



Canadian Nuclear
Safety Commission

Commission canadienne
de sûreté nucléaire

Record of Proceedings, Including Reasons for Decision

In the Matter of

Applicant Bruce Power Inc.

Subject Application to Renew the Power Reactor
Operating Licences for Bruce A and Bruce B
Nuclear Generating Stations

**Public Hearing
Dates** February 5, 2015 and April 13-16, 2015

RECORD OF PROCEEDINGS

Applicant: Bruce Power Inc.

Address/Location: P.O. Box 1540, RR#2, Building B10, 177 Tie Road, Municipality of Kincardine, Tiverton, Ontario, N0G 2T0

Purpose: Application to Renew the Power Reactor Operating Licences for Bruce A and Bruce B Nuclear Generating Stations

Application received: October 31, 2013
Supplementary Application received: November 27 and 28, 2014

Dates of public hearing: February 5, 2015 and April 13-16, 2015

Location: Part 1: Canadian Nuclear Safety Commission (CNSC) Public Hearing Room, 280 Slater St., 14th Floor, Ottawa, Ontario
Part 2: Davidson Centre, 601 Durham Street, Kincardine, Ontario

Members present: M. Binder, Chair
R. J. Barriault D. D. Tolgyesi
M. J. McDill R. Velshi
S. McEwan

Secretary: M. Leblanc
Recording Secretaries: M. Hornof / M. Young
Senior General Counsel: L. Thiele

| Applicant Represented By | | Document Number |
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| Intervenors | | Document Number |
| See Appendix A | | |
| Others | | |
| <ul style="list-style-type: none"> • Fisheries and Oceans Canada: T. Hoggarth and J. Wright • Environment Canada: N. Ali and D. Kim • Office of the Fire Marshal and Emergency Management Ontario: T. Kontra, A. Suleman and D. Nodwell • H. Lynn, Medical Officer of Health, Grey Bruce Health Unit | | |

Licence: Renewed

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1.0 INTRODUCTION

1. Bruce Power Inc. (Bruce Power) applied to the Canadian Nuclear Safety Commission¹ (CNSC) for the renewal of the Power Reactor Operating Licences (PROLs) for the Bruce Nuclear Generating Stations (NGS) A and B (Bruce A and Bruce B), located in the Municipality of Kincardine, Ontario. The operating licences, PROL-15.01/2015 and PROL-16.01/2015, both expired on May 31, 2015. Bruce Power has requested a renewal of the licences for a period of five years. This renewal considers current facility operations only; refurbishment activities were not considered in the context of this hearing. On May 28, 2015, the Commission renewed, as a single licence, the PROLs for Bruce A and B.² This *Record of Proceedings, Including Reasons for Decision* provides the detailed reasons for that decision.
2. Bruce A comprises four 750-megawatt Canada Deuterium Uranium (CANDU) reactors (Units 1-4) and their associated equipment, and Bruce B comprises four 822-megawatt CANDU reactors (Units 5-8) and their associated equipment. Both Bruce A and B are owned by Ontario Power Generation Inc. and are located on the Bruce Nuclear Power Development site. They have been operated by Bruce Power under a lease agreement since 2001.
3. Bruce A and B were previously licensed until October 31, 2014. On April 24, 2014, the Commission granted applications from Bruce Power to renew the PROLs until May 31, 2015,³ to ensure that all relevant documentation was available and in order to facilitate more meaningful public participation at the renewal hearing.
4. On July 4, 2014, Bruce Power applied to the Commission for approval to operate Bruce B Units 5 and 6 beyond 210,000 Equivalent Full Power Hours (EFPH). On September 16, 2014,⁴ the Commission approved the temporary operation of Bruce B Units 5 and 6 up to 245,000 EFPH, noting in its decision that this authorization was temporary and that the authorization for a longer term of operation would be considered in the context of this public renewal hearing. This renewal hearing considered Bruce Power's request to be authorized to operate the Bruce A and B Units 1-8 up to 247,000 EFPH, as this would ensure that all reactors would be able to operate through the requested licence period.
5. Bruce Power and CNSC staff are of the view that the Bruce A and B PROLs should be renewed as a single licence, with one associated licence conditions handbook (LCH). The conditions with which Bruce Power must comply are set out in the proposed single

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 CNSC Summary Record of Proceedings and Decision – Bruce Power Inc., "Application to Renew the Power Reactor Operating Licences for Bruce A and Bruce B Nuclear Generating Stations", May 28, 2015, e-Doc 4765352.

³ CNSC Record of Proceedings, Including Reasons for Decision – Bruce Power Inc., "Application to Amend the Bruce Nuclear Generating Stations A and B Power Reactor Operating Licences", April 24, 2015, e-Doc 4423908.

⁴ CNSC Record of Proceedings, Including Reasons for Decision – Bruce Power Inc., "Bruce Nuclear Generating Station B – Request for Approval to Operate Beyond 210,000 Equivalent Full Power Hours (EFPH)", September 16, 2014, e-Doc 4501441.

licence and compliance verification criteria are further explained in the LCH.

6. In 2014, up to \$75,000 in funding to participate in the licence renewal process was made available to Aboriginal groups, not-for-profit organizations and members of the public through the CNSC's Participant Funding Program (PFP). A Funding Review Committee (FRC), independent of the CNSC, recommended that up to \$57,120 in participant funding be provided to 10 applicants, who were required, by virtue of being in receipt of the funding, to submit a written intervention and make an oral presentation at the public hearing.

Issues

7. In considering the application, the Commission was required to decide, pursuant to subsection 24(4) of the *Nuclear Safety and Control Act*⁵ (NSCA):
 - a) if Bruce Power is qualified to carry on the activity that the licence would authorize; and
 - b) if, in carrying on that activity, Bruce Power 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.
8. The Commission was also required to decide:
 - a) whether to renew the PROLs for Bruce A and B as a single licence, with one associated LCH; and
 - b) whether to authorize Bruce Power to operate the Bruce A and B Units 1-8 beyond 210,000 EFPH, up to a maximum of 247,000 EFPH.

Public Hearing

9. The Commission, in making its decision, considered information presented for a two-part public hearing held on February 5, 2015 in Ottawa, Ontario and on April 13-16, 2015 in the Municipality of Kincardine, Ontario. The public hearing was conducted in accordance with the *Canadian Nuclear Safety Commission Rules of Procedure*.⁶ During the public hearing, the Commission considered written submissions and heard oral presentations from CNSC staff (CMD 15-H2, CMD 15-H2.A, CMD 15-H2.B, CMD 15-H2.C, CMD 15-H2.D) and Bruce Power (CMD 15-H2.1, CMD 15-H2.1A, CMD 15-H2.1B, CMD 15-H2.1C, CMD 15-H2.1D). The Commission also considered oral and written submissions from 144 intervenors (see Appendix A for a detailed list

⁵ Statutes of Canada (S.C.) 1997, chapter (c.) 9.

⁶ Statutory Orders and Regulations (SOR)/2000-211.

of interventions). The hearing was webcasted live via the CNSC website, and video archives are available for a three-month period following this decision. A *Summary Record of Proceedings and Decision* was issued on May 28, 2015.

10. Commission Member Harvey was present during the February 5, 2015 proceedings in Ottawa, Ontario, but was not present during the proceedings held April 13-16, 2015 in Kincardine, Ontario. As he did not participate in Part 2 of the hearing, he did not take part in this decision, which was made by the remaining members who took part in the entire matter.⁷
11. The Commission expresses its gratitude to Chief Vernon Roote of the Saugeen Ojibway Nation for providing a prayer during the commencement of the proceedings for the Bruce NGS licence renewals in Kincardine, Ontario.
12. Several intervenors, including a letter-writing campaign, expressed a concern that this licencing hearing would allow Bruce Power to begin reactor refurbishment and that there would be minimal public engagement in the refurbishment process. The Commission sought clarification on this matter. CNSC staff responded that, should Bruce Power decide to refurbish any unit, it will have to return to the Commission for approval, in accordance with CNSC regulatory requirements. A public Commission proceeding, including an opportunity for the public to intervene, would follow and, should approval to refurbish be granted, new licence conditions or hold points would be implemented in the licence, as was done for the Bruce A Units 1 and 2 refurbishment project. The release of any hold points would be decided at a proceeding of the Commission.
13. The Commission received a request for ruling pursuant to subrule 20(3) of the *Canadian Nuclear Safety Commission Rules of Procedure* requesting:
 - a 2-year licence for Bruce A, as well as the conduct of a public hearing and financial support for intervenors with respect to the life extension activities for Bruce A Units 3 and 4;
 - several reporting obligations regarding such a proceeding; and
 - the presentation of a site-wide risk assessment methodology by Bruce Power.

The Commission did not accept this request for ruling as it mostly pertained to the life extension (refurbishment) of Bruce A Units 3 and 4, which is a matter outside of the scope of this hearing. In addition, it is the view of the Commission that the request for ruling was, in substance, a further intervention in the proceeding which, coming well beyond the applicable time period for interventions, and not being able to be addressed fairly within the hearing process given its lateness, should not be allowed. In any event, the Commission need not make any ruling with respect to refurbishment at Bruce A at this time as refurbishment is not part of this renewal decision.

⁷ NSCA subsection 23(3).

Mandate of the Commission

14. Several intervenors stated that local Aboriginal groups did not have access to the same level of economic benefits as non-Aboriginal groups in the community and that more initiatives for the employment and procurement by Bruce Power in local Aboriginal communities were needed. The Commission notes that, as the regulatory authority over nuclear matters in Canada, it has no economic mandate and will not base its decision on the economic impact of a facility. It is the health, safety and security of the public and the protection of the environment that guide its decisions. The Commission did note, however, that although the economic impact of a licensee is not considered as part of the CNSC's mandate, the Commission does consider all aspects of a licensee's facility as a whole in its licensing decisions.
15. Several intervenors requested a shorter licence period of one to two years for Bruce Power, so that the safety case for the potential refurbishment of Bruce A Units 3 and 4, as well as Bruce B Units 5-8, could be evaluated prior to the Commission making a long-term licensing decision. The Commission notes that these proceedings considered licence renewals for existing activities at the Bruce Power site and did not consider the refurbishment of any units. The safety case that was evaluated by CNSC staff and considered by the Commission was based on the safety of the existing Bruce A and B and their current operation for the proposed licence period of five years. The Commission further notes that the Ontario provincial government must address fundamental energy policy questions, such as the refurbishment of existing nuclear reactors, and that the CNSC does not have this statutory authority, nor will it consider questions that are of a political nature. If Ontario decides that nuclear power remains part of its energy plan, the role of the CNSC is to ensure that it remains safe.

2.0 DECISION

16. Based on its consideration of the matter, the Commission concludes that Bruce Power is qualified to carry on the activity that the renewed licence will authorize. The Commission is of the opinion that Bruce Power, 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*, renews the Power Reactor Operating Licences issued to Bruce Power Inc. as a single licence for both its Bruce Nuclear Generating Stations A and B, located in the Municipality of Kincardine, Ontario. The renewed licence, PROL-18.00/2020, is valid from June 1, 2015 until May 31, 2020.

the Commission authorizes the operation of Bruce NGS A and B Units 1-8 up to a maximum of 247,000 Equivalent Full Power Hours.

17. The Commission includes in the licence the conditions as recommended by CNSC staff in CMDs 15-H2, 15-H2.B and 15-H2.D.
18. The Commission accepts CNSC staff's recommendation regarding delegation of authority for licence conditions 15.2 (refurbishment) and 15.3 (end of commercial operation). The Commission also accepts CNSC staff's recommendation regarding the delegation of authority in the single Licence Conditions Handbook (LCH). The Commission notes that CNSC staff can bring any matter to the Commission as applicable. The Commission directs CNSC staff to inform the Commission on an annual basis of any changes made to the LCH.
19. With this decision, the Commission directs CNSC staff to provide annual reports on the performance of the Bruce NGS, as part of the CNSC staff *Regulatory Oversight Report for Canadian Nuclear Power Plants*. CNSC staff shall present these reports at public proceedings of the Commission, with public participation through written interventions.
20. The Commission notes that, while a single 5-year consolidated licence is issued to Bruce Power for Bruce A and B, Bruce Power's operations will be continuously monitored by the CNSC throughout the 5-year licence period. Furthermore, the Commission emphasizes that this licence can be suspended, amended, revoked or replaced at any time, should the need arise.
21. Refurbishment was not considered in the context of this hearing. The Commission wishes to be clear that, in the event of an application for refurbishment at the Bruce NGS, this application will be considered at a public proceeding with public participation. Additionally, the Commission notes that the licensee would be governed by Section 15.2 of the proposed PROL on this matter, and that the refurbishment process would include an integrated safety review, the implementation and maintenance of a return-to-service plan, and periodic updates on the progress of the project and any proposed changes.

3.0 ISSUES AND COMMISSION FINDINGS

22. In making its licensing decision, the Commission considered a number of issues relating to Bruce Power'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.
23. CNSC staff rated Bruce Power's performance in all 14 Safety and Control Areas (SCAs). Several intervenors expressed the concern that many of the ratings assigned by CNSC staff to Bruce Power's performance were "satisfactory" rather than "fully satisfactory". The Commission expressed its displeasure about the confusion regarding these ratings and requested clarification. CNSC staff responded that a "satisfactory"

rating indicates that a facility meets all regulatory requirements, as prescribed, and does not indicate safety concerns as was suggested by the intervenors. The Commission suggested that the CNSC performance rating system be re-evaluated to provide greater clarity and transparency.

3.1 Management System

24. The Commission examined Bruce Power's management system, which covers the framework that establishes the processes and programs required to ensure that Bruce A and B achieve their safety objectives, continuously monitor their performance against these objectives, and foster a healthy safety culture.
25. Bruce Power reported that the Bruce Power Management System (BPMS), which is documented in a Management System Manual and a supporting hierarchy of governance, serves as Bruce Power's quality assurance program. Bruce Power explained that the objective of the BPMS is to coordinate the business framework needed to satisfy corporate governance and regulatory requirements at a level that will ensure, as Bruce Power's first priority, the commitment to nuclear safety. Bruce Power stated that, through operating experience (OPEX), it improves its operations in areas including, but not limited to, safety, life cycle management, and emergency response.
26. CNSC staff reported that the BPMS meets regulatory requirements as stated in CSA N286-05.⁸ CNSC staff further stated that Bruce Power's Governance, Oversight, Support and Performance business model also meets CSA N286-05 specifications.
27. CNSC staff reported that, through internal and external reviews of its programs and processes, Bruce Power further improved its quality management. CNSC staff also noted that, during the refurbishment of Bruce A Units 1 and 2, CNSC staff focused on compliance activities related to the management system and that, for all issues that were found, Bruce Power took the appropriate corrective actions. CNSC staff stated that, in the next licence period, Bruce Power would be required to implement the updated CSA N286-12.⁹
28. The Commission enquired about how the BPMS would be managed under the proposed combined licence. The Bruce Power representative responded that both Bruce A and Bruce B have shared a single management system for approximately 10 years, which has proven to be effective. CNSC staff stated that this model has been acceptable during past licence periods.
29. In its intervention, The Sustainability Toolkit noted that Bruce Power understands the importance of remaining a sustainable organization. The Commission enquired about how sustainability fits into the regulatory framework. CNSC staff responded that, while this initiative by Bruce Power is beyond regulatory requirements, a licensee is expected

⁸ N286-05: Management system requirements for nuclear power plants, CSA Group, 2005.

⁹ N286-12: Management system requirements for nuclear power plants, CSA Group, 2012.

to have a management system compliant with CSA N286, which includes sustainability.

3.1.1 Organization

30. Bruce Power reported that, throughout the licence period, improvements were made to assure the quality of submissions of organizational change management proposals and further noted that the process for organizational change management would continue to be strengthened and streamlined as the integrated management system and this process further mature.
31. CNSC staff reported that, during the current licence period, CNSC inspections relating to organizational management revealed minor issues related to the adherence to procedural requirements and the quality of records. CNSC staff noted that Bruce Power had completed all corrective actions by January 2015 and that none of the issues identified had an immediate impact on the safety of the Bruce NGS.
32. CNSC staff stated that, during the next licence period, the BPMS will transition to include new or revised versions of approximately 25 regulatory documents and CSA Group Standards. Bruce Power provided transition plans for all updated documents and CNSC staff approved the implementation dates that are detailed in the proposed LCH. The Commission asked if Bruce Power complied with all regulatory documents and standards. CNSC staff responded that Bruce Power complied with all current regulatory documents and standards and that the transition plans encompassed the adoption of updated documents and standards.

3.1.2 Safety Culture

33. Bruce Power stated that its number one value is “Safety First” and that ensuring a rigorous safety culture was an essential means to high standards of excellence. CNSC staff reported that Bruce Power was adopting the industry’s best practices on safety culture and that the frequency of its safety culture assessments met CNSC staff expectations. CNSC staff stated that Bruce Power had made adequate provision to monitor and improve its management oversight and promote a healthy safety culture, and that Bruce Power continued to implement and maintain an effective management system at Bruce A and B, in accordance with CNSC requirements.
34. CNSC staff indicated that, in 2013, Bruce Power conducted a site-wide Nuclear Safety Culture Assessment using the Institute of Nuclear Power Operators¹⁰ / World Association of Nuclear Operators (WANO)¹¹ Traits of a Healthy Nuclear Safety

¹⁰ INPO 12-2012: “Traits of a Healthy Nuclear Safety Culture, Revision 1”, Institute of Nuclear Power Operators, April 2013.

¹¹ WANO Principles, PL-2013-1: “Traits of a Healthy Nuclear Safety Culture”, World Association of Nuclear Operators, May 2013.

Culture Framework. CNSC staff was present during the self-assessment and reviewed the assessment method, the findings, the corrective action plans and their implementation, and found that Bruce Power followed the established processes for safety culture self-assessment. The Commission enquired about the areas of improvement that were identified. The Bruce Power representative responded that equipment health and communications were identified as areas of improvement and that, to date, initiatives related to these improvements had been successful.

35. The Commission asked for more information concerning Bruce Power's strong safety record, noting that it was not common for industrial sites. The Bruce Power representative responded that Bruce Power had implemented a 'Target Zero' program and used the International Safety Rating System, through which indicators are used to eliminate hazards from the workplace. The Commission asked if CNSC staff had observed this safety culture firsthand. CNSC staff responded that it confirmed the safety culture at Bruce Power through daily site inspections and independent reviews of Bruce Power's safety statistics.
36. The Commission asked for more information concerning worker accidents in 2014, noting that Bruce Power's safety performance during that year appeared to be lower than when Bruce Power was engaging in higher-risk refurbishment activities. A Bruce Power representative responded that Bruce Power had followed-up on all accidents, and that lessons learned were documented and shared with Bruce Power staff, as appropriate. The Commission also asked if the safety statistics included incidents involving contractors. The Bruce Power representative responded that they did.
37. Many intervenors, including unions, commented that safety culture is very important at Bruce Power and that safety-related concerns can be openly reported, if needed.

3.1.3 Conclusion on Management System

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

3.2 Human Performance Management

39. Human performance management encompasses activities that enable effective human performance through the development and implementation of processes that ensure that licensee staff is sufficient in number in all relevant job areas and have the necessary knowledge, skills, procedures and tools in place to safely carry out their duties.
40. Bruce Power reported that, during the licence period, significant progress was made towards Bruce Power's goals to strengthen the monitoring of human performance with

the aim of reducing human performance-related events and errors. CNSC staff's review of Bruce Power's human performance program and a 2013 inspection found that the program addressed the fundamental principles that the CNSC considers necessary to support human performance.

41. CNSC staff reported that, due to an increasing trend in the number of events with human performance-related causes in late 2012, Bruce Power performed assessments of its human performance program and instituted a Human Performance Recovery Plan. This plan was endorsed by CNSC staff, as well as by WANO, which reviewed the plan during a Technical Support Mission.
42. The Commission enquired about how Bruce Power was managing the loss of expertise as a large percentage of its workforce begins to retire. A Bruce Power representative responded that the company has planned for this transition by investing in nuclear engineering programs and employing summer students, and that they have not had difficulties in attracting qualified personnel to work for Bruce Power. The Bruce Power representative also indicated that a strong knowledge management program, which was audited by the International Atomic Energy Agency (IAEA), had been implemented to help with this transition.

