meet applicable regulatory requirements and the requirements of Safeguards agreements.
169. CNSC staff reported that they had reviewed the document N-PROG-RA-0015 “Nuclear Safeguards” submitted by OPG, and found it to be acceptable. CNSC staff added that, during this licence period, OPG provided CNSC staff with all required reports and complied fully with all requests. CNSC staff said that the IAEA had conducted four physical inventory verifications, four design information verifications, and four interim inventory verifications; in all cases, OPG provided the IAEA with the necessary access and assistance to perform their activities.

170. 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 at the facility.

Packaging and Transport

171. CNSC staff reported that a licence to transport Category I, II and III nuclear material issued to OPG is revised every year. CNSC staff added that, for transportation of nuclear substances, OPG uses packages of its own designs, certified for use by the CNSC and maintained by OPG to ensure compliance with the approval certificate. CNSC staff said that OPG complies with the *Packaging and Transport of Nuclear Substances Regulations*⁹ requirements for all shipments leaving the site.

Other Information

Application of the *Canadian Environmental Assessment Act*

172. Before making a licensing decision, the Commission must be satisfied that all applicable requirements of the *Canadian Environmental Assessment Act*¹⁰ (CEAA) have been fulfilled.
173. CNSC staff indicated that the application to renew the licence for the facility under subsection 24(2) of the NSCA is not prescribed for the purposes of paragraph 5(1)(d) of the CEAA in the *Law List Regulations*¹¹. Since there are no other CEAA triggers for this project that involve the CNSC, CNSC staff stated that an environmental assessment under CEAA is not required.
174. Based upon the above assessment, the Commission is satisfied that an environmental assessment under the CEAA is not required for OPG's application for licence renewal.

Cost Recovery

175. CNSC staff informed the Commission that OPG is in good standing with respect to the *Cost Recovery Fees Regulations*¹² requirements for Pickering NGS-A.

Financial Guarantees

176. In order to ensure that adequate resources are available for a safe and secure future decommissioning of the Pickering site, the Commission requires that an adequate financial guarantee for realization of the planned activities is put in place and maintained in a form acceptable to the Commission throughout the licence period.

⁹ Statutory Orders and Regulations, S.O.R./2000-208

¹⁰ Statutes of Canada, S.C. 1992, c. 37

¹¹ Statutory Orders and Regulations, S.O.R./94-636.

¹² Statutory Orders and Regulations, SOR/2003-212

177. CNSC staff reported that, during a Commission hearing on November 2, 2007, the Commission accepted OPG's financial guarantee proposal and assigned a licence condition requiring OPG to provide an update prior to June 30, 2012.
178. CNSC staff reported that the estimated cost of decommissioning the Pickering NGS-A is \$1.851 B assuming planned shutdown dates of 2021 and 2027 for Units 1 and 4. CNSC staff added that for the Pickering NGS-A renewal, the financial guarantee remains valid, sufficient and in effect. CNSC staff also said that OPG plans to conduct a complete decommissioning cost estimate review as part of the 5-year Ontario Nuclear Funds Agreement reference plan update cycle.
179. Responding to the Commission's question about the status of the provincial contribution to the financial guarantee, CNSC staff informed the Commission that on February 22nd, 2010 a new provincial guarantee between CNSC and the Province of Ontario and the second amending agreement to the CNSC financial security and Ontario Nuclear Funds Access Agreement between OPG, the CNSC and the Province in Ontario had been signed.
180. Based on this information, the Commission considers that the financial guarantee is acceptable for the purpose of the current application for licence renewal.

Nuclear Liability Insurance

181. CNSC staff informed the Commission that OPG has a nuclear liability insurance coverage, for the Pickering NGS-A nuclear facility, as required under sub-section 15(1) of the *Nuclear Liability Act*¹³.

Non-Proliferation

182. CNSC staff informed the Commission that, during the current licensing period, OPG has continued to provide regular and accurate information to CNSC staff on the status of foreign-obligated nuclear items at Pickering NGS-A, which are subject to the relevant bilateral cooperation agreements between Canada and other countries. CNSC staff is of the opinion that the renewal of the Pickering NGS-A operating licence would be in conformity with measures required to implement international obligations on export and import controls to which Canada has agreed.
183. Based on the provided information, the Commission is satisfied that OPG has made, and will continue to make, adequate provisions regarding non-proliferation at the facility that are necessary for maintaining national security and for implementing international agreements to which Canada has agreed.

