

Record of Proceedings, Including Reasons for Decision

In the Matter of

Applicant Ontario Power Generation Inc.

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

Hearing Dates November 1, 2007, January 10, 2008 and
February 20, 2008

RECORD OF PROCEEDINGS

Applicant: Ontario Power Generation Inc.

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

Purpose: Application for the renewal of the Power Reactor Operating Licence for the Darlington Nuclear Generating Station

Application received: N/A

Date(s) of hearing: November 1, 2007, January 10, 2008 and February 20, 2008

Location: Canadian Nuclear Safety Commission (CNSC) Public Hearing Room, 280 Slater St., 14th. Floor, Ottawa, Ontario (Day One and Day Three) and Holiday Inn, Oshawa, Guild Hall, 1011 Bloor St. East, Oshawa, Ontario (Day Two)

Members present
on all three hearing days: C.R. Barnes, Presiding Member M. J. McDill
A.R. Graham A. Harvey

Secretary: M.A. Leblanc
Recording Secretary: S. Dimitrijevic
Legal Counsel: S. Maislin Dickson (Day One and Day Three) and L. Thiele (Day Two)

Applicant Represented By	Document Number
<ul style="list-style-type: none"> • T. Mitchell, Chief Nuclear Officer, Ontario Power Generation (OPG) • W. Robbins, Senior Vice-President, Darlington Nuclear Generation Station (DNGS) • C. Sellers, Chief Nuclear Engineer • M. Peckham, Vice-President of Performance Improvement and Nuclear Oversight • F. Dermarkar, Director of Engineering Services • J. McInnes, Director of Corporate Public Relations 	CMD 07-H20.1 CMD 07-H20.1A CMD 07-H20.1B CMD 07-H20.1C CMD 07-H20.1D CMD 07-H20.1E
CNSC staff	Document Number
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Intervenors	Document Number
See appendix A	

Licence: Renewed

Date of Release of Summary Decision: February 26, 2008

Date of Release of Decision: May 9, 2008

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Introduction

1. Ontario Power Generation Inc. (OPG) has applied to the Canadian Nuclear Safety Commission (Commission)¹ for the renewal of its Power Reactor Operating Licence for the Darlington Nuclear Generating Station (DNGS) for a period of five years. The current operating licence, PROL-13.15/2008, expires on February 29, 2008.
2. The DNGS is located in the Province of Ontario on the north shore of Lake Ontario, about 10 kilometres south-east of the city of Oshawa. The nuclear facility consists of four CANDU pressurized heavy water reactors and their associated equipment. Each reactor has a nominal electrical output of 881 megawatts (MW).
3. Included within the licensed area is the Tritium Removal Facility (TRF), constructed and operated to reduce tritium concentration in heavy water inventories. A hazardous material storage building was added to the site for storage of heavy water from the Bruce Heavy Water Plant. Heavy water storage is licensed separately by the CNSC.

Issues

4. In considering the application, the Commission was required to decide, pursuant to subsection 24(4) of the *Nuclear Safety and Control Act*:²
 - 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

5. The Commission, in making its decision, considered information presented for a public hearing held on November 1, 2007 in Ottawa, Ontario, January 10, 2008 in Oshawa, Ontario and February 20, 2008 in Ottawa, Ontario. The public hearing was conducted in accordance with the *Canadian Nuclear Safety Commission Rules of Procedure*.³ During the public hearing, the Commission received written submissions and heard oral presentations from CNSC staff (CMD 07-H20, CMD 07-H20.A, CMD 07-H20.B, CMD 07-H20.C, CMD 07-H20.D, CMD 07-H20.E and CMD 07-H20.F) and OPG (CMD 07-H20.1, CMD 07-H20.1A, CMD 07-H20.1B, CMD 07-H20.1C, CMD 07-H20.1D and CMD 07-H20.1E). The Commission also considered oral and written submissions from 22 intervenors (see Appendix A for a detailed list of interventions).

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

² S.C. 1997, c. 9.

³ S.O.R./2000-211.

Decision

6. As stated in its *Summary Decision* released February 26, 2008, and based on its consideration of the matter, as described in more detail in the following sections of this *Record of Proceedings*, the Commission concludes that OPG is qualified to carry on the activity that the renewed licence will authorize. The Commission is of the opinion that OPG, in carrying on that activity, will make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed. Therefore,

the Commission, pursuant to section 24 of the *Nuclear Safety and Control Act*, issues Nuclear Power Reactor Operating Licence PROL 13.00/2013 to Ontario Power Generation Inc., Toronto, Ontario, for the Darlington Nuclear Generating Station. The licence is valid from March 1, 2008 to February 28, 2013.

7. The Commission includes in the licence the conditions recommended by CNSC staff as set out in the draft licence attached to CMD 07-H20.E.
8. With this decision, the Commission expects that CNSC staff will monitor the implementation of the new licence conditions. In addition to the regular annual reports, the Commission requests that a status report on the implementation of the new licence conditions be presented to the Commission at a public proceeding of the Commission, in approximately two years from the date of issuance of the renewed licence.

Issues and Commission Findings

9. In making its licensing decision under section 24 of the NSCA, the Commission considered a number of matters relating to OPG's qualifications 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. The Commission's findings on these issues are summarized in this section.
10. The findings of the Commission presented below are based on the Commission's consideration of all of the information and submissions available for reference on the record for the hearing.

Operating Performance

11. The Commission considered the operating performance at the DNGS as an indication of OPG's qualifications to continue to safely operate the plant and, in doing so, provide adequate protection for the environment and the health and safety of persons. The areas of operating performance that the Commission examined encompassed aspects of organization and plant management, conduct of operations, and non-radiological health and safety.