3.2.1 Training

43. Bruce Power stated that personnel training is managed through its Worker Learning and Qualification Program. Bruce Power noted that this program includes initial training, knowledge maintenance and improvement, as well as professional development. Bruce Power also indicated that its personnel training program would be improved during the next licence period in areas including task qualification, knowledge upgrades and systematic approach to training (SAT)-based training.
44. CNSC staff reported that Bruce Power has a well-documented and defined SAT-based program, which underwent improvements during the current licence period. CNSC staff further noted that the training program was adequately implemented and that any minor deficiencies identified during CNSC compliance verification activities had been or were in the process of being addressed by Bruce Power. CNSC staff stated that Bruce Power was required to perform a gap analysis between its current training program and the recently issued REGDOC-2.2.2, *Personnel Training*¹² by December 2016, and was also required to ensure its full implementation by the end of 2017.
45. In response to an intervention by the Provincial Building and Construction Trades Council of Ontario, the Commission enquired about the accuracy of the reported \$100,000,000 spent annually by Bruce Power on training. The Bruce Power representative confirmed this figure and described the various training programs that it supported, including apprenticeships for Aboriginal people. The Commission requested more information about these apprenticeships. The Bruce Power representative

¹² CNSC Regulatory Document REGDOC-2.2.2, "Personnel Training", 2014.

responded that, as part of its long-term commitment with respect to Aboriginal employment, relationships with colleges had been established for specific work streams at Bruce Power, including sponsorships and apprenticeships for Aboriginal people.

3.2.2 Examination and Certification

46. Bruce Power reported that its personnel certification program was managed as a subset of the Worker Learning and Qualification Program and that, through this program, it enabled personnel to competently and safely operate, maintain and improve the performance of Bruce A and B. Bruce Power further reported that, in the next licence period, it would continue to actively recruit and train additional personnel to address future retirements and to ensure sufficient coverage for all shifts in the case of planned and unplanned absences. Bruce Power presented statistics regarding its planned personnel certification activities.
47. CNSC staff reported that, based on compliance verification activities over the licence period, initial examination certification programs and the requalification testing program at Bruce A and B met CNSC regulatory requirements. CNSC staff noted that, although Bruce Power maintained the number of certified staff above the minimum requirement, a shortage in Authorized Nuclear Operators (ANOs), due to issues such as illness and leave, led to multiple hours of work non-conformances. CNSC staff expects that Bruce Power will achieve optimal staffing levels by 2017 which will eliminate or greatly reduce these non-conformances.
48. CNSC staff further reported that a minor deficiency was identified at Bruce A with respect to knowledge and skills maintenance of currently certified staff, and provided details about this deficiency. CNSC staff explained that, although these deficiencies were corrected by Bruce Power, an issue with the clarification of certain roles and responsibilities in RD-204, *Certification of Persons Working at Nuclear Power Plants*¹³ was found. CNSC staff noted that a joint initiative between the CNSC, Bruce Power and OPG has been undertaken to address this issue through the revision of RD-204, planned for the spring of 2016. CNSC staff stated that this issue did not pose a risk to nuclear safety and that all shift supervisors and managers were qualified to perform their roles. CNSC staff also confirmed that all staff in positions requiring CNSC certification at Bruce A and B were competent to safely perform their duties.

3.2.3 Human Factors

Minimum Shift Complement

49. CNSC staff reported that, although Bruce Power was found to have staffing levels below the minimum shift complement 12 times during the current licence period, Bruce Power met the overall CNSC requirements for the minimum staff complement.

¹³ CNSC Regulatory Document RD-204, "Certification of Persons Working at Nuclear Power Plants", 2008.

CNSC staff reviewed these minimum shift complement non-compliances and reported that none of the reported events had an impact on the safety at Bruce A and B.

50. The Commission requested more details about the 12 minimum shift complement violations. CNSC staff responded that, while the minimum shift complement is a regulatory requirement, this complement is not specific to control room operators and includes non-safety-related positions. CNSC staff considered this statistic to be acceptable over a five-year licence period. Additionally, CNSC staff stated that they have detailed oversight on this regulatory requirement and that all minimum shift complement violations were of short duration and promptly reported to the CNSC by Bruce Power. CNSC staff confirmed the adequacy of Bruce Power's staffing levels.

Fitness for Duty

51. Bruce Power stated that it implemented several programs to ensure that its staff remains fit for duty at all times. CNSC staff stated that Bruce Power continued to implement and maintain an effective human performance program at Bruce A and B in accordance with CNSC requirements, and confirmed that Bruce Power has a sufficient number of workers who possess the necessary knowledge and skills to safely carry out the licensed activities.
52. Bruce Power reported that it engaged Deloitte Canada LLP (Deloitte) in a fatigue study to review existing documentation and data related to fatigue risk. As a result of this fatigue study, new procedures were implemented in November 2014 to prevent and manage worker fatigue. CNSC staff stated that the new guidance and procedures were acceptable to reduce the potential for fitness for duty impairments for held-over Bruce Power staff.
53. CNSC staff explained that fatigue is widely recognized as a factor that affects fitness for duty, and that hours-of-work limits are expected to be in place to limit fatigue. CNSC staff reported that, although Bruce Power certified new ANOs during the current licence period, CNSC inspections found that Bruce Power was occasionally requiring ANOs at Bruce A to work beyond their regular 12-hour shift to meet the minimum shift complement requirements.
54. The Commission requested additional details about how the Deloitte fatigue study improved fatigue management at Bruce Power. A Bruce Power representative responded that Deloitte evaluated Bruce Power's work schedules and scheduling practices. The study also provided Bruce Power with an evaluation and recommendations on its fatigue monitoring and education programs, as well as recommendations on managing shift schedules and fatigue in emergency situations. The Bruce Power representative noted that changes to shift scheduling, as well as to worker fatigue procedures, had been successfully implemented.

3.2.4 Conclusion on Human Performance Management

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

3.3 Operating Performance

56. Operating performance includes an overall review of the conduct of the licensed activities and the activities that enable effective performance, as well as improvement plans and significant future activities at Bruce A and B. Bruce Power operates Bruce A and B within the bounds of the Operating Policies and Principles (OP&Ps), which outline the operating boundaries within which the stations may be safely operated.
57. Bruce Power reported that its operations program ensures the safety of the public, environment, plant personnel and plant equipment under normal operations and accident conditions. Additionally, its operations program consists of governing documents in the areas of operations, operating limits, reporting requirements, and operational safety requirements.

3.3.1 Conduct of Licensed Activity

58. CNSC staff stated that its compliance activities during the licence period included surveillance, monitoring and walk-down inspections of all systems in the plant, including electrical systems. CNSC staff further reported that routine inspections of Bruce A and B were conducted against the requirements of the OP&Ps and found that these were satisfactorily implemented. CNSC staff was satisfied with the quality of Bruce Power's procedures, their usage and that they are being continually improved.
59. CNSC staff stated that, during the licence period, unplanned transients¹⁴ that occurred in the reactors were monitored and that data over the last two years was showing a decreasing trend. However, due to the total number of transients at Bruce A, CNSC staff opened an action item on Bruce Power to perform an assessment with the goal of reducing transient frequency by the end of 2015. CNSC staff noted that none of the unplanned transients resulted in a risk to nuclear safety and there were no serious process failures during the licence period.

¹⁴ "Unplanned transients" denotes the unplanned reactor power transients due to all causes while the reactor is operating and not in a guaranteed shutdown state. Unexpected power reductions may indicate problems within the plant and place unnecessary strain on systems. Unplanned transients include stepbacks, setbacks, and reactor trips where the trip resulted in a reactor shutdown.

3.3.2 *Outage Management Performance*

60. CNSC staff reported on planned maintenance outages that were conducted during the current licence period. During a planned outage on Bruce B Unit 6 in 2010, a tritium release outside of containment occurred. This event was reported to the Commission and Bruce Power took appropriate corrective measures.
61. CNSC staff stated that several forced unplanned outages occurred at both Bruce A and B during the licence period. CNSC staff confirmed that these events were reported to the Commission, were of low safety significance and that Bruce Power had conducted appropriate follow-up actions for these events.

3.3.3 *Safe Operating Envelope*

62. A licensed nuclear power plant must be controlled in accordance with a set of operational safety requirements, derived from the safety analysis, within the boundaries of the Safe Operating Envelope (SOE). The SOE is the set of limits and conditions within which a nuclear power plant must be operated and which is monitored and controlled by the operator. CSA N290.15¹⁵ was developed to provide requirements for definitions, implementation and maintenance of the SOE. CNSC staff reported that Bruce Power successfully implemented CSA N290.15 during the current licence period and that the implementation of the SOE maintained the reactors operating in their analyzed state, thereby ensuring adequate safety at all times.

3.3.4 *Accident Management and Recovery*

63. Bruce Power stated that it has Abnormal Incident Manuals, Emergency Field Operating Procedures and Severe Accident Management Guidelines (SAMGs) based on the analyzed design basis, as well as beyond design basis requirements. CNSC staff reported that Bruce Power's Abnormal Incident Manuals and Emergency Field Operating Procedures are up-to-date, available to operators, and that operators are trained in their use.
64. Bruce Power reported that it had constructed a new Emergency Management Centre and implemented a new response organization that follows the Incident Management System. Bruce Power also installed on-site and off-site remote gamma monitoring.
65. CNSC staff reported that a simulated severe accident using SAMGs was conducted at Bruce A in 2014 and that a similar exercise was planned for Bruce B in 2015. CNSC staff confirmed that Bruce Power had adequate corrective actions for all issues that were identified during the exercise. CNSC staff also reported that, during the next licence period, Bruce Power would implement REGDOC-2.3.2, *Accident*

¹⁵ N290.15: Requirements for the safe operating envelope of nuclear power plants, CSA Group, 2010.

*Management: Severe Accident Management Programs for Nuclear Reactors.*¹⁶

66. The Commission enquired about the delay in implementation of CNSC REGDOC-2.3.2. CNSC staff responded that, as per the Commission's direction in August 2014,¹⁷ a workshop with industry was conducted on January 20, 2015 to clarify some of the concerns about the interpretation of REGDOC-2.3.2. CNSC staff stated that an acceptable path forward had been established and that an implementation strategy would be determined in the next few months. A Bruce Power representative concurred with CNSC staff and added that Bruce Power's main concern with REGDOC-2.3.2 was that the wording did not accurately reflect the accident management strategies that Bruce Power had in place, which could leave Bruce Power open to non-compliance actions in the future. CNSC staff confirmed the accident management strategies that Bruce Power has in place are in compliance with CNSC requirements.

3.3.5 Conclusion on Operating Performance

67. Based on the above information, the Commission concludes that the operating performance at the facilities during the current licence period provides a positive indication of Bruce Power's ability to carry out the activities under the proposed licence.

3.4 Safety Analysis

68. Safety analysis is a systematic evaluation of the potential hazards associated with the conduct of a proposed activity or the operation of a facility, and considers the effectiveness of preventive measures and strategies in reducing the effects of such hazards. It supports the overall safety case for the facility.
69. An intervention from an individual questioned the CNSC's determination of reasonable risk and the Commission requested more information on this matter. CNSC staff responded that a licensee must have a robust safety case which evaluates all potential risks to the facility, and that the CNSC has a robust system to evaluate the licensee's safety case, including probabilistic safety assessments (PSAs).

¹⁶ CNSC Regulatory Document REGDOC-2.3.2, "Accident Management: Severe Accident Management Programs for Nuclear Reactors", 2014.

¹⁷ Minutes of the Canadian Nuclear Safety Commission (CNSC) Meeting held on August 20 and 21, 2014, e-Doc 4528070.

3.4.1 Hazard Analysis

70. Hazard analysis includes analysis of external hazards and fire hazards. CNSC staff stated that Bruce Power met requirements for the evaluation of external hazards. CNSC staff explained that the evaluation of external hazards was incorporated in the PSA methodology, that it was satisfied that Bruce Power's methodology and approach were acceptable, and that Bruce Power followed the accepted methodology.
71. Regarding fire hazard analysis, CNSC staff stated that Bruce Power's fire safety analysis – Fire Hazard Assessment and Fire Safe Shutdown Analysis – was compliant with the requirements of CSA N293-07¹⁸ and best industry practices. CNSC staff noted that Bruce Power had made progress in addressing a number of recommendations from its assessments, and provided a seven-year (2014-2021) corrective action plan to address outstanding recommendations. CNSC staff stated that Bruce Power's submission was acceptable and noted that, with the compensatory measures in place, the outstanding issues did not represent an increased risk to nuclear safety or pose an impediment to relicensing.
72. In response to several interventions, the Commission enquired about whether Bruce Power had adequate guidance for the assessment of external hazards and whether tornadoes were considered during hazard analysis. The Bruce Power representative stated that there is adequate guidance for these assessments and that, if uncertainties are encountered, international experts are consulted. The Bruce Power representative also stated that an F3¹⁹ level tornado was evaluated and that a sensitivity analysis was conducted on wind speeds up to 280 kilometres per hour. CNSC staff added that, while research continues to be conducted with respect to methodologies for the assessment of external hazards, at this time, the guidelines for Canadian operators were adequate and consistent.
73. Greenpeace Canada, in its intervention, expressed the concern that not all of the hazards evaluated in the Level 1 PSA were carried over to the Level 2 PSA. The Commission requested more information on this matter. CNSC staff responded that, if an external event is not considered credible at a Level 1 PSA, it will not be carried into the Level 2 PSA. Furthermore, the occurrence of some events is bounded by other events occurring and, as such, they may not be carried over during the hazard analysis.
74. In its intervention, Beyond Nuclear expressed the concern that the risk presented by floods and high water on Lake Huron had not been appropriately considered. The Commission requested additional information about flood hazards at Bruce Power. The Bruce Power representative responded that waves 5 to 20 metres high were considered during risk assessments, which was well beyond the maximum wave height in historical records.

¹⁸ N293-07: Fire protection for CANDU nuclear power plants, CSA Group, 2007.

¹⁹ As based on the Fujita Scale, a tornado rating scale ranging from F0 to F5.

3.4.2 *Deterministic Safety Analysis*

75. A deterministic safety analysis evaluates the nuclear power plant's responses to events by using predetermined rules and assumptions (conservative or best-estimate methods). CNSC staff stated that it reviewed Bruce Power's deterministic safety analysis program to determine the extent to which analysis tools, procedures and activities were in compliance with applicable standards and guidelines. As a result of the review, CNSC staff reported that Bruce Power has an effective, well-managed program for performing deterministic safety analysis.
76. CNSC staff noted that the objectives of the deterministic safety analysis are stated in CNSC REGDOC-2.4.1, *Deterministic Safety Analysis*,²⁰ which has replaced CNSC regulatory document RD-310, *Safety Analysis for Nuclear Power Plants*.²¹ Bruce Power submitted a three-year plan for the implementation of its Safety Report Improvement Project to upgrade the safety reports to the newer requirements of REGDOC-2.4.1 by the end of 2017. CNSC staff stated that this plan was acceptable, and noted that this change represented an incremental improvement because safety analysis is continuously updated over time.
77. Safety analysis also includes aging management. CNSC staff noted that, as a reactor core ages with time, the impact of aging effects on various structures, systems and components, including the heat transport system, on the overall safety case needs to be addressed. Bruce Power stated that its aging management program includes systematic monitoring of aging related parameters important to safety analysis and assessment of the impact on safety margins. CNSC staff stated that Bruce Power's assessment of the impact of aging on safety analysis was satisfactory, supporting the continued safe operation of Bruce A and Bruce B.

3.4.3 *Probabilistic Safety Assessment*

78. A PSA is a comprehensive and integrated assessment of the safety of the nuclear power plant that considers the initial plant state and the probability, progression, and consequences of equipment failures and operator response, to derive numerical estimates that provide a consistent measure of the safety of the design. Such assessments are most useful in assessing the relative level of safety. The safety goals are called Severe Core Damage Frequency (SCDF) and Large Release Frequency (LRF). SCDF is a measure of the likelihood of releasing radioactive material from the fuel into containment. The internationally accepted SCDF limit is 1.0E-4 occurrence/yr, or once in ten thousand years. LRF is a measure of the potential for release of radioactive material from containment to the environment. The internationally accepted LRF limit is 1.0E-5 occurrence/yr, or once in a hundred thousand years.

²⁰ CNSC Regulatory Document REGDOC-2.4.1, "Deterministic Safety Analysis", 2014.

²¹ CNSC Regulatory Document RD-310, "Safety Analysis for Nuclear Power Plants", 2008.

79. The CNSC regulatory standard S-294, *Probabilistic Safety Assessment (PSA) for Nuclear Power Plants*²² was added to the Bruce A and B licences in 2009. With the introduction of S-294 in the licences, Bruce Power was required to seek CNSC staff acceptance of the PSA methodologies and computer codes to be used for PSA. CNSC staff reported that the following Bruce Power methodologies and computer codes had been accepted by CNSC staff:
- Level 1 at-power: internal events, common cause failures, data, accident sequence quantification, internal flood, internal fire, seismic, external hazard, high wind/tornado, external flood phase 1;
 - Level 1 shutdown/outage: internal events, internal flood, internal fire, seismic;
 - Level 2 at-power: internal events, internal flood, internal fire, seismic;
 - Level 2 shutdown/outage: internal events, internal flood, internal fire, seismic; and
 - Computer codes used in the analyses.
80. Bruce Power stated that, following CNSC staff acceptance of the PSA methodologies and computer codes, Bruce Power performed the analyses in accordance with S-294 requirements, and submitted Bruce A and B PSAs to the CNSC, which included both internal events results (events occurring within the plant) and external events results, including seismic, high winds, internal fires, internal floods and other hazards. Bruce Power used two internationally agreed metrics to assess the probabilistic risk of potential accidents at its stations.
81. CNSC staff stated that Bruce Power was compliant with S-294 requirements for PSAs and confirmed that the Bruce Power PSA reports were consistent with the accepted methodologies, as well as applicable quality assurance requirements, although some low-risk, minor gaps were identified. CNSC staff stated that the results for both Bruce A and B showed that:
- the SCDF and LRF calculated individually for internal events and for each external event met the safety goal limits of 1.0E-4/yr and 1.0E-5/yr respectively;
 - the total SCDF (3.24E-05 occurrence/yr for Bruce A and 2.49E-05 occurrence/yr for Bruce B), calculated by simple summation from the contribution of both internal and external events, also met the safety goal limit;
 - the total LRF, with emergency mitigating equipment (EME) credits and improvements (8.42E-06 occurrence/yr for Bruce A and 1.93E-06 occurrence/yr for Bruce B), calculated by a simple and conservative summation from the contribution of both internal and external events, met the LRF limit; and
 - the Bruce A and B station designs are robust and have multiple defence provisions.

²² CNSC Standard S-294, "Probabilistic Safety Assessment (PSA) for Nuclear Power Plants", 2005.

82. In addition to the S-294 requirements, Bruce Power also submitted Bruce A and B PSAs that incorporated some of the additional improvements from Fukushima Action Items. Bruce Power included credit for EME installed as part of Fukushima response in the Bruce A and Bruce B Level 1 and Level 2 At-Power, Internal Flooding, Fire, Seismic, and High Wind PSAs.
83. CNSC staff stated that it was satisfied with the development of the updated PSA to incorporate Fukushima enhancements in the Bruce A and B PSAs, and explained that the results showed that the Fukushima enhancements would improve safety in terms of providing mitigating capabilities as an additional layer of defense-in-depth for very rare events. CNSC staff was satisfied that, with the Fukushima enhancements, the SCDF limit and the LRF limit were met for Bruce A and Bruce B, and noted that further reduction in LRF would be achieved once the remaining post-Fukushima enhancements have been credited in the PSA.
84. Although S-294 does not require the summation or aggregation of risk from the separate hazards, Bruce Power provided information regarding, and estimated results for, aggregated single unit and full station risk. Bruce Power noted that the issues with simple addition of separately assessed risks included the lack of an international consensus on an aggregation methodology, exclusivity (for example, a station cannot be in both the operating and shutdown states at the same time), and the different statistical methods and levels of uncertainty inherent in internal and external event PSAs. CNSC staff concurred that there is currently no internationally accepted whole-site PSA methodology for station aggregation, but noted that such a methodology was being developed.
85. For the proposed licence period, CNSC staff recommended that the new CNSC REGDOC-2.4.2, *Probabilistic Safety Analysis (PSA) for Nuclear Power Plants*²³ replace the existing S-294. Bruce Power stated that it was targeting full implementation of REGDOC-2.4.2 by June 30, 2019, which was acceptable to CNSC staff.
86. Several intervenors expressed concerns that Bruce Power was exceeding the LRF limit. CNSC staff reported that, contrary to what the intervenors stated, international and Canadian guidelines for the PSA LRF limit for an existing facility is 1.0E-5/yr and that Bruce Power was not contravening these PSA frequency guidelines. CNSC staff reiterated that Bruce Power was compliant with S-294, which specifies the same LRF limit of 1.0E-5/yr.
87. In its intervention, Greenpeace Canada expressed the view that the CNSC does not appropriately regulate licensee PSA requirements. The Commission requested more information on this matter. CNSC staff responded that Canada is currently a leader with respect to industry requirements for PSA, and provided the Commission with information regarding ongoing improvements in PSA methodologies.