¹³ Revised Statutes of Canada, R.S.C., 1985, c. N-28

Cobalt-60

184. CNSC staff informed the Commission that the current and proposed new Pickering NGS-A operating licenses authorize OPG to possess, manage and store Cobalt-60. In addition, the proposed operating licence requires that OPG implement and maintain a program for the receipt, storage and handling of Cobalt-60. CNSC staff explained that Pickering NGS-A is not authorized to produce Cobalt-60, but it facilitates the transport, storage and handling of Cobalt-60 produced at Pickering NGS-B. CNSC staff added that the program for the receipt, storage and handling of Cobalt-60 will not address Cobalt-60 produced as a by-product of operating a nuclear reactor at this station, which is managed through other OPG's existing processes.
185. CNSC staff added that OPG had provided an application update on Cobalt-60 including the receipt and handling of Cobalt-60 as a sealed source, and had requested an exemption from the requirement to conduct leak tests on sealed sources as specified in Section 18 (2) (d) of *Nuclear Substances and Radiation Devices Regulations*. OPG had proposed an alternate means to ensure the protection of the environment and the health and safety of persons, which includes storage of the Cobalt-60 sealed sources in the Auxiliary Irradiated Fuel Bay (AIFB) equipped with gamma scan and tritium analyzers. CNSC staff stated that they had reviewed OPG's alternate means of ensuring the protection of the environment and health and safety of persons and considered it to be acceptable.
186. Based on the information provided, the Commission accepts the alternative means for safe storage and exempts OPG from the requirement to conduct leak tests on the sealed sources that contain Cobalt-60 produced by Pickering NGS-B, as specified in Section 18(2)(d) of the *Nuclear Substances and Radiation Devices Regulations*. This exemption is granted in accordance with section 7 of the NSCA and section 11 of the *Nuclear Safety and Control General Regulations*.

Pickering NGS-A Safety Improvement Plan

187. CNSC staff informed the Commission that they had requested that OPG submit information on its assessment of existing safety challenges at Pickering NGS-A, along with a safety improvement plan to address these challenges during the next licensing period. In response, OPG submitted information with a list of ongoing improvement activities that would continue during the proposed licensing period. The information also included new initiatives such as resolution of the issues related to safety culture, minimum complement, fish mortality, and Inter Station Transfer Bus. Based on the information, CNSC staff is of the opinion that OPG is actively reviewing and planning activities that will ensure the safe operation of the Pickering NGS-A during the proposed licensing period.

Public Information Program

188. OPG submitted information on their Community Relations/Public Information program, emphasizing the objectives and explaining main components of the program. OPG also submitted an extensive list of program highlights and accomplishments.
189. CNSC staff informed the Commission that they had reviewed program documentation included in OPG's licence renewal application and included governing document N-STD-AS-0013 "External Communications". Besides the program documentation, the review included identification of target audiences, specific objectives of communication with neighbouring communities and general public and media opinion on operation of the facility. CNSC staff stated that this review indicated favourable impressions of OPG and its operation of the facility, which have been growing during the licensing period. CNSC staff is of the opinion that OPG adequately informs the public on the general nature of the effects on the environment and health and safety of persons that may result from the operation of the facility.
190. Several intervenors expressed their satisfaction with the quality of public information programs and with the transparency and leadership that OPG has shown.
191. The Commission asked OPG about their plans in terms of public information beyond the proposed licensing period and about their public information strategy to deal with bigger issues, such as refurbishments and decommissioning. OPG representatives responded that they have plans that include active communication with stakeholders and with community through the Community Advisory Council and Town Council. OPG representatives added that they were developing a long-term plan to keep their stakeholders and the public informed.
192. The Commission sought more information on consultation with the Aboriginal groups. OPG responded that they had been consulting with Aboriginal groups on their major environmental assessments, and that several groups had been included in consultations, so that all groups were included in the process; however, upon repeated invitations to participate in this hearing, the contacted Aboriginal groups did not express interest to intervene.
193. 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.