Organization and Plant Management

12. OPG described its organizational structure and plant management. OPG also reported on its long-term strategy and high level objectives for the projected useful life of the station. This strategy is addressed in the five-year business plan that encompasses maintenance outages for each reactor unit, as well as a simultaneous shutdown of all units for a vacuum building outage, planned for 2009.
13. CNSC staff reported that it has found OPG's organization and plant management program at the DNGS to be adequate. CNSC staff noted performance indicators considered to assess this program, such as evidence of configuration management, management self-assessment, prompt reporting to the CNSC, corrective action program, and defence-in-depth risk approaches as well as minimization of process failures and unplanned transients.
14. The Commission sought more detailed information and requested that OPG present an organizational chart for the DNGS. In response to this request, OPG presented two organizational charts containing reporting lines and accountability areas for the DNGS management team.

Conduct of Operations

15. OPG reported on the operation of the plant and informed the Commission that the DNGS continued to be operated according to the Operational Program requirements. OPG stated that human performance errors have decreased from 50 events in 2003 to 10 events at the end of 2006.
16. With respect to public safety, OPG stated that it maintains safety through the application of the defence-in-depth concept achieved by a set of multiple, overlapping barriers consisting of engineered, administrative and people-based barriers.
17. OPG further informed the Commission that there was only one unplanned reactor trip in November 2003, and that no serious or near miss serious process failures occurred since the beginning of the current licence period.

18. With respect to fuel reliability, OPG noted that it has been well below target with no fuel defects in the core from 2005 to the first quarter of 2007. In the second quarter of 2007, a fuel defect in Unit 1 caused the fuel reliability index to increase but still remain below target.
19. CNSC staff identified the operating performance safety sub-areas and reported on the document reviews and field inspections of systems and operational practices. CNSC staff expressed the opinion that OPG was committed to improve the safety culture framework and self-assessment methodology.
20. CNSC staff concluded from field and control room inspections that OPG staff at the DNGS has followed procedures, performed the necessary testing and verifications, and complied with the requirements of the licence.

Tritium Removal Facility

21. OPG informed the Commission on the operation of the Tritium Removal Facility (TRF). OPG stated that the operation of this facility leads to a significant reduction of workers' radiation exposure and a minimization of emissions to the environment.
22. OPG further informed the Commission on the improvement of OPG's performance in all key areas of the TRF from 2003 to 2005. OPG noted that the deterioration in performance observed in 2006 was attributed to several start-up issues experienced during the planned outage.
23. In its intervention, Citizens for Renewable Energy expressed concerns regarding the emissions of tritium from this facility. In response to comments requested by the Commission, OPG explained that the TRF is covered under the current DNGS operating licence, and that tritium emissions from this facility are less than one percent of regulatory limits. CNSC staff concurred with OPG, and added that it had asked OPG to investigate the causes for an increase in tritium levels, and that it was satisfied with actions taken by OPG to obtain resolution of these events. CNSC staff also indicated that it conducted an audit of the environmental management program at the facility, and that it observed that OPG has a satisfactory program in place to reduce emissions from the TRF.

Outage Management

24. In its written submission, OPG provided detailed information on planned outages performed during the current licence period and on forced shutdowns that occurred during the same period, and described the corrective measures that were taken.
25. CNSC staff noted that, during the current licence period, its evaluations did not identify any serious problems with outage planning and execution.

Non-Radiological Health and Safety

26. OPG explained the program and actions taken to protect its personnel from unnecessary occupational hazards and risks that could adversely affect their health and safety. OPG presented data on All Injury Rate (AIR), Accident Severity Rate (ASR), and Maximum Reasonable Potential for Harm (MRPH) events. Data on construction contractor safety performance was also included in the submitted material.
27. OPG stated that the DGNS has sustained excellent conventional safety performance over the past five years. OPG also defined the specific objectives for occupational health and safety improvements that include a reduction of high frequency events, a reduction of risks related to high consequence events, further improvements to conventional safety governance and the maintenance of regulatory compliance.
28. CNSC staff reported that its surveillance and monitoring did not uncover any items requiring regulatory action. CNSC staff noted that, following the occurrence of several lost time accidents early in 2006, OPG established and implemented a recovery plan which resulted in the ASR improving steadily.
29. A number of intervenors, including the Corporation of the Municipality of Clarington, the Society of Energy Professionals, the Power Workers' Union, the Canadian Nuclear Workers Council, the Firehouse Youth Centre, the University of Ontario Institute of Technology, the Durham College, and John R. O'Toole, M.P.P., Durham, expressed the view that OPG operates all of its facilities in a safe and environmentally responsible manner and continues to build a strong safety culture.
30. CNSC staff has rated this safety area and all sub-areas, including programs and their implementation, as meeting requirements.

Conclusions on Operating Performance

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

Performance Assurance

32. As an indication of the adequacy of OPG's qualifications and protection measures, the Commission examined performance assurance at the DNGS.