²³ CNSC Regulatory Document REGDOC-2.4.2, "Probabilistic Safety Analysis (PSA) for Nuclear Power Plants", 2014.

88. The Commission enquired about the IAEA's five levels of defence in depth.²⁴ CNSC staff responded that Canada is a leader in the IAEA's defence-in-depth concept and applies and implements all five levels of defence in depth, which include normal operations as well as beyond-design-basis accidents and events. CNSC staff added that, by considering all five levels of defence in depth, all on-site facilities are considered, including used fuel bays and waste management facilities.
89. In their interventions, Greenpeace Canada and New Clear Free Solutions questioned why Bruce Power did not have a formal policy with respect to achieving its LRF target of 1.0E-6/yr. The Commission requested more information on this matter. CNSC staff responded that, while achieving a PSA target is not a regulatory requirement, CNSC staff expects an operator to make enhancements in order to achieve its target. Bruce Power responded that it is continuously striving to meet the 1.0E-6/yr target through improvements identified during PSAs. The Commission stated that such a policy should be formalized and strongly recommends that Bruce Power develops such a policy, as well as formally documents that enhancements to Bruce A and B will be considered by Bruce Power if the PSA result is between the safety goal limit and the target.
90. Several intervenors suggested that the accident frequency for nuclear reactors is much higher than what is predicted in PSAs. The Commission requested an explanation on this matter. CNSC staff responded that PSA provides a frequency that is derived from the perspective of the plant design and operation, and is a tool that is used to support an NGS' safety case. PSA demonstrates the likelihood of events occurring, but is not a predictor of accidents.
91. In their interventions, Greenpeace Canada, Beyond Nuclear, and New Clear Free Solutions expressed the concern that PSAs show that the safety of nuclear power plants has decreased in the past decade. The Commission requested more information about this matter. A Bruce Power representative provided information about modern PSA calculations and noted that, due to the additional external events that are now considered, PSAs are more accurate and cannot be compared to those done a decade ago. The Bruce Power representative also noted that a large release in 1999 was considered to be one percent of cesium in the core, whereas current PSAs consider a large release to be approximately 5 times less than that, or 1.0E+14 Becquerels, leading to a greater degree of conservatism in current PSA calculations. CNSC staff commented that comparisons of historical and current PSA results are not appropriate due to changes in PSA methodology. The Commission asked whether NGSs are safer than they were 10 to 15 years ago and CNSC staff responded that they are.
92. Several intervenors expressed the concern that the overall risk presented by the Bruce A and B stations, or the whole Bruce Power site, had not been appropriately determined. The intervenors also expressed concerns that the risks that the other reactor units pose to each other were not considered in PSAs. A Bruce Power representative

²⁴ International Atomic Energy Agency International Safety Advisory Group Report INSAG-10, "Defence in Depth in Nuclear Safety", 1996.

clarified that single-unit PSAs do include the risks presented by the other units at an NGS, and that the majority of the large release category was made up of multi-unit events. The Bruce Power representative added that, currently, aggregated PSAs for an NGS are calculated by summing single-unit PSAs, which overestimates the risk. CNSC staff noted that it had consulted with international PSA experts on whole-site PSAs and was evaluating a new approach for these PSAs.

93. Several intervenors expressed the concern that external events, such as high winds and earthquakes, when combined with internal events, were not appropriately considered during PSAs. The Bruce Power representative responded that the risks from external events were taken into account during the Level 1 PSAs of the external events and that these results were then used in the Level 2 PSAs. CNSC staff stated that all NPP operators are required to complete both Level 1 and Level 2 PSAs, thus including both internal and external events, as per the S-294 requirement.
94. In their interventions, Greenpeace Canada and New Clear Free Solutions expressed the view that including EME in PSAs was not appropriate and questioned the effectiveness of EME. In addition, Greenpeace Canada questioned that the integration of EME into PSAs had been completed within three years, even though it had taken approximately ten years to determine how to include external events in the PSAs. The Commission requested more information about this matter. The Bruce Power representative responded that a very conservative application of EME was considered in the PSAs and that the development of the methodology was done in consultation with international experts. CNSC staff added that this methodology was reviewed by the Electric Power Research Institute and AMEC NSS Limited, and was approved by CNSC staff in accordance with S-294. The Commission requests regular updates on PSA methodology improvements.
95. Regarding the New Clear Free Solutions intervention, the Commission enquired why it appeared that the reactors would be safer during a large earthquake than during design basis internal events. The Bruce Power representative responded that PSAs estimate not only the risk presented by an event, but also the probability of the event, and since the probability of a large earthquake was low, the PSA result for this event was lower.
96. Some intervenors noted that LRF PSAs showed a higher probability of an early large release compared to later large releases. The Commission requested more information on how a large release could occur within 24 hours, and why the PSAs appeared to indicate that an early release accounted for such a large proportion of the LRF. A Bruce Power representative responded that, although improbable, a large release within 24 hours could be possible in the case of a catastrophic failure in containment. CNSC staff explained that the PSAs appeared to indicate a higher probability of an early large release because, when considering the large release category, all other more credible release categories have been eliminated from possibility, leaving a small probability of a large release occurring. Within this context, the most likely scenario was an early large release. However, CNSC staff emphasized that a large release would occur from a complete failure of containment, which was not considered to be in the scope of

credibility. CNSC staff also noted that events that would lead to a large release within 24 hours were not considered to be credible due to the defence-in-depth design of the reactors.

97. In its intervention, New Clear Free Solutions expressed concern that Bruce Power had not conducted uncertainty analysis as part of its PSA. The Commission requested more information on uncertainty and sensitivity analyses conducted by Bruce Power as per the CNSC-accepted Bruce Power PSA methodologies. CNSC staff confirmed that, as part of S-294 regulatory requirements, uncertainty and sensitivity analyses were conducted by Bruce Power. The New Clear Free Solutions representative expressed displeasure that the requested documentation with respect to these analyses had not been provided. A Bruce Power representative stated that Bruce Power would provide the requested documentation to the intervenor.

3.4.4 Criticality Safety

98. Bruce Power reported that there was no risk to criticality safety at the Bruce Power site. Bruce Power noted that booster fuel assemblies are permanently stored in the Booster Storage Facility, and that 22 irradiated Low Void Reactivity Fuel bundles from its Low Void Reactivity Fuel Demonstration Irradiation continue to be safely stored in a subcritical state in the irradiated fuel bays under normal and credible abnormal conditions.
99. CNSC staff proposed the addition of the nuclear facility-specific licence condition 15.5, regarding a nuclear criticality safety program, and the addition of RD-327, *Nuclear Criticality Safety*,²⁵ as an updated regulatory requirement. CNSC staff noted that this represented an administrative change since the technical specifications in the regulatory document were essentially the same as the standards referenced in the existing licence. Bruce Power confirmed that it was transitioning its governance to include relevant clauses of RD-327.

3.4.5 Management of Safety Issues

100. In the lifetime of a nuclear power plant, safety issues may arise as a result of such things as plant aging, research and development discoveries, or lessons learned from accidents. As part of continuous improvement, the licensee needs to manage these issues as part of the overall safety analysis effort. CNSC staff provided updates and information regarding the following issues:
1. Fukushima Action Items;
 2. CANDU Safety Issue AA3: Computer Codes and Plant Model Validation;
 3. Channel Voiding during a Large Loss of Coolant Accident (LOCA) Follow-up to Generic Action Item 00G01 (Generic Action Item closed);
 4. CANDU Safety Issue AA9 (Analysis of Void Reactivity Coefficient), PF9

²⁵ CNSC Regulatory Document RD- 327, "Nuclear Criticality Safety", 2010.

(Fuel behaviour in high temperature transients) and PF10 (Fuel behaviour in power pulse transients); and

5. Generic Action Item 01G01 Fuel Management and Surveillance Software Upgrade (Generic Action Item closed).

101. CNSC staff stated that the above issues have appropriate and adequate safety measures in place, and form part of the continuous safety improvement work required by the CNSC. CNSC staff noted that the existing CANDU reactors are designed to safely shut down to respond to even the most remote accident. In addition, completion of the recent Fukushima enhancements have added portable EME, cooling water access points to critical systems, which have upgraded the capability of operating crews even further to handle these remote emergencies.
102. Dr. Sunil Nijhawan, in his intervention, expressed concerns regarding the safety of various components of the CANDU design. The Commission acknowledged these concerns, and Bruce Power noted that they appeared to be industry-wide concerns, rather than specific to the Bruce NGS. The Bruce Power representative suggested that, although Bruce Power believed that the CANDU design and its operations were safe, these concerns could be further explored with Dr. Nijhawan through a dedicated forum, including the CANDU Owner's Group (COG) where appropriate. CNSC staff concurred with the suggestion for Bruce Power to establish such a forum, but noted that the information and recommendations presented to the Commission by CNSC staff were based on facts and science, and reiterated that the CANDU design and Bruce Power's operations were safe and met regulatory requirements. Bruce Power stated that it would establish such a working group and the Commission supports this suggestion.

3.4.6 Conclusion on Safety Analysis

103. 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. The Commission will impose the proposed licence condition for criticality safety.
104. The Commission recognizes that Bruce Power is compliant with the probabilistic safety assessment's LRF safety goal limit of $1.0E-5$ /yr, as stated in CNSC Regulatory Standard S-294. However, the Commission noted that having a policy with respect to achieving its LRF safety goal targets of $1.0E-6$ /yr is a good practice and strongly recommends that Bruce Power develops such a policy and formally documents that enhancements to Bruce A and B will be considered by Bruce Power if the PSA result is between the safety goal limit and the target.
105. The Commission understands that Bruce Power will establish a working group, including the COG where appropriate, to further evaluate the CANDU safety concerns brought forth in Dr. Sunil Nijhawan's intervention. The Commission requests updates

on the progress of this initiative and any conclusions resulting from this working group.

3.5 Physical Design

106. Physical design includes activities to design the systems, structures and components to meet and maintain the design basis of the facility. The design basis is the range of conditions, according to established criteria, that the facility must withstand without exceeding authorized limits for the planned operation of safety systems. The specific areas that comprise physical design at the Bruce A and B are: design governance, site characterization, facility design, system design, structure design and components design.
107. CNSC staff reported that, during the current licence period, Bruce Power focussed on continuous improvement, as well as innovation and excellence in design management. Bruce Power performed more than 3300 modifications to both Bruce A and B during the current licence period. CNSC staff noted that the implementation of physical design at Bruce A and B met regulatory requirements during the current licence period and that there are no significant outstanding issues related to physical design.

3.5.1 Design Governance

108. Design governance includes the following:
 - Equipment environmental qualification;
 - Human factors in design; and
 - Pressure boundary.
109. CNSC staff stated that, overall, Bruce Power has well-developed design governance, and that CNSC staff did not have any major concerns in this area.

Equipment Environmental Qualification

110. CNSC staff stated that Bruce Power's environmental qualification program must meet the requirements of CSA N290.13-05²⁶ (reaffirmed 2010) and noted that it conducts routine inspections on both the maintenance and environmental qualification programs. Bruce Power stated that it identified the components that would reach the end of their 40-year assumed qualified life, and incorporated activities related to these components in its preventative maintenance program. Bruce Power further stated that, in order to remain environmentally qualified, it would need to replace those components or extend their assumed qualified life beyond 40 years based on additional technical evaluations. CNSC staff stated that it was satisfied with the approach taken by Bruce Power, and

²⁶ N290.13-05: Environmental qualification of equipment for CANDU nuclear power plants, CSA Group, 2005, Reaffirmed 2010.

noted that it would verify that the necessary work is completed and that the stations remain environmentally qualified through the on-going compliance process.

111. In its intervention, Beyond Nuclear expressed the concern that the emergency generators could fail during an event, and questioned their flood and seismic qualifications. The Commission requested more information about the emergency generators. The Bruce Power representative responded that all lessons learned from the Fukushima Daiichi accident with respect to the emergency generators had been implemented, that the generators are seismically and flood qualified, and that Bruce Power has redundancy in the quantity of generators on site. The Commission enquired if the emergency generators would operate in extreme cold weather conditions and the Bruce Power representative responded that they would.
112. The Commission requested verification that the equipment purchased by Bruce Power is appropriately qualified and not from a suspect source. A Bruce Power representative responded that all of its equipment is purchased under strict technical specifications and that any equipment that is associated with a critical safety function undergoes a quality inspection prior to installation, during which Bruce Power validates its quality. Bruce Power assured the Commission that, due to reports of equipment from suspect sources in other countries, it has taken steps to further strengthen its equipment qualification processes. The Commission requests updates on the issue of equipment from suspect sources at a future proceeding of the Commission.

Human Factors in Design

113. CNSC staff reported that, on the basis of onsite inspections and compliance verifications, CNSC staff was satisfied with the overall process for taking into account human factors in the design at Bruce Power.

Pressure Boundary

114. The pressure boundary program must meet the requirements of CSA N285.0-08, Update 1²⁷ and its referenced codes and standards. CNSC staff stated that it was satisfied with Bruce Power's pressure boundary program. CNSC staff noted that Bruce Power had made a regulatory commitment to update all Bruce A and B design documentation for pressure retaining systems and components, and that Bruce Power was providing semi-annual updates on the progress of this initiative. CNSC staff stated that the progress and completion dates for this initiative, which are administrative in nature and of low safety significance, was acceptable.
115. The Commission enquired about inspection procedures for feeder tubes. A Bruce Power representative responded that a comprehensive program ensures the inspection

²⁷ N285.0-08, Update 1: General requirements for pressure-retaining systems and components in CANDU Nuclear Power Plants, CSA Group, 2008.

of all pressure boundary components, not only feeder tubes, during outages and that Bruce Power employs a periodic inspection program which ensures that all pressure boundary components are inspected frequently and are fit for service.

116. One intervenor expressed a concern that the 4 mm thick feeder tubes in CANDU reactors could present a risk for feeder tube rupture. The Commission requested more information about this matter. CNSC staff responded that the design of the pressure tubes was not a concern. CNSC staff explained the controlling parameters for these pressure boundary components and noted that burst tests conducted on the CANDU feeder tubes showed that their integrity was maintained to a factor of 6 or 7 times higher than normal operating conditions.
117. In its intervention, the Canadian Coalition for Nuclear Responsibility expressed a concern that the calandria vessel rupture discs would not be able to adequately withstand high pressure. The Commission requested more information about the rupture discs. CNSC staff responded that the discs were designed to rupture in the event of a large pressure increase to allow the calandria to vent itself, allowing for a controlled failure of the pressure boundary and to maintain vacuum in the vacuum building.

3.5.2 System Design

Service Water Design

118. CNSC staff reported that Bruce Power performed capacity testing of Bruce A Low Pressure Service Water (LPSW) pumps as per a CNSC inspection request, and that all LPSW pumps were performing as per their design.

Emergency Coolant Injection

119. CNSC staff reported that an external leak in the Emergency Coolant Injection heat exchanger at Bruce A, which was identified in root cause analysis to be due to a pressure pulse during the start-up of recovery pumps, had been mitigated appropriately by Bruce Power. CNSC staff stated that there was no safety issue with this system.

Electrical Power Systems

120. CNSC staff reported that, though now fully qualified, Bruce Power had initially procured the Qualified Power Supply Standby Diesel Generator 2 (SDG2) at Bruce A without obtaining the documentation normally required for a generator providing a safety-related function. The Commission enquired about why Bruce Power had procured an unqualified system. A Bruce Power representative responded that the standby diesel generator had not originally been intended to be a safety-related system. When the decision was made to use it as a qualified power supply at Bruce A, Bruce

Power undertook qualification activities to ensure that it meets requirements.

121. CNSC staff noted that, although Bruce Power reported electrical system-related events during the current licence period, Bruce Power responded to them appropriately and there was no safety concern.
122. Although some areas of improvement were found during a CNSC Type II inspection of the electrical power systems of Bruce A and B, CNSC staff reported that, overall, the inspection confirmed the appropriate maintenance of these systems and that there were no safety concerns. CNSC staff assured the Commission that the electrical system related events reported by Bruce Power were of low safety significance.
123. The Commission noted that Bruce Power had used an unqualified rectifier on an emergency power generator and enquired as to why this was done. A Bruce Power representative responded that Bruce Power had temporarily installed a portable rectifier on the generator while repairs were being made to the permanent rectifier. Bruce Power assured the Commission that the portable rectifier was promptly replaced with the repaired, qualified rectifier.

Instrumentation and Control

124. CNSC staff stated that, based on inspections and desktop reviews over the licence period, there were no significant safety concerns for instrumentation and control systems.

Fire Protection Design

125. CNSC staff reported that, following a code compliance review, it was found that Bruce Power is in compliance with the 2007 edition of CSA N293. However, because of the date of construction of the Bruce Power facilities versus the date of issuance of the codes (1970's vs. 2007), several historical design-related non-conformances were identified. CNSC staff noted that many of these items had been addressed and closed to the satisfaction of CNSC staff, and that Bruce Power had acceptable plans in place to address the remaining non-conformances.

3.5.3 Structure Design

126. CNSC staff reported that the design of the containment building structures, which were built in accordance with the requirements of the *National Building Code of Canada, 1965*,²⁸ is robust and that the requirements of newer standards are satisfied. Bruce Power stated that it would evaluate the safety-related structures of Bruce A and B

²⁸ National Building Code of Canada, National Research Council, 1965.

against the requirements outlined in CSA N291²⁹ over the next licence period.

127. In their interventions, the Canadian Coalition for Nuclear Responsibility and Greenpeace Canada questioned the containment design on CANDU reactors compared to other reactor designs. The Commission requested further information on this issue. The Bruce Power representative responded that there is full containment around each reactor core and that the units within an NGS share a common vacuum building that is maintained at a negative pressure through a filtered ventilation system. CNSC staff further noted that the comparison of CANDU reactors with other reactor designs was not appropriate due to the significant difference in technologies.
128. Several intervenors commented that the CANDU design is robust, noting the defence-in-depth approach, and that it can allow for large volumes of water from multiple sources to be readily circulated through the system, providing additional redundancy in case of an event.

3.5.4 Components Design

129. With respect to fuel design, CNSC staff reported that both Bruce A and B continue to operate safely and within the fuel power limits of the licence. CNSC staff noted that the fuel defect rates for Units 3-8 were below average; however, while it is trending downwards, the fuel defect rate of Units 1 and 2 was slightly higher due to refurbishment debris in the system.
130. CNSC staff reported that, after obtaining CNSC approval, Bruce Power began using 37M fuel in Bruce A Units 3 and 4 in March 2013, and in Bruce B Units 5-8 in March 2014. CNSC staff stated that the use of the 37M fuel would improve safety margins and, consequently, partially offset the minor safety margin erosion due to plant aging.
131. CNSC staff further reported that, although some endplate cracks in fuel bundles removed from Bruce B Units 5-8 had been discovered, Bruce Power has a well-developed fuel inspection program and has submitted an updated corrective action plan to address this issue. CNSC staff has found this corrective action plan acceptable and stated that it does not consider this to be a safety issue.
132. In its intervention, Northwatch expressed the concern that the Bruce A Unit 1 and 2 fuel defects and Bruce B endplate cracking were not being investigated thoroughly and provided recommendations for addressing these problems. The Commission requested more information on this matter. A Bruce Power representative responded that the cause of the fuel defects was understood and was being managed appropriately. With respect to the endplate cracks, the Bruce Power representative noted that an active investigation was being conducted and that this situation was being monitored closely by both Bruce Power and CNSC staff. CNSC staff assured the Commission that the Bruce Power fuel monitoring program is extensive and that, at this time, there was no

²⁹ N291: Requirements for safety-related structures for nuclear power plants, CSA Group, 2008.

safety concern. The Commission directs CNSC staff to provide it with annual updates on these matters to ensure that they do not become a safety concern.

133. The Commission enquired about the storage of defective fuel. CNSC staff responded that defective fuel is stored in a specific area in the primary spent fuel bay and that this fuel is closely monitored.