Licence Length and Conditions

194. OPG requested and CNSC staff recommended a licence term of five years beginning July 1, 2010 and ending June 30, 2015. CNSC staff also proposed changes to the format and content of the operating licence to clarify the legal requirements, remove duplication, and achieve consistency in the licences. The proposed changes were aiming at simplifying the licence format and resulted in two documents: the proposed

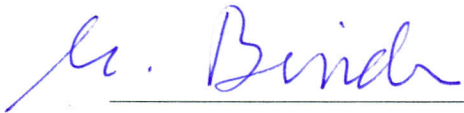
Pickering NGS-A PROL licence that contains high-level binding regulatory requirements and the Licence Conditions Handbook (LCH) that contains the related low-level technical details for each licence condition.

195. CNSC staff stated that the proposed changes would reduce the number of licence amendments that are administrative in nature and that are of low risk, which currently require approvals by the Commission. The proposed PROL changes include a generic statement that allows the Commission to delegate certain approvals to CNSC staff, which would enhance transparency, predictability and clarity of the regulatory requirements while maintaining adequate oversight of licensed activities within the mandate of the CNSC.
196. The Commission sought more information on reporting during the proposed licence period and on the role of annual reports. CNSC staff responded that this was a part of the continuous improvement in the regulatory process and that they were establishing a periodic safety review that would identify necessary actions with respect to the currently operating facility on an annual basis, looking at the same time at the long-term aspects. CNSC staff added that this approach could be applied to new facilities, existing facilities or a facility undergoing refurbishment.
197. In its intervention, Greenpeace Canada requested that the licence renewal be aligned for both Pickering NGS-A and Pickering NGS-B, given that the entire Pickering station would be closed in the 2020s.
198. Looking at the time scale beyond the proposed licensing period and commenting on potential benefits of such a solution, the Commission suggested harmonization of the licences for Pickering NGS-A and Pickering NGS-B as a rational approach to preparations for end-of-life and decommissioning activities that are expected to start during the following licensing period, from 2013 to 2018. In response, OPG stated that two separate licensees for two Pickering stations exist for historical reasons and that their intentions were to consider harmonization of the licences; however, at this time they were requesting a five-year licence for operation of Pickering NGS-A. CNSC staff stated that the requested five-year licence had been supported from the safety standpoint and said that they were involved in discussions about ways to harmonize licenses for the two sites. CNSC staff added that a consolidation of the licenses could reduce administrative work; however, such consolidation would require serious preparations.
199. Based on the above information and considerations, the Commission concluded that a three-year licence with annual reports is appropriate and requested consolidation of licences for Pickering NGS-A and Pickering NGS-B. The Commission approves the licence conditions and accepts the Licence Conditions Handbook as recommended by CNSC staff. The Commission also accepts CNSC staff's recommendation regarding the delegation of authority, and notes that they can bring any matter to the Commission as applicable.

CONCLUSION

200. 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.
201. The Commission concludes that an environmental assessment of the proposed continued operation of the facility, pursuant to the *Canadian Environmental Assessment Act*, is not required.
202. 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.
203. Therefore, the Commission, pursuant to section 24 of the *Nuclear Safety and Control Act*, renews Ontario Power Generation's Nuclear Power Reactor Operating Licence for its Pickering Nuclear Generating Station A (NGS-A) located in the city of Pickering, Ontario. The renewed licence, PROL 04.00/2013, is valid from July 1, 2010 to June 30, 2013.
204. The Commission includes in the licence the conditions as recommended by CNSC staff and set out in the draft licence attached to CMD 10-H6.C and CMD 10-H6.E. The Commission accepts the proposed *Licence Conditions Handbook* (LCH) as set out in the CMD 10-H6.C and CMD 10-H6.E.
205. With this decision, the Commission requests that OPG prepare yearly reports on their activities regarding fish mortality. The reports should include results of conducted studies, efficiency of applied mitigation measures and all other relevant data, and should be presented at public proceedings of the Commission by the end of each calendar year. The Commission expects the first of the reports to be presented by December 2010.
206. The Commission exempts OPG, pursuant to section 7 of the NSCA and section 11 of the *Nuclear Safety and Control General Regulations*, from the requirement to conduct leak tests on the sealed sources that contain Cobalt-60 produced by Pickering NGS-B, as specified in Section 18(2)(d) of the *Nuclear Substances and Radiation Devices Regulations*. The Commission accepts OPG's alternative provisions for their safe storage.
207. The Commission acknowledges the explanation by OPG regarding the end-of-life of the Pickering stations and dependence of functioning of Pickering NGS-A and Pickering NGS-B on common facilities and services.