Quality Management

33. OPG informed the Commission on its coordinated activities carried out in order to achieve the required levels of quality and safety in operation of the DNGS. OPG also noted the existence of a multi-tiered system of planned reviews and audit activities. OPG stated that the first three-year nuclear oversight audit cycle has been completed in December 2006. Corrective actions and quarterly reviews by the OPG Nuclear Executive Committee have been initiated. A self-assessment and a follow up audit will be conducted in 2008.
34. OPG further informed the Commission that it had resolved issues related to CNSC staff's recommendations regarding the Chief Nuclear Officer expectations charter and the Nuclear Organization Standard.
35. OPG stated that it had corrected deficiencies identified by CNSC staff in the application of the CSA N286 series of quality standards in the audit program and that a detailed comparison between the requirements of N286-05, "*Management System Requirements for Nuclear Power Plants*", as well as existing managed processes is currently underway.
36. With respect to operating experience (OPEX) at the DNGS, OPG held workshops for OPEX Single Points of Contact (SPOC) to ensure that OPEX information is effectively communicated to the front-line staff. OPG has also performed several self-assessments and one audit to identify areas for improvement. OPG noted that corrective actions are in place to improve the overall efficiency of the OPEX program.
37. CNSC staff noted that it identified coding and trend analysis of causal factors as areas of weakness, and that OPG has undertaken initiative to address the issues.
38. CNSC staff noted that it has verified quality management (QM) program and reviewed process documentation and quality management documents submitted in support of the application for licence renewal. Based on the findings, CNSC staff reported to the Commission that OPG has maintained a documented QM program which meets CNSC expectations and complies with the licence conditions relevant to the implementation of the QM program.
39. With respect to the pressure boundary Quality Assurance (QA) Program, CNSC staff noted that this program has been reviewed and verified by the Technical Standards and Safety Authority (TSSA) of the province of Ontario, and that the licensee had obtained two Certificates of Authorization from the same authority.
40. Based on the information provided by the licensee during the current licence period, CNSC staff is of the opinion that the managed processes for this program have been adequately implemented.

Human Performance

41. OPG presented its human performance program that establishes a systematic framework for human performance management and is specifically designed to achieve higher levels of safety and unit reliability through event-free operation. OPG reported issuing a human performance standard based on the Institute of Nuclear Power Operations Human Performance Leadership Framework to describe the roles and responsibilities, organizational structure, and programs that support an improved human performance program.
42. OPG explained the concept of Event Free Day Resets used as an indicator of human performance effectiveness. The presented trend shows a continuous tendency of significant improvement since 2001.
43. CNSC staff informed the Commission on compliance activities conducted in the areas of human factors in design, work organization and job design, procedures and job aids, and human performance programs. CNSC staff stated that the licensee's performance in these review areas have met regulatory expectations. CNSC staff further informed the Commission that OPG's improvement initiatives in this area have been reviewed and found adequate.
44. The Commission sought more information on the ability of employees to express their concerns on operation, performance, management, and safety issues. OPG responded that there are existing mechanisms used by employees to express their concerns and described the multi-layer process developed to protect and encourage whistleblowers. OPG also described the existing corporate-driven ombudsman process.

Staffing and Training

45. The Commission considered the adequacy of OPG programs for personnel training and its staffing initiatives as a further indication of OPG's qualification to carry out the proposed activities under the licence.
46. In this respect, OPG provided an update on the ongoing certification, maintenance and training programs. These programs included re-qualification testing of certified staff, job task analysis and Shift Supervisor training.
47. OPG informed the Commission that the Science Fundamentals and Equipment Principles training programs based on an upgraded systematic approach to training (SAT) have been used since 2002.
48. CNSC staff informed the Commission on its inspections of OPG's training programs. CNSC staff stated that all identified deficiencies have been corrected.

49. CNSC staff reported that it evaluated the Unit Zero Control Room Operator simulator-based training program and the training program for non-certified staff. CNSC staff noted that the programs had been designed and developed according to the SAT principles and that OPG has corrected all identified problems. CNSC staff also reported that two audits of the licensee's program regarding requalification testing had been conducted and that two action notices remain outstanding. CNSC staff is of the view that a revision to the CNSC document *Requirements for the Requalification Testing of Certified Shift Personnel at Canadian Nuclear Power Plants*, planned for early 2008, will clarify the requirements and allow for future closure of the outstanding items.
50. The Commission has been informed that OPG and CNSC staff were working on the project to transfer the administration of certification examinations for certified shift personnel. The target date for exam transfer has been set for 2008.
51. The Commission sought further information with respect to the demographics and average age of workers at the DNGS and asked OPG to present its view of the anticipated development in staffing during the next licence period. In response, OPG stated that the average age of employees at the DNGS is 46 years. OPG added that it has an aggressive apprenticeship program and that it does not expect problems regarding filling positions to ensure safe operation of the plant during the next licence period. CNSC staff stated that OPG was adequately addressing the demographic issues and staffing requirement.
52. Programs in all sub-areas of performance assurance, as well as their implementation, have been rated by CNSC staff as meeting requirements.

Conclusions on Performance Assurance

53. Based on the above information and considerations, the Commission concludes that OPG has in place the necessary programs in the areas of quality management, human performance and training to assure continued adequate performance at the DNGS.

Radiation Protection

54. With respect to the protection of workers from radiation, OPG informed the Commission that the total collective radiation dose performance at the DNGS was consistently much lower throughout the current licence period than the median performance for all other CANDU stations. OPG added that the internal tritium exposure has been reduced and that the improvement of the purification system resulted in gradual reduction in isotopic activities.

55. OPG also noted that the average dose per exposed worker was below the regulatory dose limits for the current licence period. The maximum individual doses did not exceed 15 milliSieverts per year (mSv/a) during any year of this licence period, compared with regulatory limits of 50 mSv/a or 100 mSv over 5 years. OPG added that the radiological impact on the public continues to remain at very low levels with an average dose of 1 microSievert per year ($\mu\text{Sv/a}$), while the regulatory effective dose limit to a member of the public equals 1 mSv/a. CNSC staff confirmed that the collective dose during routine operations was decreasing during the current licence period and that the internal dose decreased steadily over the last 10 years.
56. OPG further noted that the number of unplanned exposures has steadily decreased, and that non-compliance with OPG's radiation protection requirements showed continued improvement. However, personal contamination events have shown a trend upward and, therefore, corrective actions have been introduced. OPG stated that necessary improvements have been made after five events regarding personnel crossing radiography barriers have been documented.
57. OPG informed the Commission on two strategic initiatives for future improvements in radiation protection. The first initiative includes a major reduction of tritium in the reactor vault by improving functionality of the vapour recovery system and eliminating leaks. The second initiative comprises a reduction of the gamma dose rate by replacing system components with others made using improved materials.
58. In its intervention, Citizens for Renewable Energy expressed concerns regarding public safety due to tritium releases, as well as other releases to water and air.
59. With respect to the presented trends regarding data on radiological and non-radiological releases, the Commission sought more information on the causes of increased releases of elemental tritium in the atmosphere. In response, OPG described two single events leading to increased tritium emissions. OPG stated that both events had been reported to CNSC staff and there were no radiological consequences from any of them.
60. CNSC staff has rated this safety area as meeting requirements for the program and exceeding requirements for its implementation.
61. Based on the above information and considerations, the Commission concludes that OPG makes adequate provision for the protection of persons from radiation at the DNGS.