Primary Heat Transport System Pressure Relief Valves

134. An intervention from Dr. Sunil Nijhawan expressed the concern that the primary heat transport system pressure relief valves on the Bruce Power reactors are inadequately sized and that this could lead to inadequate steam relief capacity and over-pressurization during a severe accident. The Commission requested more information about the pressure relief valve sizing. A representative from Bruce Power responded that Bruce Power's technical specialists had reviewed the issues raised by the intervenor and determined that the valves were safe. A Bruce Power representative explained that the reactor component design was based on ensuring that the reactors are operating in a safe state during normal operating conditions, explained how the size of the pressure relief valves had been determined, and noted that its interpretation of the associated standards was reviewed and approved by the American Society of Mechanical Engineers.³⁰ CNSC staff stated that it had been involved in the review of the valve design process, that it had reviewed the information submitted by Dr. Nijhawan and was of the view that the steam relief capacity provided by the pressure relief valves was adequate. CNSC staff also noted that the pressure relief valve sizing re-evaluation was a Fukushima Follow-Up Action Item and that this information was discussed in that context at a CNSC Public Meeting in August 2013,³¹ where it was concluded that the valve sizing is adequate.
135. The Commission enquired about the consequences of using larger pressure relief valves. The Bruce Power representative responded that an over-sized valve could lead to undesirable pressure drops due to increased steam relief capacity.
136. The Commission stated that a path-forward was required to deal with this matter and that another review based on Dr. Nijhawan's submission is required. The Bruce Power representative concurred and expressed that, although the current pressure relief valve sizing was compliant with CNSC regulations, in its commitment to safety, Bruce Power would work with Dr. Nijhawan to re-evaluate the sizing. CNSC staff encouraged further engagement between Bruce Power and Dr. Nijhawan, and noted that the CNSC would want to ensure that any work be done in such a way that the results could be used for a regulatory decision.

³⁰ American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section III, Subsection NB.

³¹ Minutes of the Canadian Nuclear Safety Commission (CNSC) Meeting held on August 21 and 22, 2013, e-Doc #4255297.

3.5.5 Conclusion on Physical Design

137. On the basis of the information presented, the Commission concludes that the design of the Bruce A and B NGS is adequate for the operation period included in the proposed licence. The Commission directs CNSC staff to provide it with annual updates on the Bruce A Unit 1 and 2 fuel defects, Bruce B endplate cracking and the analysis of pressure relief valve sizing.

3.6 Fitness for Service

138. Fitness for service covers activities that are performed to ensure the systems, components and structures at Bruce A and B continue to effectively fulfill their intended purpose. The specific areas that comprise fitness for service at the Bruce A and B sites include equipment fitness for service / equipment reliability, maintenance, structural integrity, aging management, chemistry control, and periodic inspection and testing. CNSC staff stated that, based on the information assessed, Bruce Power's performance in the fitness for service SCA met CNSC requirements.

3.6.1 Equipment Fitness for Service / Equipment Reliability

139. Bruce Power reported that its equipment reliability program has an overall objective of ensuring that all systems important to safety meet their defined design and performance criteria at defined levels of reliability throughout the life of the plant.
140. CNSC staff reported that, throughout the current licence period, a reduced number of equipment failures and improvements in areas such as containment leak rates demonstrate that Bruce Power is employing the necessary resources to ensure that the systems at its facilities remain fit for service. CNSC staff also noted that Bruce Power's reliability program has been in compliance with CNSC Regulatory Standard S-98, *Reliability Programs for Nuclear Power Plants*³² over the current licence period and that Bruce Power will be transitioning to the newer RD/GD-98, *Reliability Programs for Nuclear Power Plants*³³ in the next licence period with a target implementation date of October 2015. CNSC staff stated that the Bruce Power reliability program met CNSC requirements.
141. The Commission requested additional information about containment leak rates. CNSC staff responded that the criteria to pass the leak rate test is 1% per hour and that Bruce Power leak rates test results were approximately 0.16% per hour.
142. The Commission noted that reliability targets were not met for the Bruce A Units 1 and 2 shutdown systems (SDS1 and SDS2) in 2013 and asked for more information on this matter. A Bruce Power representative stated that a very conservative approach is taken

³² CNSC Regulatory Standard S-98, "Reliability Programs for Nuclear Power Plants", 2005.

³³ CNSC Regulatory Document RD/GD-98, "Reliability Programs for Nuclear Power Plants", 2012.

for the calculation of reliability targets and that these calculations include the reliability of the support systems/equipment associated with the shutdown systems. CNSC staff clarified that, in the cases of Units 1 and 2, it was not the shutdown systems themselves that experienced a very short period of unavailability, but rather those support systems/equipment. CNSC staff emphasized that no reactor in Canada has been or will be allowed to operate without the availability of the shutdown system. The Commission noted that when terminology such as ‘unavailability’ of an emergency shutdown system is used, this can raise concern when the matter is not explained.

143. The Commission enquired about accelerated corrosion that had been identified in Bruce B Unit 8 steam generators. A Bruce Power representative responded that three steam generators in Bruce B Unit 8 were fabricated from material that was low in chromium, resulting in accelerated corrosion. The Bruce Power representative made clear to the Commission that the steam generators are inspected at every outage, that an end-of-life evaluation had been conducted and that additional supports were put in place to ensure their integrity.

3.6.2 Maintenance

144. CNSC staff reported that Bruce Power has policies, processes and procedures in place that provide direction and support for its maintenance program, and that this program meets the requirements and expectations set out in RD/GD-210, *Maintenance Programs for Nuclear Power Plants*.³⁴
145. CNSC staff reported that Bruce Power’s preventative maintenance completion ratio has steadily improved in the current licence period and meets CNSC staff expectations. Furthermore, although the corrective maintenance backlog was previously a concern for CNSC staff, the backlog was significantly reduced in 2014, is now in the industry average range, and this action item has now been closed. However, the backlog of deficient (elective) and deferred preventative maintenance at both stations is still an issue. Corrective actions that meet CNSC expectations are being applied by Bruce Power, with industry norms expected to be achieved by the end of 2016.
146. Bruce Power reported that it is focussing on maintenance backlog reduction in support of improving equipment reliability and forced loss rates. In this effort, it has adopted Institute of Nuclear Power Operators AP-928, *Work Management Process Description*³⁵ to address the issue. Bruce Power noted that, as a result, it has re-categorized corrective maintenance and elective maintenance to critical component maintenance and deficient component maintenance.
147. ATS Automation, in its intervention, commented on the Bruce Reactor Inspection and Maintenance System, noting that the system would be used to inspect fuel channels and include pressure measurement and sampling. The Commission requested more

³⁴ CNSC Regulatory Document RD/GD-210, “Maintenance Programs for Nuclear Power Plants”, 2012.

³⁵ INPO AP-928, *Work Management Process Description*, Rev. 3, Institute of Nuclear Power Operators, 2010.

information on this subject. A Bruce Power representative stated that this system would be used and tested during the August 2015 outage and was expected to increase the efficiency and reliability of inspections, and lower the dose to workers.

3.6.3 *Structural Integrity*

148. CNSC staff reported that Bruce Power plans to update the Life Cycle Management Plan for concrete containment structures to meet the requirements of REGDOC-2.6.3, *Aging Management*³⁶ by the end of 2016. Bruce Power is also expected to perform leakage rate tests for the main containment structures and the vacuum buildings for Bruce B in 2015 and Bruce A in 2016.
149. Bruce Power reported that it would be performing a Bruce B Vacuum Building Outage and a Station Containment Outage during the spring of 2015, including positive pressure tests on both vacuum building and containment structures and a thorough inspection of these structures to meet CSA N287.7³⁷ and CSA N285.5³⁸ requirements. Bruce Power noted that Fukushima-related improvements to containment would also be made.
150. Several intervenors expressed concerns about the integrity of the concrete containment structures. The Commission enquired about the verification of the concrete containment structures integrity. CNSC staff responded that since the containment structure is a special safety system, every aspect of its performance is routinely reviewed and described the inspection process for containment structures and associated systems. The Bruce Power representative confirmed that the containment structures did not have any degradation of concern.

3.6.4 *Aging Management*

151. Bruce Power described its aging management program. Bruce Power stated that, as part of its aging management program, it developed Life Cycle Management Plans, which are based on completed condition assessments and ensure that the current condition of systems, structures and components are understood. Bruce Power explained that Life Cycle Management Plans monitor aging effects so that proactive action can be taken, when appropriate, to ensure fitness for service on an ongoing basis. Bruce Power noted that its Asset Management process provides a way for it to evaluate various component end-of-life strategies to achieve an integrated Asset Management Plan, with approved mitigation options documented in the Life Cycle Management Plan.

³⁶ CNSC Regulatory Document REGDOC-2.6.3, "Aging Management", 2014.

³⁷ N287.7: In-service examination and testing requirements for concrete containment structures for CANDU nuclear power plants, CSA Group, 2008.

³⁸ N285.5: Periodic inspection of CANDU nuclear power plant containment components, CSA Group, 2013.

152. CNSC staff reported that Bruce Power's integrated aging management program framework, related processes and Life Cycle Management Plans are in accordance with CNSC staff requirements, as documented in RD-334, *Aging Management for Nuclear Power Plants*.³⁹ CNSC staff provided additional information regarding fracture toughness, material wear and fretting, annulus spacers and operation beyond 210,000 equivalent full power hours (EFPH). CNSC staff accepted Bruce Power's plans to transition to full compliance with REGDOC-2.6.3 by the end of 2016.
153. The Commission enquired about whether Bruce Power was planning to replace any major components during the proposed licence period. A Bruce Power representative responded that, through its planned maintenance program, Bruce Power would be replacing components such as rotors and turbine generator stators; however, at this time, there were no plans to replace major components such as pressure tubes, feeders or steam generators.
154. The Commission asked whether there were any safety implications from the fluctuation in power level caused by aging components. CNSC staff replied that this aspect of aging management is closely inspected and that no significant safety concerns had been identified.
155. The Commission asked whether the types and frequency of inspections would change due to the aging of the Bruce NGS. CNSC staff responded that it has a risk-informed baseline inspection program, including a reactive inspection component that, amongst other issues, considers aging management.

Pressure Tubes

156. In September 2014, the Commission authorized Bruce Power to operate the Bruce B Units 5 and 6 beyond 210,000 EFPH, up to a maximum of 245,000 EFPH and subject to the decision of the Commission as part of this relicensing hearing.⁴⁰ Bruce Power reported that, through extensive research and development efforts examining pressure tube health and longevity, it has been determined that pressure tube robustness will continue to meet regulatory requirements over the next five-year licence period, up to 247,000 EFPH.
157. CNSC staff stated that it had verified that Bruce Power has established programs to monitor the fitness for service of pressure tubes up to 247,000 EFPH and recommended that the Commission approve Bruce Power's request. CNSC staff explained that, of all the aging and degradation mechanisms affecting the pressure tubes, deuterium uptake and its effect on fracture toughness was considered to be the dominant contributor to the risk of pressure tube failure. CNSC staff reported that Bruce Power planned to submit a revised version of its Fuel Channel Life Cycle

³⁹ CNSC Regulatory Document RD-334, "Aging Management for Nuclear Power Plants", 2011.

⁴⁰ CNSC Record of Proceedings, Including Reasons for Decision – Bruce Power Inc., "Bruce Nuclear Generating Station B – Request for Approval to Operate Beyond 210,000 Equivalent Full Power Hours (EFPH)", September 16, 2014, e-Doc 4501441.

Management Plan and Fuel Channel Condition Assessment by the end of 2015. In addition, Bruce Power was also requested to submit semi-annual updates regarding pressure tube tests.

158. Many intervenors expressed concern at the operation of Bruce NGS Units beyond the original pressure tube design of 210,000 EFPH. In its intervention, the Canadian Environmental Law Association expressed its displeasure that the September 2014 approval for the operation of Bruce B Units 5 and 6 beyond 210,000 EFPH had been considered without the possibility of public intervention. CNSC staff indicated that, in coming to the Commission for the September 2014 request, as well as for this hearing, Bruce Power had to demonstrate that pressure tubes would meet all requirements if operated beyond 210,000 EFPH. CNSC staff also considered the results obtained from the industry-wide Fuel Channel Life Management Project, which showed that pressure tubes at Bruce Power will be fit for service until at least 247,000 EFPH. Furthermore, the Commission noted that, as stated in its September 16, 2014 decision, a public hearing was not held at that time because the authorization to operate beyond 210,000 EFPH was temporary and any authorization for a longer period was to be considered in the context of this public hearing, which has been the case.
159. An intervention from an individual suggested that operation beyond 210,000 EFPH was “unchartered territory.” CNSC staff noted that, following a public hearing on May 7, 2014, Pickering NGS was authorized to operate beyond 210,000 EFPH up to 247,000 EFPH.⁴¹ CNSC staff also provided information about the testing that was conducted on pressure tubes from an Argentinian CANDU reactor that had been operated beyond 210,000 EFPH, and stressed that the CNSC would not allow a reactor to operate in an experimental state or with pressure tubes that are approaching a state where they are no longer fit for service.
160. The Commission enquired about how the hydrogen equivalent concentration relates to pressure tube fitness for service. A Bruce Power representative responded that the hydrogen equivalent concentration increases in the pressure tubes relative to their operating lifetime and that reactors operating close to 210,000 EFPH have maximum hydrogen equivalent concentrations of 60 parts per million (ppm). Since the likelihood of a pressure tube bursting increases with hydrogen concentration, a correlation to the fitness for service of pressure tubes exists. The Bruce Power representative noted that, through the Fuel Channel Life Management Project, pressure tubes have been tested up to hydrogen concentrations of 124 ppm and beyond. CNSC staff added that it had reviewed the burst test results, has a high level of confidence in the fitness for service of pressure tubes up to 124 ppm, and noted that in-service inspections are frequently conducted to ensure fitness for service of pressure tubes and other critical components.

⁴¹ CNSC Record of Proceedings, Including Reasons for Decision – Ontario Power Generation Inc., “Application to Request Removal of a Hold Point for the Pickering Nuclear Generating Station”, May 7, 2014, e-Doc 4480741.

3.6.5 Chemistry Control

161. CNSC staff reported that it conducted several inspections of Bruce A and B plant chemistry management during the current licence period and concluded that Bruce Power's chemistry management program met regulatory expectations.

3.6.6 Periodic Inspection and Testing

162. CNSC staff reported that Bruce Power is required to implement periodic inspection programs (PIPs), in accordance with CSA standards, to monitor the continued fitness for service of nuclear pressure boundary components, containment components and containment structures.
163. CNSC staff provided details for Bruce PIPs under relevant CSA standards and noted that, in March 2013, CNSC staff conducted a Type II inspection of Bruce B PIPs for adherence to CSA N285.4,⁴² CSA N285.5, and CSA N287.7, and found that Bruce Power's implementation of the PIPs meets CNSC requirements. CNSC staff noted that Bruce Power had provided it with a transition plan to the 2009 version of CSA N285.4, with a target completion date for full implementation at the end of 2018.
164. CNSC staff stated that, following a request from Bruce Power, CNSC staff found it acceptable that Bruce Power defer leakage rate tests for the Main Containment Structures and the Vacuum Buildings to 2015 for Bruce B and 2016 for Bruce A. Overall, CNSC staff did not identify any safety concerns in this area.
165. The Commission enquired about the frequency and nature of inspections conducted by CNSC staff. CNSC staff responded that inspections of all systems in the plant, including electrical systems, are conducted on a routine basis and ensure that all equipment will work as designed and required, even in extreme conditions.

3.6.7 Conclusion on Fitness for Service

166. The Commission is satisfied with Bruce Power'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 Bruce A and B, is fit for service. The Commission is satisfied that, with continued monitoring and regulatory oversight, the pressure tubes can be operated up to a maximum of 247,000 EFPH. The Commission authorizes the operation of Bruce NGS A and B Units 1-8 up to a maximum of 247,000 EFPH. The Commission noted, however, that it is of the view that achieving industry norms for the backlog of deficient and deferred preventative maintenance should be a priority for Bruce Power in the next licence period and that progress in this regard will be monitored through annual updates via the CNSC staff *Annual Regulatory Oversight Report for Canadian Nuclear Power Plants*.

⁴² N285.4: Periodic inspection of CANDU nuclear power plant components, CSA Group, 2009.

3.7 Radiation Protection

167. As part of its evaluation of the adequacy of the provisions for protecting the health and safety of persons, the Commission considered the past performance of Bruce Power in the area of radiation protection. The Commission also considered the Radiation Protection Program at the Bruce NGS, in accordance with the *Radiation Protection Regulations*,⁴³ to ensure that both radiation doses to persons and contamination are monitored, controlled and kept as low as reasonably achievable (ALARA), with social and economic factors taken into consideration. The *Radiation Protection Regulations* also prescribe dose limits for workers and members of the public.
168. CNSC staff reported that, during the current licence period, radiation protection has been rated as “satisfactory” at both Bruce A and B, with the exception of Bruce A in 2010 when it was rated as “below expectations” due to the November and December 2009 Bruce A Unit 1 Alpha Event.
169. CNSC staff stated that Bruce Power’s Radiation Protection Program meets regulatory requirements, maintains doses below regulatory limits and ALARA, and protects the health and safety of persons.

3.7.1 Application of ALARA

170. Bruce Power reported that, through processes described in its Radiation Protection Program and other initiatives, it consistently maintained worker radiological exposures below regulatory limits and improved contamination control methods during the licence period. Bruce Power also noted that it implemented an internal awareness campaign, “Rad Event Zero,” to raise the profile of radiation safety, and greatly expanded the use of air monitors in its facilities.
171. CNSC staff reported that, based on multiple inspections at Bruce A and B during the licence period, Bruce Power’s performance in this area was improving. CNSC staff noted that, although some areas for improvement had been identified, they did not pose a risk to the health and safety of workers. CNSC staff was satisfied that Bruce Power was responding to the identified areas for improvement, and had implemented an appropriate ALARA program.

3.7.2 Worker Dose Control

172. Bruce Power reported that, through its contamination control program and training, improvements on dose control were made during the licence period. Bruce Power stated that personal contamination events had been declining since 2010 and that Bruce Power’s performance was now better than the industry standard for personal contamination events during outages. Bruce Power also reported on a number of

⁴³ SOR-2000-203.

initiatives, implemented during 2013 and 2014, that significantly reduced collective radiation exposure. Bruce Power stated that, in the next licence period, it planned to continue to implement its Radiation Protection Improvement Plan, which was in progress. Bruce Power also reported that it developed and implemented alpha dosimetry and enhanced alpha radiation detection and protection training, and implemented new radiation protection instrumentation during the licence period.

173. CNSC staff reported that, during the licence period, Bruce Power's Radiation Protection Program had been revised three times and that multiple inspections demonstrated that the implementation of the program met regulatory requirements. CNSC staff noted that the Bruce Power Radiation Protection Program includes contamination control, radiation dose control, and airborne radiation monitoring and control. CNSC staff reported that Bruce Power maintained doses below the regulatory dose limits for nuclear energy workers of 50 millisieverts per year (mSv/y) and 100 mSv/5 years.
174. CNSC staff further reported that, during the licence period, Bruce Power revised its worker dose action levels.⁴⁴ CNSC staff stated that it had reviewed and accepted the proposed changes. CNSC staff further noted that a 2013 inspection concluded that all worker dose regulatory requirements were being met at Bruce Power. CNSC staff was satisfied that the minor deficiencies that were noted were of low safety significance and that Bruce Power had responded with corrective action plans for each deficiency, to be completed by mid-2015.
175. The Commission enquired about the yearly variation in personal contamination events, as well as total collective radiation dose to employees, during the licence period. A Bruce Power representative explained that, with respect to personal contamination events, the frequency was higher during several years due to the Bruce A refurbishment and restart project. With respect to the higher collective doses at Bruce A, the Bruce Power representative explained that there were significant outages during 2012 that involved high-dose work, which resulted in an overall higher collective dose.

Bruce A Unit 1 Alpha Event

176. CNSC staff described the November and December 2009 Bruce A Unit 1 Alpha Event (Alpha Event). CNSC staff explained that 557 workers were affected and that 45 workers had received an unplanned dose greater than 2 mSv. The maximum dose from the event to a worker was 6.9 mSv, well below the annual limit of 50 mSv/y for nuclear energy workers. CNSC staff noted that Bruce Power took extensive corrective actions after this event. The Commission notes that the Alpha Event was also extensively discussed in previous meetings of the Commission.

⁴⁴ An action level is defined in the *Radiation Protection Regulations* as a specific dose of radiation or other parameter that, if reached, may indicate a loss of control of part of a license's radiation protection program and triggers a requirement for specific action to be taken.