208. The Commission directs OPG to prepare, by the end of this licence period, the merging of licences for Pickering NGS-A and Pickering NGS-B, and to submit an application for a one-site licence, focusing on the end-of-life of the facility, decommissioning (including a comprehensive plan on decommissioning strategies) and ageing management.
209. The Commission directs OPG to continue with improvements of its emergency preparedness response processes and follow recommendations regarding public alert systems and installation of additional sirens. The Commission expects to receive the first report on the progress related to this issue by December 2010.



Michael Binder
President,
Canadian Nuclear Safety Commission

SEP 20 2010

Date

Appendix A – Intervenors

Intervenors	Document Number
Ajax-Pickering Board of Trade, represented by J. G. Smith	CMD 10-H6.2
Pickering Nuclear Community Advisory Council, represented by J. Vincett, J. Dike and A. Goodall	CMD 10-H6.3
Safe Communities of Pickering and Ajax, represented by J. McKinnon	CMD 10-H6.4
North American Young Generation in Nuclear, Durham Chapter, represented by S. Mustafa and S. Lagan	CMD 10-H6.5
Greenpeace Canada, represented by S-P. Stensil	CMD 10-H6.6 CMD 10-H6.6A
Town of Ajax, represented by R. Ashby	CMD 10-H6.7
City of Pickering, represented by Mayor D. Ryan	CMD 10-H6.8 CMD 10-H6.8A
Organization of CANDU Industries, represented by N. Alexander	CMD 10-H6.9
Durham Strategic Energy Alliance, represented by D. Lindeblom	CMD 10-H6.10
Durham Catholic District School Board, represented by J. McCafferty	CMD 10-H6.11
Power Workers’s Union, represented by P. Falconer	CMD 10-H6.12 CMD 10-H6.12A
Society of Energy Professionals, IFPTE Local 160, represented by J. Fierro and V. Chetcuti	CMD 10-H6.13
Lake Ontario Waterkeeper, represented by J. Bull	CMD 10-H6.14
Pickering East Shore Community Association, represented by K. Falconer and W. Norwood	CMD 10-H6.15
Canadian Nuclear Workers’ Council, represented by D. Shier and J. Usher	CMD 10-H6.16 CMD 10-H6.16A
Durham College	CMD 10-H6.17
Durham Nuclear Health Committee	CMD 10-H6.18
Mark Holland, MP, Ajax-Pickering	CMD 10-H6.19
Joe Dickson, MPP, Ajax-Pickering	CMD 10-H6.20
PineRidge Arts Council	CMD 10-H6.21
Big Brothers and Sisters of Ajax-Pickering	CMD 10-H6.22
Greater Oshawa Chamber of Commerce, represented by B. Malcolmson	CMD 10-H6.23
Regional Municipality of Durham	CMD 10-H6.24
University of Ontario Institute of Technology	CMD 10-H6.25
United Way of Ajax-Pickering-Uxbridge	CMD 10-H6.26
Scientists in School	CMD 10-H6.27
St. Paul’s On-The-Hill Community Food Bank	CMD 10-H6.28
SNAP Pickering	CMD 10-H6.29
Veridian Corporation	CMD 10-H6.30
Rouge Valley Health System Foundation	CMD 10-H6.31
Wayne Arthurs, MPP, Pickering-Scarborough East	CMD 10-H6.32
Dan Carter	CMD 10-H6.33
Durham West Arts Centre	CMD 10-H6.34
Whitby Chamber of Commerce	CMD 10-H6.35