Environmental Protection

62. To determine whether OPG will make adequate provisions for the protection of the environment while carrying out the proposed activities at the DNGS during the proposed licence period, the Commission considered the adequacy of OPG's programs for environmental protection.

63. OPG described the Environmental Management Program established at the DNGS to assess environmental risks and noted that, during the current licence period, the DNGS has not exceeded a Derived Release Limit (DRL) for any nuclide or nuclide group.
64. OPG informed the Commission that it has monitored radiological and non-radiological releases (sulphur dioxide, carbon dioxide, nitric oxides, and ozone depleting substances) to air and water and that the DNGS had met all regulatory effluent release requirements. There have been no spills and unplanned releases as a result of the operations during the current licence period.
65. With respect to low and intermediate level radioactive waste, OPG informed the Commission that the waste is generated from day-to-day operations and outages and represents a significant environmental aspect at the DNGS. This waste is transported to the Western Waste Management Facility for processing and storage. CNSC staff noted that there was a decrease in the volume of radioactive waste generated over the current licence period.
66. CNSC staff informed the Commission of an inspection of the OPG's Environmental Management Program (EMP) and its implementation at the DNGS. CNSC staff noted that OPG has identified the significant environmental aspects of the DNGS operation, taking into account the likelihood and magnitude of the interaction with the environment, regulatory scrutiny, stakeholder interest and business risk and/or benefit.
67. In this EMP, OPG reported having identified the issues it plans to address during the next licensing period. These issues encompass remediation of contaminated soils, biodiversity enhancements, phase-out of ozone depleting substances, waste reduction, reduction in tritium emissions, and monitoring of fish impingement in the cooling water intake.
68. CNSC staff reported to the Commission that OPG tracks the environmental protection performance of the DNGS using an environmental index, which is a weighted composite of several performance indicators. However, CNSC staff noted that OPG has not been reporting to the CNSC on monitoring results for routine releases of hazardous substances, as required by the licence and as described in CNSC Regulatory Document S-99, *Reporting Requirements for Operating Nuclear Power Plants*. OPG has been advised of this non-compliance and CNSC staff intends to continue to monitor this issue.
69. With respect to the presence of aquatic biota in cooling water, CNSC staff informed the Commission that an intake of aquatic biota had been quantified and found to be negligible.
70. Based on this information, the Commission is satisfied that OPG has made, and will continue to make, adequate provision at the DNGS for the protection of the environment during the proposed licence period.

Design Adequacy

71. The Commission examined issues related to the plant design, safety analysis and safety issues in order to assess the adequacy of the safety margins provided by the design of the facility.

Plant Design

72. OPG informed the Commission that all design changes were prepared and executed in accordance with the OPG Engineering Change Control (ECC) process, which has been modified and implemented at the DNGS in 2005. The modifications encompass six areas of risk: Employee Safety, Environment, Equipment, Nuclear Safety, Production, and Security and Safeguards.
73. CNSC staff reported on its reviews of the plant design, design changes and safety enhancement programs. CNSC staff is of the opinion that OPG's documentation meets requirements.

Safety Analysis

74. OPG provided information on the safety analyses performed to support its operation licence and stated that its safety analysis methodology improvement work is ongoing. OPG noted that the safety analysis basis for the operation of the DGNS is subject to periodic review and update.
75. OPG informed the Commission on the initiated review of the heat transport system (HTS) ageing and its impact on safety analysis. A study of various ageing mechanisms resulted in conclusions that the primary adverse impacts should be expected on pressure tubes and steam generator fouling, and that Neutron Overpower Protection (NOP) would be the most affected. The NOP trip coverage has been re-evaluated in cooperation with Bruce Power and lead to the conclusion that the applied protection measures in place are adequate. OPG noted that the results of this analysis have been sent to the CNSC.
76. CNSC staff confirmed that, upon its request, OPG has submitted information on the impact of plant ageing on safety analysis. CNSC staff explained that the information provided an insight into the differences between the previous and the new methodology used by OPG for safety analyses. CNSC staff added that the conservatisms used in the previous methodology have been re-evaluated under the new methodology and procedures were reduced where justified. The conclusion was that the current safety settings for the shutdown systems provide adequate coverage for all neutron overpower designed basis events and offer sufficient operating and safety margins.

77. CNSC staff expressed its opinion that, although the new methodology may be theoretically sound, it requires a detailed review to assess the appropriateness of its use for NOP determination and for other safety analysis applications. CNSC staff will complete this review by October 2008 and intends to inform the Commission of its findings.
78. CNSC staff stated that it considers the trend for safety analysis at the DNGS to be deteriorating, although the programs and their implementation still meet requirements.
79. The Commission sought more information regarding negative trends in safety analysis and several unresolved safety issues. OPG responded that it intends to address all of the open issues and stated that the operation of the plant remains safe. CNSC staff stated that, although the rating was satisfactory, there are a number of safety issues that have been outstanding for a number of years, and that a clear plan of action was sought.
80. The Commission requested that OPG present its view of the anticipated development in this safety area during the next licence period. In response, OPG prepared a list for Day Two of the hearing, commented on five major safety issues relevant to nuclear safety analysis and presented an action plan to address the issues over the proposed licence period.
81. CNSC staff reviewed OPG's action plan and stated that the proposed approach and timelines were acceptable. CNSC staff further noted its view that current operation of the plant remains within its safety limits.
82. Based on the above information, the Commission concludes that the safety analysis for the DNGS is acceptable for the purpose of the licence renewal. The Commission is of the opinion that the risks associated with safety analysis are not unreasonable. The Commission expects that OPG will address the issues related to safety analysis in a timely manner.