177. Several intervenors, including contracting companies and unions, noted that they had employees and members affected by the Alpha Event. The Commission asked if the intervenors were satisfied with Bruce Power's response to the Alpha Event. The intervenors responded that they were.
178. The Commission asked numerous questions relating to concerns expressed by several intervenors regarding doses to workers, whether the Alpha Event was foreseeable and the efforts made to investigate the event. The Commission received extensive information on this subject. The Commission is satisfied that the root cause analysis for the Alpha Event was adequately evaluated by CNSC staff and reported to the Commission, and that appropriate mitigation measures were put in place to prevent reoccurrence of this event. The Commission is satisfied that this event did not and will not cause adverse health effects to the workers involved. The Commission accepts the findings of this event presented during this and previous public proceedings and considers this matter closed.

3.7.3 Public Radiation Exposure

179. Bruce Power reported that, through the evaluation of doses to potential critical groups, the maximum dose received by a member of the public due to the Bruce Power site operations during the current licence period continued to be a very small percentage of the annual regulatory limit of 1 mSv/y. CNSC staff concurred with Bruce Power.
180. In the Environmental Assessment Information Report (EA Report) conducted under the NSCA, CNSC staff reported that the highest annual public dose of 0.00441 mSv/y was observed in 2009, representing 0.44% of the regulatory limit and 0.22% of the natural background dose.⁴⁵ The EA Report included the methodology used by Bruce Power to calculate the maximum dose to a member of the public and further analysis performed by CNSC staff.
181. One intervenor suggested that there is no safe limit for exposure to radiation and expressed the view that 1 mSv/y was an administrative limit, not a protective limit. The Commission questioned this statement and requested more information. CNSC staff emphasized that this limit is in fact a very protective limit established for regulatory purposes and that a significantly higher dose would be required for any adverse health effects to occur. CNSC staff explained how the public dose limit was derived and noted that some areas of the world have background doses significantly higher than 1 mSv/y, with studies showing that these doses have no impact on human health. CNSC staff added that a study of 42,000 nuclear energy workers in Canada⁴⁶ showed that there is no increased cancer incidence in this population.

⁴⁵ The regulatory dose limit for a member of the public is 1000 µSv (1 mSv) per year and the natural background dose is estimated at 2100 µSv (2.1 mSv) per year.

⁴⁶ CNSC INFO-0811, "Verifying Canadian Nuclear Energy Worker Radiation Risk: A Reanalysis of Cancer Mortality in Canadian Nuclear Energy Workers (1957-1994), Summary Report", June 2011.

182. In its intervention, the Bruce Peninsula Environment Group stated that the International Committee on Radiation Protection (ICRP) had found that the public annual dose limit of 1 mSv/y was not protective of the female gender and had also recommended to drastically lower the limit. The Commission requested more information about this matter. CNSC staff disagreed with the information presented by the intervenor. CNSC staff explained that the ICRP had not recommended to lower the public dose limit and that ICRP recommendations consider receptors of both genders, as well as children. CNSC staff noted that CNSC dose limits are equivalent to those recommended by the most recent ICRP 103 Publication⁴⁷ recommendations.

3.7.4 Conclusion on Radiation Protection

183. The Commission concludes that, given the mitigation measures and safety programs that are in place or will be in place to control radiation hazards, Bruce Power will provide adequate protection to the health and safety of persons and the environment.
184. The Commission accepts the findings of the November and December 2009 Alpha Event at Bruce A Unit 1 presented during this and previous public proceedings and considers this matter closed.

3.8 Conventional Health and Safety

185. Conventional health and safety covers the implementation of a program to manage workplace safety hazards. The conventional health and safety program is mandated by provincial statutes for all employers and employees to minimize risk to the health and safety of workers posed by conventional (non-radiological) hazards in the workplace. This program includes compliance with the applicable labour codes and conventional safety training.
186. Bruce Power reported that conventional health and safety is a priority for the company and that, in 2010, it became the first nuclear facility in Canada to become certified to the Occupational Health and Safety Assessment Series 18001: 2007 Standard by an external registrar.
187. Bruce Power also detailed many initiatives and improvements that were made to its Health and Safety Program over the licence period, and reported that its Industrial Safety Accident Rate has been better than target since 2004 with the site recently exceeding three million working hours without a lost time injury.
188. CNSC staff reported that Bruce Power continued to maintain a conventional health and safety program in accordance with regulatory requirements and that it was rated “fully satisfactory” throughout the current licence period. CNSC staff noted that Bruce Power

⁴⁷ ICRP Publication 103, “The 2007 Recommendations of the International Commission on Radiological Protection”, 2007.

has a policy of “Safety First” and that it reinforces this policy through multiple awareness campaigns.

189. Several intervenors commented that Bruce Power has a robust conventional health and safety program in place. In its intervention, the Power Workers’ Union stated that it was seeking a greater opportunity for involvement in Bruce Power’s joint health and safety committee, including a process that formally includes worker representatives during accident and incident investigations, and that Bruce Power was working with them to consider this request.
190. With respect to lost time injuries, the Commission enquired about whether statistics about contractor injuries were included in Bruce Power’s statistics. The Bruce Power representative responded that, if the contractor was supervising its own employees, then the injury statistics would be applied to the contractor.
191. Based on the information presented, the Commission concludes that the health and safety of workers and the public was adequately protected during the operation of Bruce A and B for the current licence period, and that the health and safety of persons will also be adequately protected during the continued operation of the facility.

3.9 Environmental Protection

192. Environmental protection covers Bruce Power’s programs that identify, control and monitor all releases of radioactive and hazardous substances, and that aim to minimize the effects on the environment which may result from the licensed activities. It includes effluent and emissions control, environmental monitoring and estimated doses to the public.
193. Bruce Power reported that its Environmental Management System (EMS) had been implemented at all Bruce Power facilities and was designed to comply with all relevant environmental legislation, regulations and other requirements. The EMS was successfully re-registered to the International Organization for Standardization (ISO) 14001:2004 standard by the ISO registrar. CNSC staff reported that the Bruce Power EMS had been implemented in accordance with REGDOC-2.9.1, *Environmental Protection: Policies, Programs and Procedures*.⁴⁸
194. CNSC staff reported that, under the NSCA, protection of the environment is included as a requirement for all licensees and that CNSC staff performs licensing reviews and compliance activities to ensure the protection of the environment at Bruce A and B on an ongoing basis. During the current licence period, Bruce Power was rated as “satisfactory” for this SCA.

⁴⁸ CNSC REGDOC-2.9.1, “Environmental Protection: Policies, Programs and Procedures”, 2013.

195. CNSC staff noted that three new CSA environmental standards, N288.4-10,⁴⁹ N288.5-11⁵⁰ and N288.6-12⁵¹ were published during the licence period, in addition to REGDOC-2.9.1, and that Bruce Power was targeting to be fully compliant with these new standards by the end of 2018. CNSC staff noted that it would report to the Commission, through the CNSC staff *Regulatory Oversight Report for Canadian Nuclear Power Plants*, the progress on the implementation of the new standards.
196. CNSC staff stated that there was no requirement for an environmental assessment (EA) pursuant to the *Canadian Environmental Assessment Act, 2012*⁵² (CEAA 2012). For this licence renewal application, CNSC staff conducted an EA under the NSCA to determine whether Bruce Power has and will continue to make adequate provision for the protection of the environment and the health of persons. The results of this EA under the NSCA were documented in the EA Report, which was based on information submitted by Bruce Power, reviews completed by CNSC staff and independent environmental monitoring results.
197. CNSC staff reported in the EA Report that an environmental risk assessment conducted by Bruce Power provided the basis for the Environmental Monitoring Program (EMP). In 2013, Bruce Power completed an environmental risk assessment as per CSA N288.6-12.
198. On January 30, 2015, Bruce Power submitted a Preliminary Quantitative Risk Assessment that considered human health and ecological stressors. CNSC staff reported in the EA Report that, based on its high-level review of this assessment, Bruce Power has made, and will continue to make, adequate provision for the protection of the environment.

3.9.1 Effluent and Emissions Control

199. CNSC staff reported that, during the licence period, Bruce Power implemented and maintained an effluent monitoring program as required by the *Class I Nuclear Facilities Regulations*.⁵³ CNSC staff also reported that its review of non-radioactive discharges to the environment from the Bruce NGS indicated that no significant risks to the public or the environment occurred during the licence period.

⁴⁹ N288.4-10: Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills, CSA Group, 2010.

⁵⁰ N288.5-11: Effluent monitoring program at Class I nuclear facilities and uranium mines and mills, CSA Group, 2011.

⁵¹ N288.6-12: Environmental risk assessment at Class I nuclear facilities and uranium mines and mills, CSA Group, 2012.

⁵² S.C. 2012, c. 19, s. 52.

⁵³ SOR/2000-204.

200. In the EA Report, CNSC staff reported that Bruce Power had updated its derived release limits (DRLs)⁵⁴ in compliance with Bruce A and B LCHs. The new DRLs were reviewed and accepted by CNSC staff in May 2013, and the Commission approved and issued revised licences to Bruce Power with the new DRLs in January 2014.⁵⁵ CNSC staff reported that radiological releases continued to be below 1% of the DRLs for both air and water.
201. In its intervention, the Saugeen Ojibway Nation (SON) expressed concerns about DRLs and action levels. The Commission enquired about the nature of the SON's concerns. The SON representative responded that the SON's technical advisors found that the limits were without function and that the community did not have confidence that releases, even those below the limits, were not going to impact their health. CNSC staff explained that the SON's concerns were being addressed, and noted that the approach to determining the DRLs and action levels was in a review process. CNSC staff also noted that a discussion paper on a revised process in which limits would serve a control purpose has been issued and is being peer-reviewed, and that another similar approach, which was recently proposed by the IAEA, is being evaluated by CNSC staff.
202. One intervenor expressed concerns about the environmental and health impact of the Bruce NGS on his property, referencing multiple incidents over the course of several years, and suggested that these concerns had been dismissed in the past. The Commission requested more information about these matters. CNSC staff indicated that the intervenor's concerns had not been dismissed by the CNSC and provided the Commission with a summary of the studies that had been conducted on and around the intervenor's property, including investigations by the Ontario Ministry of Environment, and noted that these studies found that the concentrations of contaminants were well below regulatory limits. CNSC staff also stated that, while the intervenor's property was not included in the CNSC's 2013 Independent Environmental Monitoring Program (IEMP), it could be included in the 2015 sampling program. A Bruce Power representative stated that Bruce Power has radiation monitors adjacent to the intervenor's property, that Bruce Power conducts regular sampling on the property and that, to date, results had indicated that the concentrations of contaminants were well below regulatory limits.
203. An intervenor suggested that a community health study should be conducted in the communities around the Bruce NGS and presented a proposal for such a study. The Commission expressed concerns about the scope of such a study, noting that it would fall between the criteria for an epidemiological study and a wellness survey, and requested more information about this proposal. The intervenor provided details about

⁵⁴ The DRL for a given radionuclide is the release rate that would result in an annual committed effective radiation dose of 1 mSv to the most exposed group of the public (also known as the critical receptor) for that nuclear substance.

⁵⁵ CNSC Record of Proceedings, Including Reasons for Decision – Bruce Power Inc., “Application to Amend the Bruce Nuclear Generating Station A Power Reactor Operating Licence”, January 23, 2014, e-Doc 4302516 and “Application to Amend the Bruce Nuclear Generating Station B Power Reactor Operating Licence”, January 23, 2014, e-Doc 4302505.

the proposed study and noted that some community groups had expressed an interest in it. The intervenor further stated that similar community health studies have identified health problems directly related to industrial sites in other cities. CNSC staff responded that the health studies referenced by the intervenor evaluated sites that were not relevant comparisons to the Bruce Power site and also noted that several decades of monitoring indicated that the levels of contamination by radionuclides in the environment surrounding the Bruce Power site were very low. Additionally, the RADICON Study⁵⁶ showed that there was no increased incidence of childhood cancers around the Bruce Power site.

204. The Commission asked if any health-related studies had been conducted in the surrounding communities. The Chief Medical Officer of Health for Grey-Bruce responded that community well-being evaluations were done in 2011 and 2014, and explained that the primary health concerns that were identified for the region were related to lifestyle, including diet, smoking and drinking habits, rather than the releases from the Bruce NGS. The Chief Medical Officer of Health for Grey-Bruce further noted that due to the low population of the area, epidemiological studies would not be statistically significant.

Air Emissions

205. Bruce Power reported that its radiological releases from 2009 to 2013 remained well below the regulatory limit of 1 mSv/y for a member of the public. Bruce Power noted that the additional air monitoring systems that have been installed off-site further ensure that gamma, tritium and carbon-14 emissions are kept well below DRLs. CNSC staff concurred with Bruce Power.
206. In the EA Report, CNSC staff reported that airborne tritium, which is the principal radiological emission associated with dose to the public, was trending down for both Bruce A and B. Additionally, during 2012, Bruce A experienced slightly higher iodine airborne emissions, but the emissions remained below 1% of the DRL. CNSC staff explained that this was caused by defective carbon filter beds, which were then replaced, and that iodine emissions were returning to the average long-term values. CNSC staff further reported that, while it appeared that carbon-14 emissions increased at Bruce A, this was directly related to the return to service of Units 1 and 2. CNSC staff noted that, at Bruce B, an increased focus on moderator purification resin management and the reduction of cover gas purging has led to a decrease in carbon-14 emissions.

⁵⁶ Canadian Nuclear Safety Commission, "Radiation and Incidence of Cancer Around Ontario Nuclear Power Plants from 1990 to 2008 (the RADICON Study) – Summary Report", May 2013.

Water Emissions

207. In the EA Report, CNSC staff reported that Bruce A showed a stable trend in tritium releases to water, while Bruce B showed elevated releases in 2012 due to a boiler tube leak. The carbon-14 emissions were generally stable and all radiological releases to water from Bruce A and B remained below 1% of the DRLs for each site.
208. CNSC staff also reported that Bruce Power monitors the local drinking water to ensure that radioactive releases are not having an impact on the health of the public, with tritium concentrations remaining well below 100 Bq/L and less than 1% of the Ontario Drinking Water Standard for tritium of 7,000 Bq/L.
209. In the EA Report, CNSC staff reported that Bruce Power monitors groundwater semi-annually through samples collected at 10 multi-level wells at both Bruce A and B. With the exception of one well at Bruce A and two wells at Bruce B, average tritium concentrations around both Bruce A and B were consistently under 1,000 Bq/L. CNSC staff further reported that the elevated tritium concentrations at Bruce A monitoring well 4-2 peaked at 4,465 Bq/L in April 2013, which was attributed to a moderator spill in January 2012. The elevated tritium concentrations at Bruce B monitoring well 4-3 peaked at slightly over 3,000 Bq/L, which was attributed to a heavy water spill for a tanker in the Ancillary Service Building. CNSC staff noted that, although these monitoring wells are not a source of drinking water, none surpassed the Ontario Drinking Water Standard for tritium. Furthermore, the Bruce A and B sites are hydraulically isolated from public areas, with Lake Huron being the only off-site receptor.
210. An intervenor expressed concern that a well in Inverhuron Park was contaminated with tritium. The Commission requested more information about this well. CNSC staff responded that this well was originally affected by the waste management facility operations and that, while the tritium concentrations were not considered hazardous, monitoring indicated that they were above action limits, leading to ongoing corrective actions.
211. With respect to an intervention from Dr. Brant Ulsh, the Commission enquired about the results of experiments involving tritium exposure up to 100,000 Bq/L. The intervenor responded that, biologically, no effect was seen in exposures at 100,000 Bq/L. The intervenor expressed the view that Ontario's current drinking water limit of 7,000 Bq/L of tritium was adequate.
212. CNSC staff reported that, in December 2010, charges were laid against Bruce Power by Environment Canada (EC) under section 36 of the *Fisheries Act* as a result of uncontrolled chemical releases from the facility. The Commission enquired about the status of these charges against Bruce Power. An EC representative responded that Bruce Power had performed appropriate remedial actions related to EC enforcement actions, that EC is satisfied that these measures are sufficient to protect the environment, and that the charges against Bruce Power had been dropped.

3.9.2 Environmental Monitoring

213. CNSC staff noted in the EA Report that three screening-level EAs under the *Canadian Environmental Assessment Act*⁵⁷ (CEAA 1992) had been completed for Bruce Power's facilities. CNSC staff provided information about these EAs and stated that an environmental assessment follow-up monitoring program (EA FUMP) has been implemented at Bruce Power since 2007 to verify the accuracy of the predictions and the effectiveness of mitigation measures as reported in the 2006 EA Screening Report for the refurbishment of Bruce A Units 1 and 2.⁵⁸ CNSC staff provided details on the EA FUMP. Although the EA FUMP is scheduled to be completed in 2017, CNSC staff noted that, based on the information submitted to date, the results support the conclusions in the 2006 EA Screening Report. Additional monitoring would continue as warranted.
214. Bruce Power reported that its EMP carries out aquatic, terrestrial and air sampling and includes local volunteer participants who provide locally produced foods. In the EA Report, CNSC staff reported that it reviewed and assessed Bruce Power's EMP reports throughout the licence period and that monitoring data indicates that the concentration of radionuclides measured in the environment is very low, with doses to the public well below regulatory limits. CNSC staff stated that, based on continuous monitoring, terrestrial biota in the vicinity of Bruce A and B continues to be protected.
215. The Commission asked several intervenors, including the Municipality of Kincardine and the Bruce County Federation of Agriculture, about whether they felt that Bruce Power's EMP was adequate. The intervenors responded that the EMP was, in their view, adequate.
216. The Commission asked if Bruce Power has difficulty obtaining volunteers for its foodstuffs monitoring program and whether the footprint for monitoring is adequate. A Bruce Power representative responded that Bruce Power does not have difficulties engaging volunteers for the program. With respect to the monitoring area footprint, the Bruce Power representative noted that it is a zone of approximately 10 kilometres and that, since nearly no impacts are seen within the sampling zone, going beyond this zone would not be meaningful.
217. In its intervention, the Métis Nation of Ontario (MNO) representative noted that it has unique requirements from other critical groups identified in Bruce Power's monitoring program and that these requirements need to be recognized. CNSC staff responded that, in the 2006 EA Screening Report for the refurbishment of Bruce A Units 1 and 2, the Métis were identified as receptors in the human health risk assessment. CNSC staff also explained how Valued Ecosystem Components were determined and noted that, in terms of monitoring, there were still opportunities to integrate Valued Ecosystem

⁵⁷ S.C. 1992, c. 37.

⁵⁸ CNSC Record of Proceedings, Including Reasons for Decision – Bruce Power Inc., “Environmental Assessment Screening Report for Refurbishment for Life Extension and Continued Operations of the Bruce A Nuclear Generating Station”, May 19, 2006, e-Doc 3010456.

Components of particular interest to the MNO into ongoing monitoring programs.

218. The MNO expressed a concern that some of the foodstuffs regularly consumed by Métis people, as well as plants used for traditional medicinal purposes, were excluded from EMPs. The MNO also noted a lack of communication with respect to EMP results. The Commission requested clarification on these matters. The Bruce Power representative responded that, should the MNO wish to include additional foodstuffs and plants in Bruce Power's EMP, Bruce Power would accommodate this request and welcomed the MNO's input. The Bruce Power representative also noted that environmental monitoring results are publicly available on the Bruce Power website and are communicated to the MNO through regular quarterly meetings. CNSC staff also responded that, should the MNO wish to include additional foodstuffs and plants in the CNSC's Independent Environmental Monitoring Program (IEMP), CNSC staff can arrange to meet with the MNO to discuss their requests and work together to make adjustments to the program. The MNO representative stated that they would like to have an active role in the monitoring process.
219. In its intervention, the Lake Huron Fishing Club noted that Bruce Power is actively involved in environmental monitoring of fish, and commented that fish populations have increased in the past number of years.

CNSC Independent Environmental Monitoring Program

220. CNSC staff reported that, in 2013, the CNSC IEMP sampled air, water, soil, vegetation, and local food in the vicinity of the Bruce Power site. The samples were analyzed by CNSC's laboratory in Ottawa, Ontario. The IEMP results showed that the public and the environment in the vicinity of Bruce A and B are protected from radioactive releases from Bruce A and B, and that the measured radioactivity in all samples was well below CNSC reference levels and within known background levels. CNSC staff further noted that IEMP sample data are currently available on its public website, allowing the community to see how Bruce Power is performing in terms of emissions to the environment. CNSC staff stated that the IEMP results confirmed that Bruce Power's environmental protection program was effectively protecting the health of people and the environment from radioactive releases from its facility.
221. The Commission asked if data from the IEMP has been compared to the data submitted by Bruce Power from its EMP. CNSC staff responded that, although the data cannot be compared directly due to different sampling areas and methods, the results are compared for consistency and, should there be any major discrepancies, they would be investigated. The Commission further enquired about the IEMP sampling schedule. CNSC staff responded that sampling would be conducted annually for several years and if it is established that the results continue to stay below CNSC reference levels, the sampling schedule will be risk-based.