Safety Issues

83. With respect to nuclear safety issues, OPG informed the Commission on the Safe Operating Envelope (SOE), which ensures that the set of conditions within which the plant has been shown to be safe and controllable is incorporated into its operational programs and documentation.
84. OPG also reported that corrective actions related to gaps in testing and calibration have been completed.
85. Providing information on the Risk Management Program, OPG stated that a probabilistic risk assessment has been used to monitor the risks associated with significant plant configuration changes while the units were at high power and to monitor the risks on a daily basis. A deterministic risk monitor was developed and used in the risk assessment of the weekly plans and to help control the execution of high-risk tasks.

86. OPG provided information on the inspection regarding fuel management conducted in 2005 which resulted in one directive, two action notices and one recommendation. OPG stated that the directive was subsequently closed.
87. With respect to fuel and fuel channels, OPG noted that the Fuel Reliability Index was as high as 97% with only three defect bundles in core during the current licence period.
88. OPG noted that a recent NOP analysis had shown that, as a result of HTS aging, the effective NOP trip coverage would eventually be inadequate for certain flux shapes. OPG stated that it has undertaken an initiative to mitigate these effects.
89. CNSC staff stated that it has documented outstanding safety issues common to several nuclear generating stations as generic action items (GAIs). Nine of these GAIs are relevant to the DNGS. CNSC staff added that OPG had requested closure of six of these nine items and CNSC staff was currently reviewing the request.

Conclusions on Design Adequacy

90. On the basis of the information presented, the Commission concludes that the design of the DNGS is adequate for the operation period included in the proposed licence. The Commission is of the view that, although there are action items still open, the risks associated with these items are reasonable.

Equipment Fitness for Service

91. The Commission considered whether OPG is maintaining the critical components of the facility in a condition so that structures, systems and components important to safety remain effective throughout the life of the plant. The Commission considered the maintenance program, the structural integrity of key components, the reliability of special safety systems and overall equipment qualification.

Maintenance

92. OPG reported that its conventional safety performance continues to be among the best of the industry throughout the year 2007. OPG noted that it had reduced the number of system leaks from over 750 to less than 350, and that it has maintained the corrective maintenance backlog to less than 15 items through 2007. OPG expects to be able to maintain this target in the future.
93. OPG further reported that the DNGS had implemented a Pressure Boundary Program compliant with the *Boiler, Pressure Vessel, and Pressure Piping Code* CSA B-51, as well as with the requirements of the *ASME Boiler and Pressure Vessel Code*.

94. OPG stated that it had developed an action plan to address CNSC staff's concerns regarding the Darlington Maintenance Program.
95. CNSC staff reported that it had completed a review of OPG's maintenance program and concluded that OPG has policies, processes and procedures in place. CNSC staff added that the data submitted by OPG in support for the licence renewal application indicate that improvements have been made in the preventive maintenance program, leak management program and the conduct of maintenance program.
96. In this safety area, CNSC staff rated both the program and its implementation as meeting requirements.

Structural Integrity

97. OPG presented its program improvements that include the development of an inspection program for pressure vessels under corrosive environments, the installation of zebra mussel antifouling covers, water chlorination system redesign and trash sump debris, and trash removal system redesign.
98. CNSC staff informed the Commission on the inspections and in-service inspections that OPG performs periodically (in ten-year cycles) to monitor degradation rates of pressure boundary components. With respect to the critical pressure retention, the components were monitored under the fitness-for-service programs and the results indicated that the overall leakage rate of the main containment structure at the peak pressure has been significantly lower than the operational target.
99. CNSC staff also reported that, in order to establish pressure tube fitness for service, OPG carried out a number of inspections of pressure tubes during the current licence period. CNSC staff stated that OPG's methodology used to demonstrate fitness for service of pressure tubes, as well as the periodic inspection program, is adequate.
100. CNSC staff rated the structural integrity programs and their implementation as meeting requirements. However, CNSC staff noted that OPG currently lacks a fully implemented integrated ageing management program for the plant. Initiatives are underway to fully implement such a program.

Reliability of Safety Related Systems

101. As part of general fitness for service, it is important that key safety systems not be unavailable for significant periods of time during operation. In this regard, OPG noted that in 2005, Unit 3 Shutdown System 2 (SDS2) was unavailable for 24 seconds and Unit 2 Emergency Core Cooling was unavailable for one minute. CNSC staff added that the licensee has developed an adequate corrective action plan and that the target for safety systems unavailability has been met during the current licence period.