Natural Sciences and Engineering Research Council of Canada Lake Whitefish Research Program (Whitefish Research Program)

222. Bruce Power reported that, as part of its commitment to environmental protection, it was sponsoring independent peer-reviewed research programs into fish species and the aquatic environment (called the Whitefish Research Program). The Commission asked whether CNSC staff, as well as Environment Canada (EC) and Fisheries and Oceans Canada (DFO), review this data. CNSC staff confirmed that this research is reviewed by themselves, as well as by other interested government departments, when it is released in peer-reviewed publications.
223. In its intervention, the Whitefish Research Program representative reported that the objective of the research program is to determine whether thermal, radiological and conventional emissions can significantly affect whitefish embryos and juveniles. The Whitefish Research Program representative explained that the research, though not yet completed, indicated that there does not appear to be an increase of mortality or developmental abnormalities of Lake Whitefish with increased water temperature and thermal shocks, but changes are seen in the time and size at hatching. The Whitefish Research Program representative noted that sufficient data was not yet available for conclusions regarding thermal effects on Round Whitefish.
224. The Whitefish Research Program representative further reported that chemical effects research has, to date, shown that chemicals present in the Bruce NGS effluent do not appear to be impacting the Lake Whitefish embryos and that impacts would be seen at concentrations outside of the range of probability. The Whitefish Research Program representative noted that sufficient data was not yet available to draw conclusions regarding chemical effects on Round Whitefish. The Commission enquired about why these chemicals were chosen for the experiments. The Whitefish Research Program representative responded that they were chosen because they would be expected to be found in the effluent from the Bruce NGS.
225. With respect to radiological stressors, the Whitefish Research Program representative reported that, although only preliminary data was available, results show that, in general, the Lake Whitefish are fairly insensitive to radiological stressors at low doses. Increased mortality is seen at very high acute doses of 5 to 10 gray.⁵⁹ The Whitefish Research Program representative noted that chronic exposure experiments had recently begun.
226. The Whitefish Research Program representative further reported that preliminary research has been performed on the effects of combined stressors. The Whitefish Research Program representative stated that initial results have shown that, while effects larger than those observed for individual stressors were seen, these were only at conditions above what is considered environmentally relevant. The Whitefish Research

⁵⁹ The gray (Gy) is the SI unit of absorbed radiation dose. A dose of one gray is equivalent to a unit of energy (joule) deposited in a kilogram of a substance. Therefore, a dose of one gray of gamma radiation corresponds to 1 Sievert of equivalent dose whereas a dose of one gray of alpha radiation corresponds to 20 Sieverts of equivalent dose.

Program representative noted that preliminary data suggests that, for the receiving waters considered, single-stressor experiments may be sufficient to predict effects. The Commission enquired about whether combined stressor experiments will include chronic irradiation. The Whitefish Research Program representative responded that they will.

227. The Commission enquired about the general conclusions that have, thus far, been drawn from the Whitefish Research Program. The Whitefish Research Program representative noted that, although it is too early to draw definite conclusions, the work that has been conducted on individual stressors, as well as combined stressors, indicates that there are no major concerns with respect to the development of whitefish embryos near the Bruce Power site. The Whitefish Research Program representative also stated that, thus far, research implied that there is no genetic distinction or difference in habitat use between the Lake and Round Whitefish in the affected zone from Whitefish in the referenced areas. The Whitefish Research Program representative did note, however, that they did not have data on stressors with respect to larval fish.
228. The Commission enquired about how the results from the Whitefish Research Program would be communicated to the public, especially Aboriginal groups and the local communities. The Whitefish Research Program representative responded that regular reports are submitted to NSERC, as well as Bruce Power, and that they have begun to publish research papers. The Commission noted that the information should be presented in a simplified form for members of the public. The Whitefish Research Program representative concurred with the Commission and noted that they were working with Bruce Power on how to best disseminate this information.
229. In its intervention, the SON noted that traditional knowledge had not been included in the EA FUMP or the Whitefish Research Program. While recognizing the value of traditional knowledge, the Commission enquired about how, when discussing scientific research, this traditional knowledge could be incorporated. The SON representative responded that research focused on translating the Crown's Duty to Consult from a legal context to a practical knowledge concept was underway and could be employed in the future.
230. The Commission enquired about the way-ahead for the Whitefish Research Program. The Whitefish Research Program representative responded that, since much of the preliminary set-up had been conducted in the first three years of the project, data collection and analysis was advancing, with research and publication being the priorities for the final two years.

3.9.3 Fish Impingement and Entrainment

231. In the EA Report, CNSC staff reported that both impingement and entrainment effects are being tracked as part of the EA FUMP, with a target completion date of December 2016. CNSC staff noted that, based on historical information, the magnitude of fish

losses due to impingement and entrainment was unlikely to have a significant adverse effect at the population-level, including those for Lake Whitefish. CNSC staff noted that, in 2013, the Lake Whitefish impinged and entrained represented 0.16% of the commercial fishing quota in the area. CNSC staff stated that, based on historical data for fish impingement and entrainment at Bruce Power, the magnitude of fish losses was unlikely to have a significant adverse effect at the population level, including those for Round and Lake Whitefish.

232. In its intervention, the SON stated that it does not believe that the impingement and entrainment monitoring program was adequately designed, and suggested that the program underrepresents actual impingement and entrainment because the data is based on the proportion of the allowable fishing quota and not the actual population of the whitefish. The Commission requested more information on this matter and noted that the Ministry of Natural Resources bases its fishing quotas on current fish populations. CNSC staff detailed the Ministry of Natural Resources' considerations in setting fishing quotas and stated that the Lake Whitefish fishing quota was representative of the status of Lake Whitefish populations. The SON representative stated that new research, conducted by the University of Guelph, had indicated that the data on fish populations may not be valid. CNSC staff described the scientifically-validated methodology that was used by the CNSC to evaluate impingement and entrainment effects, and stated that this methodology showed that impacts from Bruce A and B on the whitefish populations in Lake Huron were low. The Commission noted that, while there may be some validity to the University of Guelph fish population research, its decision for this hearing would be based on accepted and validated scientific information.
233. In its intervention, the MNO expressed the concern that the impingement and entrainment program was not accurately identifying fish species. The Commission requested more information about species identification. CNSC staff responded that Bruce Power has appropriate fish identification protocols in place, with a quality assurance and control plan that CNSC staff has accepted. CNSC staff added that CNSC biologists have observed fish identification and are satisfied that the program is adequate.

3.9.4 *Fisheries Act Authorization*

234. Since operations at the Bruce NGS result in impingement and entrainment of fish that support a commercial, recreational or Aboriginal fishery, a Section 35 *Fisheries Act* authorization will be required from DFO. The need for a *Fisheries Act* authorization is based on the definition of "serious harm" in the *Fisheries Act*, which deals directly with impacts to fish rather than the general environmental protection requirements of the NSCA and the CEAA. CNSC staff noted that, under the NSCA and the CEAA 1992, impacts from impingement and entrainment are assessed at a population level.
235. CNSC staff reported that Bruce Power submitted a revised draft self-assessment on the need for a *Fisheries Act* authorization to the CNSC on March 31, 2015, but had not yet

submitted an application for the *Fisheries Act* authorization to DFO. CNSC staff stated that it expects Bruce Power to engage with Aboriginal groups with respect to the *Fisheries Act* authorization prior to an application being submitted. CNSC staff stated that it reviewed the draft self-assessment and will be following up with Bruce Power in order to obtain clarification on some of the assumptions that led to the final estimated quantity of fish loss. The next phase is for Bruce Power to propose offsets to counterbalance the impacts of the Bruce NGS on fish.

236. CNSC staff clarified that any decisions and conclusions drawn under the NSCA did not prejudice separate decisions to be made under the *Fisheries Act*. CNSC staff also added that all evidence it had considered to do the assessments under the NSCA was sufficient to make the recommendations that it had made under the relevant legislation.
237. In its intervention, the SON expressed a concern that the *Fisheries Act* authorization would, if given to Bruce Power, be permanent. A representative from DFO assured the SON and the Commission that an authorization, if granted, would be valid for a set period of time and would require facility monitoring. The DFO representative noted that DFO conducts annual reporting on all authorizations that it has granted.
238. The Commission enquired about the involvement of the Historic Saugeen Métis (HSM) in the *Fisheries Act* authorization process. The HSM representative indicated that an engagement and consultation template had been signed between themselves and Bruce Power for the *Fisheries Act* authorization and that they were satisfied with the process.

3.9.5 *Thermal Effects*

239. In the EA Report, CNSC staff reported that a 2013 preliminary risk determination for Round Whitefish concluded that there was an elevated risk to this species from thermal discharges and that CNSC staff had been seeking, through licensing reviews and EAs, to better understand the potential impact of thermal discharges from Bruce A and B. CNSC staff noted, however, that due to uncertainties in the data collected, reliable conclusions could not be drawn on this matter and that it would continue to be addressed through CNSC's regulatory compliance program and in cooperation with EC. CNSC staff opened an action item for this issue and Bruce Power provided additional information to CNSC staff in December 2014, allowing for the review and refinement of the risk assessment criteria. Based on the available data, CNSC staff is of the opinion that thermal discharges from Bruce A and B will have no significant adverse environmental effects.
240. An intervention from an individual expressed concerns that the Bruce NGS was discharging effluent water at temperatures as high as 25 degrees Celsius (°C) above lake water temperature into Lake Huron. The Commission requested clarification on effluent discharge temperatures. A Bruce Power representative responded that Bruce Power respects all discharge temperature limits set by the Ontario Ministry of Environment (MOE) and that effluent is discharged from the Bruce NGS at

approximately 9 to 10°C above lake water temperature, which is well below the MOE limits. The Bruce Power representative added that, for 2013 to 2015, Bruce Power had received an effluent discharge temperature variance from the MOE for several degrees above the permitted discharge temperature limit and for use during emergency situations; however, the variance did not allow for effluent temperatures of 25°C above lake water temperature and, to date, had not been used. CNSC staff confirmed the information presented by Bruce Power.

241. The Commission asked if Bruce Power had noticed a discernable increase in the discharge temperatures and volumes with all eight reactor units now operating. A Bruce Power representative responded that, while an increase in both discharge temperature and volume had been seen at Bruce A since the restart of Units 1 and 2, all discharges were within the limits set by their provincial permits.

3.9.6 Conclusion on Environmental Protection

242. Based on the above information, the Commission is satisfied that, given the mitigation measures and safety programs that are in place to control hazards, Bruce Power will provide adequate protection to the health and safety of persons and the environment.
243. The Commission recommends that CNSC staff and Bruce Power form a working group with interested Aboriginal groups to determine a way-ahead, acceptable to all parties, for the Environmental Assessment Follow-Up Monitoring Program (EA FUMP), arising from the May 19, 2006 EA Screening Report for refurbishment at Bruce A. The Commission directs CNSC staff to provide it with annual updates on the EA FUMP via the CNSC staff *Annual Regulatory Oversight Report for Canadian Nuclear Power Plants*.
244. The Commission directs CNSC staff to provide it with annual updates on the process of DFO authorization for Bruce Power under Section 35 of the *Fisheries Act*.⁶⁰ The Commission notes that the DFO authorization process is independent from the CNSC licensing process and that it is not an impediment to CNSC licensing. The Commission is satisfied that the *Fisheries Act* and the NSCA are complimentary statutes and that the Commission's decision on this licensing action does not prejudice or predetermine, in any way, the *Fisheries Act* authorization process that is underway.

3.10 Emergency Management and Fire Protection

245. Emergency Management and Fire Protection cover Bruce Power's provisions for preparedness and response capabilities which exist for emergencies and for non-routine conditions at the Bruce NGS. This includes nuclear emergency management, conventional emergency response, and fire protection and response.

⁶⁰ R.S.C., 1985, c. F-14, s. 35.

246. CNSC staff reported that Bruce Power's performance in this SCA was satisfactory over the licence period, with Bruce Power undertaking ambitious continuous improvement and Fukushima Action Plan initiatives.

3.10.1 Emergency Management

247. Bruce Power provided information regarding its emergency management and preparedness program. Bruce Power stated that, due to the request for more transparency in its emergency planning, Bruce Power would provide an annual report on emergency plans to the public. Bruce Power explained that this would be coordinated through a Memorandum of Understanding between Bruce Power, local hospitals and appropriate provincial and federal agencies.
248. Bruce Power reported on several emergency management initiatives that were started during the current licence period including an FM Alert System, cellular alert messaging, and emergency response capability improvement. Bruce Power stated that, in the next licence period, it would work to enhance communication redundancy within Bruce A and B, and focus on further emergency program enhancements through the use of operating experience, best practices and drill/exercise evaluations.
249. CNSC staff reported that its reviews of the Bruce Power emergency management and preparedness program validated that all components of the emergency response plan are in place, meet regulatory requirements and are in a state of readiness. CNSC staff also reported that Bruce Power's Nuclear Emergency Plan is acceptable and meets most of the requirements of the new REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response*.⁶¹ CNSC staff noted that a transition plan for the implementation of REGDOC-2.10.1 would be submitted by Bruce Power in June 2015, with implementation occurring during the upcoming licence period.
250. Several intervenors supported Bruce Power's emergency response plan. Intervenors explained that there is a good system in place to inform the public in the event of a nuclear emergency and that the public has a good understanding of the emergency plan.
251. The results from an emergency preparedness public opinion poll conducted by Oraclepoll Research and presented by an intervenor indicated that the public felt that they had a lack of information with respect to nuclear emergency preparedness measures. The Commission enquired about these results. The Bruce Power representative noted that this poll was conducted in July 2014 and that Bruce Power, in collaboration with Grey and Bruce counties had, since then, distributed emergency preparedness booklets, developed a potassium iodide (KI) distribution strategy and launched an emergency preparedness website. The Chief Medical Officer of Health for Grey Bruce also noted that the Oraclepoll Research public opinion poll indicated that 27% of residents in Bruce County felt that they were prepared in the case of an emergency and that this was a positive number because, in general, public emergency

⁶¹ CNSC Regulatory Document REGDOC-2.10.1, "Nuclear Emergency Preparedness and Response", 2014.

preparedness is difficult to achieve.

252. In response to the Canadian Environmental Law Association's (CELA) intervention and the public availability of emergency plans, the Bruce Power representative stated that, through the feedback received, Bruce Power recognized that the public would prefer a single source of information including all emergency plans, rather than multiple sources for individual plans. In this effort, Bruce Power partnered with local municipalities to create a website where all emergency preparedness information can be found. The Bruce Power representative also noted that it was recognized that segments of the population would prefer hard copies of this information and, for this reason, Bruce Power prepared an emergency preparedness booklet to be mailed to local residents.
253. An intervention from an individual expressed the concern that educational institutions did not have the required emergency preparedness plans and suggested that there was insufficient municipal involvement in emergency planning. The Commission asked whether this was the case. The Office of the Fire Marshal and Emergency Management (OFMEM) representative responded that nuclear emergency planning for schools is a municipal responsibility under the Provincial Nuclear Emergency Response Plan (PNERP). The Bruce Power representative noted that there are no educational institutions in the primary emergency planning zone.
254. Several intervenors expressed concerns that the consequences of an International Nuclear Events Scale (INES) 7 event were not adequately assessed. The Commission requested more information about this matter. CNSC staff responded that the consequences of a large release, equivalent to that of the Fukushima Daiichi accident, were evaluated by CNSC staff in the *Study of a Hypothetical Severe Nuclear Accident and Effectiveness of Mitigation Measures*⁶² (SARP Study). CNSC staff added that the INES scale is an international communication tool established by the IAEA, to be used after an incident and not to make regulatory decisions or to establish criteria for emergency planning.
255. The Commission enquired about several interventions that expressed the concern that the full effect of a large release on the Great Lakes had not been investigated. CNSC staff responded that, at Bruce Power, there would not be the same concern about contaminated water flowing into the lake as there was during the Fukushima Daiichi accident since there is minimal active groundwater flow to the lake from the Bruce Power site. Additionally CNSC staff noted that the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) reported that the impact of a Fukushima-like event on a large ecosystem would only be of a limited duration.
256. The Commission enquired about thermal siphoning during an event. CNSC staff responded that CANDU technology provides multiple sources of water that can be used to cool the boilers and that, when EME has been installed, thermal siphoning can

⁶² CNSC Draft Report, "Study of a Hypothetical Severe Nuclear Accident and Effective Mitigation Measures", June 2014.

continue for as long as required. Several intervenors expressed the concern that the EME could fail in a severe accident. The Bruce Power representative stated that there is redundancy in the EME and that there are multiple methods by which Bruce Power can ensure that the fuel remains cool in the event of a severe accident.

257. The Commission enquired about how long the reactors would stay cool through thermal siphoning in the event of a total station blackout with no operator intervention. The Bruce Power representative responded that thermal siphoning is a proven methodology and that, with the large inventory of water in the reactors, they could thermally siphon with no operator intervention for four to six hours. The Bruce Power representative added that, unless all four reactors in a station were involved in the blackout, the other reactors could feed the affected reactor without needing EME. In response to several interventions, CNSC staff clarified that a boil-off of the heat sink in the reactor would not occur within two hours and that thermal siphoning has been successfully employed in CANDU reactors in the past.
258. In response to the Canadian Coalition for Nuclear Responsibility intervention, the Commission enquired about whether CNSC staff had modeled the progression of an event with no human intervention to mitigate it. CNSC staff responded that the SARP Study had considered this scenario.

Provincial Nuclear Emergency Response Plan (PNERP)

259. CELA's intervention expressed the concern that the PNERP had not been appropriately updated. The Commission requested more information on this matter. The OFMEM representative responded that the PNERP was last formally approved in 2009 and that plans to update it were in progress. The OFMEM representative noted that, with the upcoming update, they would, for the first time, be conducting public consultation on the planning basis for the PNERP. The Commission suggested that, due to the value of their recommendations, key stakeholders should be engaged early in this consultation process.
260. The Commission noted that CELA's intervention stated that the nuclear emergency plans for the Municipality of Kincardine were not complete and sought further information on this matter. The Municipality of Kincardine representative responded that the Municipality employs a full-time staff member for emergency preparedness planning, that they regularly meet with municipal, provincial and Bruce Power representatives and that, in their view, they had done their due diligence for nuclear emergency planning. The Commission also asked the Town of Saugeen Shores representative whether the town was satisfied with its emergency preparedness. The Town of Saugeen Shores representative responded that, as an alternate host community under the PNERP, its current emergency plan was adequate, but noted that an updated plan is currently being reviewed by the OFMEM. The OFMEM representative stated that the municipal plans for both Kincardine and Saugeen Shores were in conformance with the PNERP.

261. The Commission further enquired about the inclusion of a more detailed recovery plan in the updated PNERP. The OFMEM representative responded that the PNERP update would evaluate the recovery plan, particularly the transition from response to recovery.
262. Several intervenors expressed concerns about the definition of the primary (up to 10 km from the Bruce NGS) and secondary (between 10 km and 50 km from the Bruce NGS) emergency planning zones, as well as about the planning basis for emergency response at Bruce Power. The Commission requested more information on these matters. The OFMEM representative responded that, at this time, the planning zones were considered appropriate but noted that they would be re-evaluated during the PNERP update. The OFMEM representative also noted that the planning zones were not static and could be adjusted, if needed, during an emergency. With respect to provincial emergency response planning basis at Bruce Power, the OFMEM representative responded that the current planning basis involved an OFMEM response within 15 minutes and would accommodate a release with a dose rate of 250 mSv to the most exposed person at the site boundary. The OFMEM representative thanked the intervenors for the feedback and acknowledged that more work would need to be done in terms of public education with respect to emergency preparedness.
263. The Commission requested more information regarding sheltering in place during an emergency. The OFMEM representative responded that the PNERP recommends sheltering in place only for a short duration and when a dose between 1 to 10 mSv is projected. The Commission also asked whether the PNERP included plans for the evacuation of persons with special needs. The OFMEM representative responded that the PNERP delegates this responsibility to the municipalities and noted that this was required to be detailed in their emergency plans.

Huron Challenge

264. Bruce Power reported that, in 2012, it played a significant role in the Huron Challenge, a four-day, full-scale emergency response exercise conducted by the OFMEM. Bruce Power further reported that, during the licence period, it conducted multiple enhancements to its emergency management approach, emergency and security forces and conducted a full document suite revision.
265. The Commission enquired about whether the Huron Challenge exercise was adequate in its scope. Several intervenors, including the Canadian Nuclear Association and the Township of Huron-Kinloss, expressed the view that the exercise was adequate, involved a realistic scenario, and allowed for the identification of operational gaps in areas such as communication between different parties in the exercise.
266. The Commission asked whether, since the Huron Challenge exercise, Bruce Power had corrected the communication difficulties that were encountered. A Bruce Power representative responded that establishing effective communication between organizations was one of the main lessons learned from the exercise and that

improvements to the communication systems had been made. The OFMEM representative noted that the Huron Challenge showed that a key aspect of having a good emergency plan is the operationalization of that plan.

267. The Commission enquired about the health facilities in the communities surrounding the Bruce Power site and whether they were equipped to deal with a nuclear emergency. The Bruce Power representative responded that this was tested during the Huron Challenge and discussed the Memorandum of Understanding that was established between Bruce Power and two local hospital corporations. The Bruce Power representative added that first responders were being provided with patient triage training to ensure that the capacity of health facilities is most efficiently and effectively utilized during an emergency. The OFMEM representative also discussed the availability of a field hospital during an emergency and noted that this field hospital was successfully tested during the Huron Challenge.

Potassium Iodide (KI) Distribution

268. Bruce Power reported that, as per the direction from the Commission in August 2014,⁶³ Bruce Power, in collaboration with the OFMEM and municipalities, began the pre-distribution of KI in the primary zone in April 2015. Bruce Power also reported that further efforts were being made to make KI available to all residents, businesses and institutions in the secondary zone.
269. The Commission noted that it was encouraged by the cooperation between Bruce Power, the OFMEM and the municipalities with respect to its direction for KI distribution. The Commission, however, requested confirmation that sufficient KI would be available for permanent as well as seasonal residents in both the primary and secondary zones. CNSC staff assured the Commission that pre-distribution was for all residents and facilities in the primary zone and that sufficient KI would be pre-stocked for full-time as well as seasonal residents in the secondary zone. The OFMEM indicated that it was satisfied with the work of the KI Distribution Task Group, and that the group had addressed a number of issues with common principles and strategies that would be used for KI distribution across the province, to ensure consistency in practices. The Commission enquired about whether the OFMEM would provide progress updates throughout implementation of the KI distribution plans. The OFMEM confirmed that regular updates would be provided to the Commission.
270. Several intervenors expressed the view that KI should be distributed beyond the primary zone. The Commission requested more information about this matter. The Bruce Power representative responded that, based on the predicted contamination spread in the event of a large release, a 10 km primary zone is more than adequate because the KI is intended for a situation where residents are not able to immediately relocate or who reside very close to the site. The Bruce Power representative further

⁶³ Minutes of the Canadian Nuclear Safety Commission (CNSC) Meeting held on August 20 and 21, 2014, e-Doc 4528070.

noted that contamination modeling, including the SARP Study, has shown that beyond the 10 km zone, significant time would be available for either KI distribution or for temporary relocation to take place. The OFMEM representative confirmed that the trigger for KI requirement is a dose of 50 mSv to the thyroid and that expected dose rates from a large event beyond the 10 km zone show that such a dose would be unlikely. The Commission noted that, during an emergency, public fear may increase the demand for KI and that the public may not understand the dose rate trigger for KI use. The OFMEM representative responded that the OFMEM has taken this into consideration, including the lessons learned from KI requests during the Fukushima Daiichi accident, but noted that the current plan in place has a sound scientific basis.

271. In its intervention, the Canadian Association of Physicians for the Environment expressed concern that, in the past, unless KI was pre-distributed to residents, they did not take advantage of obtaining it when given the opportunity. The Commission asked for additional details on KI pre-stocking in the secondary zone. The OFMEM representative noted that, while KI would be primarily pre-stocked in sufficient quantities in the secondary zone, residents who wish to have a supply in their homes may do so. The Bruce Power representative noted that, in the secondary zone, KI would be pre-distributed to the vulnerable population, including children and pregnant mothers.
272. The Commission requested assurances that measures were in place to manage cases of accidental ingestion of the KI tablets. Bruce Power confirmed that there were no known consequences to the accidental ingestion of KI, but noted that an emergency number was included on the KI tablet packages.
273. In their interventions, the Municipality of Kincardine, the Kincardine & District Chamber of Commerce, the HSM and individuals indicated that they were satisfied with the current plans for KI distribution. The Commission enquired about whether the intervenors considered the 10 km pre-distribution zone to be adequate and these intervenors indicated that they did.
274. The Commission enquired about KI public education programs. The Bruce Power representative responded that, for the primary zone, in addition to door-to-door KI pre-distribution and the emergency preparedness website, an education program would be conducted to provide residents with information on KI and its role in nuclear emergency preparedness. The Bruce Power representative added that, for the secondary zone, it was focusing on conducting outreach with stakeholders such as physicians. In addition, Bruce Power was providing funding to provide training to all first responders on KI.

Fukushima Action Plan

275. CNSC staff reported that Bruce Power had made significant progress in addressing the Fukushima Action Items for Bruce A and B to the satisfaction of CNSC staff, with only one of the 36 items remaining open. CNSC staff noted that the remaining item, involving the evaluation of an update to the filtered air discharge system, was on track for completion by December 2015, a date that was accepted by CNSC staff. CNSC staff committed to providing the Commission with annual updates on the status of the Fukushima Action Items.
276. The Commission requested additional information about the upgraded filtered air discharge system. CNSC staff responded that an initial design for the upgraded system was submitted to CNSC staff in January 2015 and was currently under staff review. The Bruce Power representative indicated that it was considering two designs for the filtered air discharge systems and that, after a design review, they would be installed by the end of 2016. In its intervention, New Clear Free Solutions asked that Bruce Power perform PSAs with and without the use of the filtered air discharge system. The Bruce Power representative indicated that the PSAs would be performed in this way.
277. Several intervenors, including Greenpeace Canada and individuals, expressed a concern over the effectiveness of the additional safety measures being implemented through the Fukushima Action Plan. The Commission requested more information on this matter. CNSC staff responded that the safety enhancements resulting from the Fukushima Action Plan, which were a compliance requirement and involved physical changes to the NGS, as well as the additional EME, have greatly increased the safety of Bruce A and B.
278. An intervenor expressed the concern that the passive autocatalytic recombiners (PARs), which were installed as part of the Fukushima Action Plan, would not function adequately when high concentrations of deuterium are present. The Commission requested clarification on this issue. CNSC staff responded that calculations have shown that the PARs would function adequately with deuterium present and that an experimental program with Chalk River Nuclear Laboratories was testing these calculations. CNSC staff stated that, at this time, it was satisfied that the PARs were sufficient to meet CNSC requirements. The Commission enquired about the availability of the experimental results from Chalk River. CNSC staff responded that the results would be available in the next fiscal year.
279. Dr. Sunil Nijhawan, in his intervention, expressed the concerns that the PARs could ignite if the hydrogen concentration were to increase above four percent, that a sufficient number of PARs had not been installed in the NGS, and that the PARs were designed for a design basis accident, not a severe accident. CNSC staff provided information from research that was conducted on hydrogen concentration and reactivity to address Dr. Nijhawan's concerns. The Bruce Power representative added that, while Bruce Power is confident in the PARs that it has installed, Bruce Power believed that it would be beneficial for Dr. Nijhawan to present his concerns and analysis at a CANDU

Owner's Group (COG) meeting since these issues applied to the whole industry. CNSC staff supported this proposition. The Commission agreed that a meeting between COG, Dr. Nijhawan and Bruce Power, to evaluate Dr. Nijhawan's concerns, was an appropriate path-forward.

3.10.2 Fire Protection

280. Bruce Power provided information regarding its fire protection program. Bruce Power reported that, in 2015, it opened a new fire training facility to train its emergency responders in design basis as well as external firefighting. Bruce Power also reported that they have five high-capacity pumpers, as well as dry hydrants, on site. All equipment has been fitted with standard quick-connect attachments to allow expedient connection in an emergency.
281. CNSC staff reported that Bruce Power has a comprehensive fire protection program to minimize the risk of the health and safety of persons and the environment from fire, through appropriate fire protection system design, fire safe operation and fire prevention. CNSC staff also reported that the Fire Response Program is a mature and well-managed program and there were no significant reportable events during the licence period. CNSC staff stated that all firefighting equipment at the Bruce NGS meets requirements and is well-maintained.
282. CNSC staff stated that multiple oversight initiatives are maintained with the fire response program and that Bruce Power continued its activities to implement procedural and physical upgrades as recommended within the code compliance review of the facilities against CSA N293 and the revised Fire Hazard Assessments and Fire Safe Shutdown Analysis.
283. CNSC staff reported that, in November 2014, Bruce Power requested, through a supplemental application to the CNSC Secretariat, that the Commission provide exemptions from "qualified third party" reviews for Clauses 4.5.1 and 5.9.2.4 of CSA N293-12.⁶⁴ Bruce Power later withdrew its request, noting that it would pursue its concerns with these clauses of the standard through the CSA N293 Technical Committee. CNSC staff recommended that the Commission not grant the proposed exemptions until the concerns have been resolved with the CSA Technical Committee. CNSC staff stated that it would report to the Commission on the outcome of the discussions relating to CSA N293-12 through the CNSC staff *Annual Regulatory Oversight Report for Canadian Nuclear Power Plants*. The Commission is satisfied that Bruce Power has withdrawn its request for the proposed exemptions, and that CNSC staff will continue to provide updates to the Commission on this matter.

⁶⁴ N293-12: Fire protection for nuclear power plants, CSA Group, 2012.

3.10.3 Conclusion on Emergency Management and Fire Protection

284. Based on the above information, the Commission concludes that the fire protection measures and emergency management preparedness programs in place, and that will be in place, at the Bruce NGS are adequate to protect the health and safety of persons and the environment.
285. The Commission notes that, under the PNERP, which is the jurisdiction of the OFMEM, local municipalities have the responsibility of ensuring that they have an appropriate emergency response plan. The Commission encourages local municipalities surrounding the Bruce Power site to ensure that they have appropriate nuclear emergency response plans and that these plans are shared with the public. Furthermore, the Commission expects that Bruce Power will consult with local municipalities to ensure that their nuclear emergency response plans are adequate.
286. The Commission appreciates the OFMEM's commitment to provide it with updates on nuclear emergency preparedness matters on a regular basis. The Commission directs CNSC staff to evaluate these updates, to ensure that all regulatory requirements are being met, and to report to the Commission about municipal emergency planning on an annual basis via the CNSC staff *Annual Regulatory Oversight Report for Canadian Nuclear Power Plants*. The Commission also directs CNSC staff to evaluate emergency planning beyond the Bruce Power site and to ensure that Bruce Power's emergency plans are consistent with those of the local municipalities.

3.11 Waste Management

287. Waste management covers the licensee's site-wide waste management program. CNSC staff evaluated Bruce Power's performance with regards to waste minimization, segregation, characterization, and storage.
288. CNSC staff reported that, over the licence period, waste management at Bruce A and B was rated as satisfactory and that Bruce Power was in compliance with the requirements for controlling radioactive waste. CNSC staff conducted a Type II inspection at the Bruce NGS in 2013 and found that Bruce Power's waste management program met CNSC requirements with respect to hazardous waste management.
289. CNSC staff recommended that, in the next licence period, Bruce Power begin a gap analysis to implement CSA N292.3-14.⁶⁵ CNSC staff noted that it would report to the Commission annually about the implementation of this standard.
290. Interventions from Northwatch and an individual expressed the concern that the continued operation of Bruce A and B would result in the creation of additional radioactive waste, including fuel waste. The intervenors also expressed concerns regarding the storage of used fuel waste, referring to the Fukushima accident. CNSC

⁶⁵ N292.3-14: Management of low- and intermediate-level radioactive waste, CSA Group, 2014.

staff stated that the CNSC ensures that all radioactive waste is managed in a safe manner. CNSC staff noted that used fuel waste from CANDU reactors is different from that of other reactor types because the fuel uses natural, not enriched, uranium. As such, the criticality of used fuel waste is not a safety concern, as it was for Fukushima. CNSC staff also noted that long-term waste management is considered as part of a facility's financial guarantee for decommissioning.

291. In its intervention, Northwatch expressed the concern that radioactive waste inventory and management were not addressed by Bruce Power in their CMDs. CNSC staff responded that quarterly reports are sent to the CNSC by Bruce Power with all waste inventory and that these quantities are publicly available on Bruce Power's public website. The Bruce Power representative provided the Commission with the waste volumes generated in 2013 and noted that Bruce Power is actively committed to reducing all of its waste volumes, both radioactive and conventional.
292. The Commission enquired about Bruce Power's long-term plan for used steam generators. The Bruce Power representative responded that the used steam generators were being stored onsite, and noted that Bruce Power was investigating an on-site recycling option for the contaminated components.
293. Based on the above information and considerations, the Commission is satisfied that Bruce Power is safely managing waste at Bruce A and B.

3.12 Security

294. Security covers the programs required to implement and support the security requirements stipulated in the relevant regulations and the licence. This includes compliance with the applicable provisions of the *General Nuclear Safety and Control Regulations*⁶⁶ and the *Nuclear Security Regulations*.⁶⁷
295. CNSC staff reported that Bruce Power was maintaining a fully satisfactory security program at both Bruce A and B. CNSC staff noted that initiatives undertaken by Bruce Power during the licence period ensured that Bruce Power was compliant with the *Nuclear Security Regulations*, and improved its nuclear security training program.
296. CNSC staff reported that Bruce Power met requirements regarding facilities and equipment. CNSC staff further stated that the Bruce Power response force, which is supported by the Ontario Provincial Police through a Memorandum of Understanding, also meets requirements.
297. The Commission is satisfied that Bruce Power's performance with respect to maintaining security at the facility has been acceptable. The Commission concludes that Bruce Power has made adequate provisions for ensuring the physical security of

⁶⁶ SOR/2000-202.

⁶⁷ SOR/2000-209.

the facility, and is of the opinion that Bruce Power will continue to make adequate provisions during the proposed licence period.

3.13 Safeguards

298. The CNSC's regulatory mandate includes ensuring conformity with measures required to implement Canada's international obligations under the Treaty on the Non-Proliferation of Nuclear Weapons. Pursuant to the Treaty, Canada has entered into safeguard agreements with the IAEA. The objective of these agreements is for the IAEA to provide credible assurance on an annual basis to Canada and to the international community that all declared nuclear material is in peaceful, non-explosive uses and that there are no undeclared nuclear material or activities in this country.
299. CNSC staff reported that Bruce Power has continued to implement and maintain programs at Bruce A and B to ensure the effective implementation of both safeguards measures and nuclear non-proliferation commitments. CNSC staff was satisfied that Bruce Power has demonstrated that these programs will be maintained in the next licence period.
300. CNSC staff stated that, during the licence period, Bruce Power modified its nuclear material accounting system to be in compliance with RD-336, *Accounting and Reporting of Nuclear Material*.⁶⁸ CNSC staff proposed that Bruce Power adopt the recently launched Nuclear Materials Accountancy Reporting (NMAR) e-business system during the next licence period.
301. Based on the above information the Commission is satisfied that Bruce Power has made and will continue to make adequate provisions in the areas of safeguards and non-proliferation at Bruce A and B that are necessary for maintaining national security and measures necessary for implementing international agreements to which Canada has agreed.

3.14 Packaging and Transport

302. Packaging and transport covers the safe packaging and transport of nuclear substances and radiation devices to and from the licensed facility. The licensee must adhere to the *Packaging and Transport of Nuclear Substances Regulations*⁶⁹ and Transport Canada's *Transportation of Dangerous Goods Regulations*⁷⁰ for all shipments leaving the facility.
303. CNSC staff reported that it conducted three packaging and transport inspections at Bruce Power over the current licence period and that no non-conformances were

⁶⁸ CNSC Regulatory Document RD-336, "Accounting and Reporting of Nuclear Material", 2010.

⁶⁹ SOR/2000-208.

⁷⁰ SOR/2001-286.

identified. CNSC staff rated this SCA as satisfactory for the licence period.

304. CNSC staff proposed a new standard licence condition pertaining to requirements for packaging and transport, as the current Bruce PROs were prepared in 2009, prior to the establishment of the SCA framework.
305. Based on the above information, the Commission is satisfied that Bruce Power is meeting regulatory requirements regarding packaging and transport.

3.15 Aboriginal Consultation and Public Information

3.15.1 Participant Funding Program

306. CNSC staff reported that up to \$75,000 in funding to participate in the licence renewal process had been made available through the CNSC's Participant Funding Program (PFP) to assist members of the public, Aboriginal groups, and other stakeholders in providing value-added information through informed and topic-specific interventions. The deadline for the applications was January 31, 2014.
307. CNSC staff further reported that, after review by the Funding Review Committee (FRC), which is independent of the CNSC, a total \$49,350 in participant funding was awarded to the following eight participants, who were required to submit a written intervention and make an oral presentation at the public hearing:
 - Métis Nation of Ontario;
 - Eugène Bourgeois;
 - Canadian Environmental Law Association;
 - Jutta Splettstoesser;
 - Dr. John Luxat;
 - Society of Professional Engineers and Associates;
 - Canadian Nuclear Society; and
 - Historic Saugeen Métis.
308. In February 2015, the CNSC received two additional PFP applications. Due to the rescheduling of the Bruce Power licence renewal hearings, the CNSC, as per the standard application review process, allowed for the applications to be reviewed by the FRC. Based on the recommendations from the FRC, the CNSC awarded a total of up to \$8,170 in participant funding to the following recipients, who were also required to submit a written intervention and make an oral intervention at the public hearing:
 - Dr. Brant Ulsh; and
 - Natural Sciences and Engineering Research Council (NSERC) Lake Whitefish Research Program (McMaster University and University of Regina).
309. The Commission concludes that members of the public, Aboriginal groups and other stakeholders have been encouraged to participate in the licensing process. Furthermore, assistance has been offered for the participation in the Commission's public process for

Bruce Power licence renewal application through the CNSC's PFP.

3.15.2 *Aboriginal Engagement*

310. CNSC staff stated that, as an agent of the Government of Canada and as Canada's nuclear regulator, the CNSC recognizes and understands the importance of consulting and building relationships with Canada's Aboriginal peoples. The CNSC ensures that all of its licensing decisions under the NSCA uphold the honour of the Crown and consider Aboriginal peoples' potential or established Aboriginal or treaty rights pursuant to section 35 of the *Constitution Act*.⁷¹ CNSC staff noted that, in cooperation with the DFO and the province of Ontario, the CNSC is participating in a whole-of-government approach to uphold the honour of the Crown.
311. CNSC staff reported that it conducted research to determine the Aboriginal groups that may have an interest in the licence renewal request. Based on this research, a distribution list of First Nation and Métis groups who may have an interest in the licence renewal request was created and included:
- the Saugeen Ojibway Nation (SON), which consists of two distinct communities – Saugeen First Nation and the Chippewas of Nawash Unceded First Nation;
 - the Métis Nation of Ontario (MNO); and
 - the Historic Saugeen Métis (HSM).
312. CNSC staff confirmed that these First Nations and Métis groups had previously expressed an interest in being kept informed of CNSC activities occurring at the Bruce Power site and CNSC staff has ensured this engagement through the mailing of information and in-person meetings. CNSC staff also provided details regarding potential or established Aboriginal and/or Treaty rights at the Bruce Power site.
313. CNSC staff reported that it has continued to work together and cooperate with the First Nations and Métis peoples in the Bruce Peninsula region, with respect to nuclear projects, to ensure the health and safety of workers and the public and the protection of the environment. CNSC staff also reported that Bruce Power, through its Public Information and Disclosure Program, recognizes the importance of actively providing updates and briefings to First Nations and Métis leaders and communities.
314. CNSC staff was of the view that First Nations and Métis groups who may have an interest in the Bruce Power licence renewal were identified early in the review process, were provided with information about the project, were encouraged to participate in the public hearing, and were offered the opportunity to apply for funding through the CNSC's PFP. CNSC staff noted that Bruce Power had initiated early engagement activities with all interested groups, including First Nations and Métis peoples, in the Bruce Peninsula region. CNSC staff noted that the proposed activities under the licence application were on an existing site and that, based on the information received and

⁷¹ *The Constitution Act, 1982*, Schedule B to the Canada Act 1982 (U.K.), 1982, c. 11.

reviewed to date, CNSC staff was of the opinion that the licence renewal application would not cause adverse impacts to any potential or established Aboriginal and/or treaty rights.