102. OPG noted that three steam ingress leakage tests were performed and that test results have been submitted to CNSC staff for review. OPG also indicated that, in order to preserve the level of reliability of these systems, it established an ageing management strategy for the steam barriers inside the powerhouse at the DNGS.
103. OPG notified the Commission that the DNGS has adopted an equipment reliability process description established by the Institute of Nuclear Power Operations (INPO), INPO AP 913, regarded as the industry best practice for equipment reliability.
104. CNSC staff reported that it had reviewed OPG reliability programs covering mainly reliability models and data verification, safety system availability, testing program and reporting. Based on these reviews, CNSC staff rated OPG's reliability program and its implementation as meeting requirements.
105. Commenting on probabilistic safety assessment (PSA) developed and used at the DNGS, CNSC staff noted that it has reviewed the update of the Level-1 study of the Darlington Risk Assessment (DARA) model prepared by OPG. CNSC staff stated that it considers the licensee's approach and efforts to finalize the development of DARA acceptable and will continue to monitor the evolution of this three-year project.
106. CNSC staff stated that, throughout the current licence period, OPG's annual reliability reports ARR for the DNGS were submitted in a timely manner and complied with the requirements set in CNSC Regulatory Document S-99, *Reporting Requirements for Operating Nuclear Power Plants*. CNSC staff added that the DNGS Quarterly Operations Reports, which, added to the Event Reports, provide a short-term profile of the plant reliability, have been submitted to the CNSC as required by CNSC Regulatory Document S-99.

Equipment Qualification

107. Continual assessment and verification of key safety equipment designed for harsh environments that could arise during accident conditions is important for the general safety of the plant operation. In this respect, OPG stated that the DNGS has an equipment qualification program that is in place since the commissioning of the facility.
108. OPG informed the Commission on the status of an important component of equipment qualification, its Environmental Qualification (EQ) Closure Project. Phase Two of this project has been initiated in 2004 to complete a gap analysis for components with a qualified life greater than 16 years, to replace identified components, prepare an auditable EQ security requirements checklist and support the sustaining EQ. OPG stated that most of the scheduled equipment replacement had been completed as planned.
109. CNSC staff reported that the implementation of the EQ program is still evolving and does not yet meet requirements.

110. Citizens for Renewable Energy and Greenpeace Canada, in their interventions, expressed concerns about safety and equipment qualification issues related to ageing power reactors and associated facilities.
111. The Commission sought more information on ageing of the reactors and other equipment, as well as on plans for refurbishment. OPG gave more technical details and responded that, according to their estimates, the refurbishment should take place approximately in 2018.
112. The Commission asked CNSC staff about expectations related to improvements in EQ. CNSC staff responded that this was not a safety issue, and that the main effort remains in the area of documentation, which is expected to be done by the end of 2010.

Conclusions on Fitness for Service

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

Emergency Preparedness and Fire Protection

Emergency Preparedness

114. With respect to emergency preparedness, OPG reported that there were three off-site reportable event notifications at the DNGS since the beginning of the current licence period to July 31, 2007. OPG added that all notifications were completed as per the Provincial Nuclear Emergency Plan.
115. OPG further reported that a successful drill and exercise program has been maintained throughout this licence period and that the Emergency Response Organization (ERO) training program was upgraded during this licence period.
116. CNSC staff noted that OPG provided a list of program improvements implemented during the licence period, and that these improvements provide evidence of a proactive program for continuous improvement by OPG.
117. CNSC staff stated that the DNGS consistently meets expectations and, in some cases, exceeds expectations, with respect to criteria stated in CNSC Regulatory Guide G-225, *Emergency Planning at Class I Nuclear Facilities and Uranium Mines and Mills*.

Fire Protection

118. OPG informed the Commission that it had implemented a comprehensive fire protection program based on the Canadian Standards Association standard CSA N293, Fire Protection for CANDU Nuclear Power Plants, 1995 edition.
119. OPG stated that during this licence period, fire protection upgrades and advanced incident command training were completed. OPG added that all emergency response maintainers were qualified to the International Fire Service Training Association Fire Fighter program.
120. OPG reported that there was one fire incident in 2007 and no fires at the DNGS in 2006. All crews were able to meet the ten-minute fire response requirement.
121. CNSC staff indicated that it had assessed the performance related to fire protection within the safety areas of operating performance, performance assurance, design and analysis, equipment fitness for service, and emergency preparedness.
122. CNSC staff stated that the licensee complies with the requirements of the licence conditions while operating the facility. Identified deficiencies in the program and its documentation do not result in unreasonable risks to persons or the environment.

Conclusion on Emergency Preparedness and Fire Protection

123. Based on the information provided, the Commission concludes that emergency preparedness and fire protection at the DNGS are adequate for the purpose of the proposed licence renewal.

Security

124. OPG stated that its site security program ensures that equipment, procedures and trained personnel are in place. OPG informed the Commission on the improvements that have been made in this area. The improvements include better control of the entry of vehicles and personnel, renewal of security clearances for staff and contractors on a rolling schedule, better surveillance systems and acquisition and deployment of new and better equipped patrol vehicles.
125. With respect to other site security issues, the Commission was provided with separate, protected CMDs, which have been considered in a closed session.
126. The Commission concludes that OPG has made adequate provisions for ensuring the physical security of the DNGS.

Non-Proliferation and Safeguards

127. OPG presented its program established to support compliance with the agreement between the Government of Canada and the International Atomic Energy Agency (IAEA). The Commission was informed about procedures reviewed to allow IAEA staff to conduct environmental sampling, measurements and tests.
128. OPG further informed the Commission that it works with CNSC staff and the IAEA to develop and implement an Integrated Safeguards Program, and that it continues to implement fuel safeguards with elements of the Fuel Verification Program.
129. OPG added that a physical inventory verification of all nuclear material at the DNGS was carried out annually by the IAEA. The final results have indicated that there were no discrepancies with respect to the actual status.
130. CNSC staff reported that the IAEA, with CNSC staff participation, has conducted five physical inventory verifications, five design information verifications, and 11 interim inventory verifications. In all cases, the licensee provided the IAEA with the necessary access and assistance to perform their activities. CNSC staff indicated that the licensee had responded adequately in two occasions of short notice verification requests from the IAEA.
131. CNSC staff added that OPG has continued to provide regular and accurate information to CNSC staff on the status of nuclear items related to foreign obligations and has complied fully with IAEA and CNSC requests. CNSC staff also noted that OPG's program for the safeguarding of material and non-proliferation, as well as its implementation, meet requirements.
132. Based on this information, the Commission is satisfied that OPG has made, and will continue to make, adequate provisions in the areas of safeguards and non-proliferation at the DNGS that are necessary for maintaining national security and measures necessary for implementing international agreements to which Canada has agreed.

Decommissioning and Financial Guarantee

133. The Commission requires that the licensee has operational plans for decommissioning and long-term management of waste produced during the life-span of the facility. In order to ensure that adequate resources are available for a safe and secure future decommissioning of the DNGS site, the Commission requires that an adequate financial guarantee for realization of the planned activities are put in place and maintained in a form acceptable to the Commission throughout the licence period.

134. OPG explained that its financial guarantee is comprised of three components:
- Segregated funds established pursuant to the Ontario Nuclear Funds Agreement between OPG and the Province of Ontario (the “ONFA Funds”);
 - A trust fund for the management of used fuel established pursuant to the Nuclear Fuel Waste Act (the “NFWA Trust”); and
 - A Provincial Guarantee pursuant to the Provincial Guarantee Agreement between the CNSC and the Province of Ontario, which came into effect on July 31, 2003 (the “Provincial Guarantee”)
135. CNSC staff informed the Commission that OPG had submitted revised preliminary decommissioning plans, a revision to the value of the proposed financial guarantee and a revision to the financial guarantee instrument upon which this guarantee is based⁴. CNSC staff added that annual reports on the status of the financial guarantee have been submitted as required by the current licence.
136. Based on the information submitted, the Commission concludes that the decommissioning financial guarantee for the DNGS is acceptable for the purpose of the proposed licence renewal.

Nuclear Liability Insurance

137. CNSC staff reported that the nuclear liability insurance coverage totalling \$75 million is provided for the DNGS by the Nuclear Insurance Association of Canada (NIAC).

CNSC staff reported that the insurance coverage of \$75 million, provided to the DNGS by the Nuclear Insurance Association of Canada (NIAC), meets the requirements of the *Nuclear Liability Act*⁵. The \$75 million limit is set out in policy OF-21 and it remains in effect until cancelled.

Changes to the Licence Conditions

138. CNSC staff recommended modifications to licence conditions, which are described in details in CMD 07-H20.F. These conditions are set to cover the conduct of licensed activities and the implementation of organizational changes.

⁴ The financial guarantee for OPG’s Class I Nuclear Facility Licences was the subject of a separate hearing, held on November 1, 2007. A *Record of Proceedings, including Reasons for Decision* was published following the hearing, detailing the Commission’s decision to accept the revised financial guarantee.

⁵ R.S., 1985, c. N-28.

139. CNSC staff informed the Commission on the workshop organised with the participation of all power reactor licensees in order to explain the rationale behind the new licence conditions intended to be implemented industry-wide. After the workshop, some of the conditions have been modified for better clarity while preserving the same basic intents.
140. Intervenors J. Bracket and Greenpeace Canada requested for licence conditions to include a public hearing in 2010 that would include safety analysis and probabilistic risk assessment. The Commission notes that the similar timeline for probabilistic risk assessment is already envisaged in condition 3.11 of the proposed licence. Greenpeace Canada also requested that the DNGS's end-of-life date be referenced in the licence and reviewed at each licence renewal.
141. The Commission sought OPG's opinion on the licence conditions proposed by CNSC staff and its ability to comply with the conditions. OPG expressed its readiness to comply with the last version of the proposed licence conditions.
142. Based on the above information and considerations, the Commission accepts the licence conditions as recommended by CNSC staff. The Commission is also of the view that the requirement in the proposed licence for OPG to perform a probabilistic safety assessment by December 31, 2010 provides sufficient assurance that any issues regarding this topic would be covered, and that a public hearing is not necessary. Furthermore, the Commission considers that the inclusion of an end-of-life date for the DNGS is not required in the proposed licence, since the operational safety of this reactor is regularly assessed.

Canadian Environmental Assessment Act

143. Before making a licensing decision, the Commission must be satisfied that all applicable requirements of the *Canadian Environmental Assessment Act*⁶ (CEAA) have been fulfilled.
144. CNSC staff indicated that the application to renew the licence for the DNGS 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*⁷. 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.
145. The Commission accepts CNSC staff's interpretation of the CEAA and is satisfied that the requirements of the CEAA with respect to OPG's application for DNGS licence renewal have been fulfilled. The Commission concludes that an environmental assessment pursuant to the CEAA is not required before it can consider and make a decision on this licence application.

⁶ S.C. 1992, c. 37.

⁷ S.O.R./94-636.

Public Information Program

146. In its submission, OPG outlined the various aspects of its public information program and informed the Commission that its community relations program proactively provides information and a quick response to issues and questions raised by stakeholders. OPG tracks those issues and questions to identify trends. Activities conducted during the current licence period include the publication of a quarterly community newsletter, the distribution of notifications, the organization of community information sessions, quarterly advertisements in local community newspapers and bi-monthly ads on media station and community events. OPG also distributes information on the DNGS to new residents. OPG also organizes presentations to community groups and associations and participates in the Darlington Site Planning Committee.
147. OPG stated that the anticipated program improvements include the formation of a team dedicated to community consultations, the renovation of the Public Information Centre, the formation of an Employee Green Team and the initiation of a proactive door-to-door communication initiative. One of the anticipated high profile initiatives includes activities related to the facility life extension and potential new nuclear build.
148. CNSC staff reported that OPG adequately informs neighbouring communities on the anticipated effects that may result from the licensed activity and has undertaken several new initiatives to further enhance its public information program.
149. A number of intervenors, including the Society of Energy Professionals, the Canadian Nuclear Workers Council, the Durham Nuclear Health Committee, the Eastview Boys and Girls Club, the City of Oshawa, the Big Brothers and Sisters of Clarington, the Clarington Board of Trade, the Firehouse Youth Centre and John R. O'Toole, M.P.P., Durham, have expressed the view that OPG has demonstrated an open and transparent approach in sharing with the community information about current operational safety issues and performance results.
150. Jeff Brackett, in his intervention, requested that event reports and technical reports be available on the internet. OPG stated that the information on plant performance, safety issues and material prepared for public hearing is accessible on OPG's Web site. Other general information is also publicly available. The Commission expressed its expectation that all information that does not have a proprietary or security aspect should be readily available to the public.
151. The Commission noted that the consultations have been organized in a relatively narrow area in the vicinity of the plant, and suggested that OPG organize discussions to reach a broader area. OPG responded that it was ready to broaden the area of public consultation and that the Durham region and the Toronto area have been recently included in public information activities.

152. Based on this information, the Commission is satisfied that the OPG's information program meets regulatory requirements and is effective in keeping the public in the vicinity informed on the facility operations.

Licence Length and Interim Reporting

153. OPG has applied to the CNSC for a five-year renewal of its operating licence. CNSC staff supported the request and recommended that the Commission accept and grant the proposed five-year term. CNSC staff stated that OPG is qualified to operate for the proposed licence period, and that there is adequate management and oversight in place for all processes.
154. Several intervenors representing area municipalities, local government, workers' unions, businesses, as well as members of the public supported OPG's request and CNSC staff's recommendation for a five-year licence.
155. Greenpeace Canada, Citizens for Renewable Energy and J. Brackett suggested a two-year licence renewal. Their concerns stem from the proposed construction of four additional reactors, the possibility of a life extension of the existing reactors, and OPG failing to finish several significant analyses in order to demonstrate the safe operation of the DNGS.
156. The Commission sought more information on whether work associated with the potential preparation for the construction of new reactors could interfere with the safe operation of the existing units. OPG assured the Commission that different groups within OPG are involved in the preparation of the new build and refurbishment activities. OPG further noted that the safe operation of the existing units take priority over new builds.
157. The Commission asked whether a mid-term report has been foreseen during this five-year licence period. CNSC staff responded that it intends to provide updates to the Commission in the annual industry reports. The Commission requested that, in addition to the annual reports, a status report on the implementation of the new licence conditions be provided by OPG and CNSC staff and presented at a public proceeding of the Commission in approximately two years from the date of issuance of the renewed licence.

Conclusion

158. The Commission has considered the information and submissions of the applicant, CNSC staff and intervenors as presented in the material available for reference on the record.
159. The Commission concludes that an environmental assessment pursuant to the CEAA with respect to OPG's application for the DNGS licence renewal is not required.

160. The Commission also concludes that the decommissioning financial guarantee for the DNGS is acceptable for the purpose of the proposed licence renewal.
161. The Commission is satisfied that the applicant meets the requirements of section 24 of the *Nuclear Safety and Control Act*. The Commission concludes that OPG is qualified to carry out the activities that will be permitted under the renewed licence. The Commission also concludes that, in carrying out those activities, OPG should 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.
162. The Commission therefore issues, pursuant to section 24 of the *Nuclear Safety and Control Act*, Nuclear Power Reactor Operating Licence PROL 13.00/2013 to Ontario Power Generation Inc., Toronto, Ontario, for the Darlington Nuclear Generating Station. The licence is valid from March 1, 2008 to February 28, 2013, unless suspended, amended, revoked or replaced.
163. The Commission includes in the licence the conditions recommended by CNSC staff in the draft licence attached to CMD 07-H20.E.
164. With this decision, the Commission requests that OPG and CNSC staff provide the Commission with a status report on the implementation of the new licence conditions. The status report will be presented at a public proceeding of the Commission, in approximately two years from the date of the issuance of the renewed licence.

C. R. Barnes,
Presiding Member
Canadian Nuclear Safety Commission

Date of Release of Summary Decision: February 26, 2008
Date of Release of Decision: May 9, 2008

Appendix A – Intervenors

Intervenors	Document Number
Corporation of the Municipality of Clarington, represented by Mayor J. Abernethy	CMD 07-H20.2
Society of Energy Professionals, represented by R. Sheppard	CMD 07-H20.3
Power Workers' Union, represented by P. Falconer and B. Walker	CMD 07-H20.4 CMD 07-H20.4A
Canadian Nuclear Workers Council, represented by D. Shier and T. Fraser	CMD 07-H20.5 CMD 07-H20.5A
North American Young Generation in Nuclear, Durham Chapter, represented by A. Daley and C. Waugh	CMD 07-H20.6
Jeff Brackett	CMD 07-H20.7
Citizens For Renewable Energy, represented by Z. Kleinau	CMD 07-H20.8
Bethesda House	CMD 07-H20.9
Durham Nuclear Health Committee	CMD 07-H20.10
Eastview Boys and Girls Club	CMD 07-H20.11
Lions Club of Courtice	CMD 07-H20.12
City of Oshawa	CMD 07-H20.13
Big Brothers and Sisters of Clarington	CMD 07-H20.14
Clarington Board of Trade	CMD 07-H20.15
Atomic Energy of Canada Limited	CMD 07-H20.16
Memorial Hospital Foundation-Bowmanville	CMD 07-H20.17
Firehouse Youth Centre	CMD 07-H20.18
University of Ontario Institute of Technology	CMD 07-H20.19
Darlington Nuclear Site Planning Committee	CMD 07-H20.20
Durham College	CMD 07-H20.21
John R. O'Toole, M.P.P., Durham	CMD 07-H20.22
Greenpeace, represented by S-P. Stensil	CMD 07-H20.23