315. The Commission asked CNSC staff for more information about its Aboriginal consultation process. CNSC staff explained that it undertook consultation activities early in the review process, including sending letters about the licence renewal and the PFP to interested First Nations and Métis groups; and that it had followed up via telephone to confirm receipt of the information, ask about any issues or concerns regarding the licence renewal application, and to encourage participation in the hearings.
316. CNSC staff stated that, in May 2014, it met with HSM representatives and that no specific concerns with respect to the proposed Bruce Power licence renewal application were raised. CNSC staff also discussed the October 2014 meeting that it conducted with the SON and noted that, while it offered to meet in-person with the MNO, this offer was not accepted at that time. Additionally, in January 2015, CNSC staff sent CNSC's and Bruce Power's CMDs to the SON, the MNO and the HSM, and made confirmation telephone calls to ensure receipt of the documentation.
317. Intervenors, including the SON and the MNO, expressed the view that First Nations and Métis communities should not merely be consulted but should be part of the decision-making processes regarding operations at the Bruce NGS. It was noted by those intervenors that Aboriginal groups are not just interested parties, but that they have rights to the land and that Bruce Power, the CNSC and governments have an obligation to engage them fully and must enable them to have a voice in decisions affecting them and their land. A Bruce Power representative indicated that, through agreements reached with each First Nations and Métis community, there is a partnership that involves consultation in addition to communication and providing information.
318. Bruce Power reported that, given its site location, it engages with the SON, the HSM and the MNO on a regular basis, has protocol agreements in place with all three groups and considers this an important component of its operations. Bruce Power also noted that, in 2014, it was audited by the Canadian Council for Aboriginal Business Progressive Aboriginal Relations (PAR) program and was awarded a national gold designation for its efforts to build a progressive Aboriginal relations program.
319. In its intervention, the Canadian Council for Aboriginal Business noted that Aboriginal people from across Canada make up 2.3% of Bruce Power's workforce and that Bruce Power has a very strong Aboriginal procurement process and a proactive approach to Aboriginal relations. The Commission enquired about Bruce Power's membership and participation in the PAR program. The Bruce Power representative responded that, in the spirit of continuous improvement, the PAR program allows Bruce Power to benchmark its Aboriginal relations program against some of the best in the country. The Commission enquired about the procurement of Aboriginal service-providers at

Bruce Power. The Bruce Power representative responded that working with the Canadian Council for Aboriginal Business has allowed Bruce Power to identify and reach out to more Aboriginal suppliers.

320. In its intervention, the SON noted that a central matter of concern to the SON over the past decades has been understanding and mitigating any impacts that the Bruce NGS may have on Lake Huron, its ecology and consequently, the impacts to the SON's Aboriginal and Treaty Rights, including its established right to a commercial and sustenance fishery in the waters of Lake Huron and Georgian Bay. The Commission enquired about the engagement that Bruce Power conducts with the SON. The SON representative responded that they have a formal engagement protocol with Bruce Power, but noted that they did not feel as though Bruce Power involved them sufficiently in emergency management processes and procedures. The Bruce Power representative responded that Bruce Power was committed to its engagement activities with the SON, and stated that Bruce Power would address the SON's concerns.
321. The Commission enquired about whether the SON was satisfied with the employment opportunities being provided to them by Bruce Power. The SON representative responded that employment by Bruce Power within their community was progressing and that they had confidence that Bruce Power was committed to this matter.
322. The Commission requested more details about the Protocol Agreement between the MNO and Bruce Power. A Bruce Power representative responded that a single point of contact at Bruce Power for the MNO was identified in the Protocol Agreement and that it is a well-established forum for communication. The Bruce Power representative noted that early engagement of the MNO through quarterly meetings is important to Bruce Power, and that many of the requests that the MNO put forward in its intervention had been discussed, and were being addressed and advanced through the quarterly meetings as detailed in the Protocol Agreement. The Bruce Power representative confirmed Bruce Power's commitment to meaningful engagement and consultation with the MNO and other Aboriginal groups. An MNO representative commented that the information provided by Bruce Power was not adequate or timely.
323. The Commission requested additional information about the requests put forth by the MNO in its intervention. CNSC staff responded that it had reviewed the 15 requests and that, at this time, additional licence conditions were not required to manage them. CNSC staff noted that mechanisms were in place to ensure that the MNO receives publicly available information it requests and that CNSC staff would arrange a meeting to discuss the 15 requests outlined in the MNO's intervention. A Bruce Power representative responded that many of the requests were in the process of being addressed.
324. The Commission asked the MNO about the challenges that it faced with respect to employment at Bruce Power. The MNO representative responded that more advance notice of upcoming opportunities was needed so that the MNO can provide adequate training to interested members of its communities. The MNO representative noted that

additional resources for this training would be required, as well.

325. In its intervention, the HSM noted that it had a good working relationship with Bruce Power through an amended and restated Participation Agreement and that they had established a working group to achieve the objectives and commitments of the agreement. The Commission enquired about the engagement that the HSM has with the CNSC. The HSM representative responded that there has been considerable engagement between the HSM and the CNSC and stated that CNSC staff has been available to answer their requests.
326. The Commission asked about the Participation Agreement that Bruce Power has with the HSM. The Bruce Power representative responded that there is an active dialogue between Bruce Power and the HSM and that the HSM utilizes the capacity provided to them by Bruce Power to maintain this dialogue. The HSM also meets with Bruce Power annually, allowing the communities to plan their resources more accurately.
327. The HSM noted that their community had experienced considerable economic benefit from over 50 years of safe nuclear power generation and that local members of the HSM have realized a standard of living and opportunities that were unlikely in the past. The Commission asked about how many members of the HSM community were employed at Bruce Power. The HSM representative responded that, although exact numbers were not available, many members of their community were currently employed at the Bruce Power site and that three generations had worked there.
328. Several intervenors, including the Canadian Council for Aboriginal Business and Right to Play, noted that Bruce Power supported skills-development in Aboriginal communities. The Commission enquired about the success of these initiatives. A Bruce Power representative responded that these programs were well-received by the communities and that Bruce Power was committed to their long-term success.

Consultation for the Environmental Assessment Follow-Up Monitoring Program

329. This section considers the consultation on the EA FUMP. Details regarding the EA FUMP are found in section 3.9.2.
330. Regarding the HSM intervention, the Commission enquired about whether the HSM was satisfied with the fish impingement and entrainment monitoring plan of the EA FUMP and the research on Whitefish that was being conducted. The HSM representative responded that they were content with the information being provided to them.
331. In its intervention, the SON expressed displeasure with the EA FUMP, particularly the fish impingement and entrainment monitoring plan, and the consultation done with respect to this program. The Commission enquired about CNSC staff engagement with the SON and its disposition of the SON's comments on the EA FUMP. CNSC staff

responded that, although the SON was initially involved in the planning of the EA FUMP, they voluntarily withdrew from the process in 2007. Further to that, the SON's comments on the EA FUMP were provided to Bruce Power only in August 2012, and Bruce Power dispositioned them in 2013. CNSC staff noted that, since that time, CNSC staff has regularly communicated with the SON and conducted a meeting with them in October 2014 to address their concerns about the EA FUMP. CNSC staff noted that the SON had committed to group their comments on the program into topics but CNSC staff has not yet received this proposal from the SON. The Commission enquired about why this proposal had not yet been submitted. The SON representative responded that, although they previously did not have the capacity to do this, they now had it.

332. The Commission enquired as to why, if the SON did not feel that the EA FUMP process was being adequately addressed, they did not come back to the Commission. The SON representative responded that they were not being afforded an appropriate role in shaping the EA FUMP and felt, at that time, that leaving the process was appropriate for the SON. The SON representative did note, however, that they would engage the Commission sooner should there be problems with consultation and engagement in the future.
333. The Commission enquired about a way-ahead for the fish impingement and entrainment monitoring plan component of the EA FUMP and whether a technical workshop, including all groups involved with the EA FUMP, to discuss the impacts of the facility and mitigation measures, would be a reasonable method to facilitate this consultation. The SON representative responded that the SON would participate in such a workshop; however, a facilitator may be required because they have lost confidence in their relationship with Bruce Power and CNSC staff with respect to obtaining reliable scientific information about the predicted consequences of the Bruce NGS operations. The MNO representative indicated support for this workshop. The Bruce Power representative stated that Bruce Power was committed to taking an active role in ensuring that the appropriate monitoring was being conducted in the EA FUMP and supported the idea of this workshop. CNSC staff committed to working with the three groups and providing the Commission with updates on an annual basis with respect to the progress associated with a way-ahead on the EA FUMP. The Commission recommended that such a workshop be conducted.

3.15.3 Public Information

334. A public information program is a regulatory requirement for licence applicants and licensed operators of Class I nuclear facilities. Paragraph 3(j) of the *Class I Nuclear Facilities Regulations*⁷² requires that licence applications include “the proposed program to inform persons living in the vicinity of the site of the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from the activity to be licensed.”

⁷² SOR/2000-204.

335. Bruce Power provided information on its public information and engagement programs, as well as its community support programs, and reported that its sustainability commitments and Environmental Policy have been enhanced by the partnerships that it has built and the sponsorships that it has undertaken. Bruce Power further stated that, on an annual basis, it retains Ipsos Reid to carry out independent public research surveys in the regions surrounding the site. Bruce Power stated that a March 2014 survey indicated community support for Bruce Power and provided key highlights from the survey results.
336. CNSC staff reported that Bruce Power has a well-established Public Information and Disclosure Program that meets the regulatory expectations of CNSC RD/GD 99.3, *Public Information and Disclosure*.⁷³ CNSC staff noted that Bruce Power has been submitting detailed annual reports on the implementation of its Public Disclosure and Information Program since 2012. CNSC staff further reported on the best practices that Bruce Power has employed in its Public Information and Disclosure Program, including: smartphone and tablet applications, emergency management websites, the maintenance of a modern public information centre on site, a telephone town hall in 2015 which attracted over 17,000 participants, and public bus tours on the Bruce Power site.
337. Many intervenors, including municipalities and individuals, expressed the view that there is community support for Bruce Power, and that Bruce Power is a good corporate citizen that supports environmental, educational and health initiatives in the region while encouraging feedback from the community. Several intervenors, including the Canadian Nuclear Workers Council and individuals, stated that Bruce Power has a very strong public communications and information program, leading to a high level of support from the public.
338. With respect to the Ipsos Reid surveys conducted by Bruce Power, the Commission enquired about whether the part-time residents of the community, such as cottagers, were captured in the results. The Bruce Power representative responded that it conducts surveys annually, but at different times of the year, to ensure that responses from all residents are captured. Bruce Power also conducts qualitative focus groups with local residents to obtain information that cannot be easily captured in a quantitative survey. The Commission further asked what areas of improvement had been identified by the surveys. The Bruce Power representative responded that, while the surveys indicate that communities have a high level of confidence in Bruce Power's safety and environmental protection programs, communication and finding the right method to communicate with communities are areas that the company is continuously striving to improve.
339. An intervention from an individual reported the results from a public opinion poll, conducted by Oraclepoll Research in Bruce County during July 2014, on nuclear emergency preparedness. This poll indicated different results in terms of public

⁷³ CNSC Regulatory Document RD/GD 99.3, "Public Information and Disclosure", 2012.

information and emergency preparedness than the Ipsos Reid survey conducted by Bruce Power. The Commission requested more information on this discrepancy. The Bruce Power representative responded that a public opinion poll is a snapshot in time, which is why Bruce Power looks at public opinion over a multi-year period. The Bruce Power representative also noted that answers are dependent on the region surveyed. Additionally, the poll presented in this intervention included questions on emergency management issues, such as KI distribution, for which initiatives had not yet been started when the poll was conducted.

340. The Commission enquired about the means by which Bruce Power communicates with surrounding municipalities. A representative from the Municipality of Kincardine responded that it had recently established a Memorandum of Understanding with Bruce Power with respect to the exchange of information and noted that the Municipality holds regular meetings with Bruce Power regarding emergency preparedness and other information relevant to the community. The Commission further enquired on how this information is disseminated to the community. The representative from the Municipality of Kincardine stated that the Council meetings are open to the public, as well as broadcast on local television, and that information is also disseminated through means of communication such as newsletters and social media.
341. The Commission asked about onsite initiatives that Bruce Power conducts to engage members of the public. A Bruce Power representative described the site-wide bus tours and the school programs in which Bruce Power participates. The Saugeen Chamber of Commerce noted in its intervention that the Bruce Power Visitors Centre had become a well-attended tourist attraction.
342. During its intervention, CELA expressed displeasure in being denied involvement during consultation for a CSA Group Standard. The Commission requested more information about this matter. CNSC staff described the CSA document consultation process that it facilitates. The Commission requested that stakeholders notify the CNSC should they encounter difficulties during consultations for CSA Group Standards.
343. Several intervenors, including individuals and Aboriginal groups, indicated that the timelines set by the CNSC for public review of documentation related to the hearing were not sufficient. Several intervenors, including CELA and Greenpeace Canada, also indicated that public availability of documentation for the hearing was not adequate. CNSC staff responded that, after Hearing Part 1, it ensured that every document referenced in the CNSC CMDs was publicly available, except very few security- or commercially-sensitive. The Commission noted that it would take the intervenors' concerns under consideration for future proceedings.
344. In response to an intervention from Northwatch, the Commission enquired about whether the 7-month licence extension granted to Bruce Power⁷⁴ resulted in a more

⁷⁴ CNSC Record of Proceedings, Including Reasons for Decision – Bruce Power Inc., “Application to Amend the Bruce Nuclear Generating Stations A and B Power Reactor Operating Licences”, April 24, 2015, e-Doc 4423908.

thorough application, as well as in increased public engagement and transparency. CNSC staff stated that because Bruce Power was able to complete their application with all relevant information by Part 1 of this hearing, a more fulsome application and set of documents were available for intervenors, leading to a greater level of public engagement and transparency.

3.15.4 Conclusion on Aboriginal Engagement and Public Information

345. Based on this information, the Commission is satisfied that Bruce Power's public information program meets regulatory requirements and is effective in keeping Aboriginal communities and the public informed of facility plans and operations. The Commission is satisfied that Bruce Power has adequately consulted with the public, Aboriginal groups and other stakeholders, and encourages it to continue to create, maintain and improve its dialogue with the neighbouring communities.
346. The Commission acknowledges the efforts made in relation to the CNSC's obligations regarding Aboriginal consultation and the Legal Duty to Consult. The Commission is satisfied that the proposed licence renewal will not cause any adverse impacts to any potential or established Aboriginal or treaty rights and that the consultation activities undertaken for this licence renewal were adequate, given that no changes to the licensed activities have been requested.⁷⁵
347. The Commission reaffirms its commitment to upholding the honour of the Crown and the CNSC's common law duty to consult with Aboriginal groups, and notes that interested Aboriginal groups can submit interventions for consideration by the Commission at public proceedings. The Commission also directs CNSC staff to engage with Aboriginal groups on the Aboriginal engagement processes in relation to Bruce Power operations, and to ensure that appropriate Aboriginal engagement is being conducted by Bruce Power. The Commission encourages interested Aboriginal groups to continue to collaborate with CNSC staff and Bruce Power, as appropriate, but notes that, should Aboriginal groups be dissatisfied with the level of engagement between themselves and Bruce Power, CNSC staff is committed to working with them to determine an acceptable resolution, where issues relate to matters under the regulatory purview of the CNSC.

3.16 Decommissioning Plans and Financial Guarantee

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

⁷⁵ Rio Tinto Alcan v. Carrier Sekani Tribal Council, 2010 SCC 43, [2010] 2 S.C.R. 650 at paras 45 and 49.

349. CNSC staff reported that licensees are required to maintain an acceptable Decommissioning Plan (DP) that sets out the manner by which a nuclear facility will be decommissioned in the future, and that meets requirements of CSA N294-09⁷⁶ and the guidance set out in Regulatory Guide G-219, *Decommissioning Planning for Licensed Activities*.⁷⁷
350. CNSC staff reported that, under the lease agreement between OPG and Bruce Power, OPG has to maintain a consolidated financial guarantee for decommissioning its Ontario assets, including Bruce A and B. CNSC staff noted that the DP for Bruce A and B, prepared by OPG, was last revised and presented to the Commission in 2012. Based on OPG's evaluation, the present value of the financial guarantee stands at \$14,221 million and was accepted by the Commission in 2012.⁷⁸ CNSC staff confirmed that it remains in effect and meets the guidance set out in CNSC Regulatory Guide G-206, *Financial Guarantees for the Decommissioning of Licensed Activities*.⁷⁹ CNSC staff noted that the DP is updated by OPG on a five-year cycle. As such, OPG is required to review and revise the decommissioning plan, associated cost estimates and proposed financial guarantee by June 30, 2017 for the next five-year cycle.
351. Based on this information, the Commission considers that the preliminary decommissioning plans and related financial guarantee are acceptable for the purpose of the current application for licence renewal.

3.17 Nuclear Liability Insurance and Cost Recovery

352. The *Nuclear Liability Act*⁸⁰ (NLA) requires Bruce Power to carry nuclear liability insurance of \$75 million for each of the Bruce A and B facilities. CNSC staff confirmed that Bruce Power is insured by the Nuclear Insurance Association of Canada for \$50 million per station and by the European Liability Insurance for the Nuclear Industry for \$25 million per station and that Bruce Power is compliant with the requirements of the NLA.
353. CNSC staff reported that Bruce Power is in good standing with respect to the *Canadian Nuclear Safety Commission Cost Recovery Fees Regulations*⁸¹ requirements and there is no concern with respect to payment of future cost recovery fees.
354. Based on this information, the Commission is satisfied that Bruce Power meets regulatory requirements for nuclear liability insurance and cost recovery.

⁷⁶ N294-09: Decommissioning of facilities containing nuclear substances, CSA Group, 2014.

⁷⁷ CNSC Regulatory Guide G-219, "Decommissioning Planning for Licensed Activities", 2000.

⁷⁸ CNSC Record of Proceedings, Including Reasons for Decision – Ontario Power Generation Inc., "Financial Guarantee and Licence Amendments for OPG's Class I Nuclear Facility Licences", October 24, 2012, e-Doc 4056177.

⁷⁹ CNSC Regulatory Guide G-206, "Financial Guarantees for the Decommissioning of Licensed Activities", 2000.

⁸⁰ R.S.C., 1985, c. N-28.

⁸¹ SOR/2003-212.

3.18 Licence Length and Conditions

355. Bruce Power requested the renewal of the current operating licences for a period of five years. CNSC staff recommended that the Bruce A and B licences be renewed as a single licence, with a single associated LCH, for a period of five years. CNSC staff explained that, under the single licence, Bruce A and B would have shared programs, but reporting and safety performance assessment would continue to be done separately. CNSC staff recommended that annual reports for Bruce A and B be provided for consideration by the Commission at public meetings to be held annually, and that the stations be reported on separately. In addition, in order to provide adequate regulatory oversight of changes that are administrative in nature or are less significant and do not require a licence amendment nor Commission approval, CNSC staff recommended that the Commission delegate authority for certain licence conditions that contain the phrase “a person authorized by the Commission” to the following CNSC staff:
- Director, Bruce Regulatory Program Division;
 - Director General, Directorate of Power Reactor Regulation; and
 - Executive Vice-President and Chief Regulatory Operations Officer.
356. Several intervenors expressed concerns regarding the proposed five-year PROL for both Bruce A and B, suggesting that it was unprecedented. The Commission enquired about the validity of these concerns and why a single licence and LCH were considered to be appropriate. CNSC staff responded that the CNSC has been issuing five-year PROLs for 10 years and that the last two PROLs issued to Bruce Power were also for five-year licence periods. CNSC staff added that Bruce A and B are both regulated by a single set of regulatory requirements and share common programs, which would be managed more effectively and consistently under a single licence. CNSC staff stated there will be an increase in regulatory effectiveness with no change to regulatory oversight at the facility and emphasized that safety will not be compromised; performance for the two stations would still be reported on separately and the operating limits of the stations would not be combined. The Bruce Power representative added that, administratively, combining the licences and LCHs would enable more effective management of the programs at Bruce A and B.
357. Several intervenors opposed the Bruce Power PROL renewal and/or the length of its renewal. Some intervenors were of the view that there was a significant risk associated with the operation of nuclear power plants, including financial cost, the possibility of severe accidents and radiation risks. Some intervenors suggested that the power could be generated by other means. Other intervenors recommended that a shorter licence be issued to Bruce Power to ensure adequate regulatory control, safety case review and transparency of the licensing process.
358. Other intervenors expressed support for the Bruce Power licence renewal. They were of the view that Bruce Power has safely operated Bruce A and B and would continue to do so over the life of the facility. Intervenors were also of the view that Bruce Power was an important part of the energy supply and economy of Ontario.

359. Based on the above information received during the course of this hearing, the Commission is satisfied that a five-year single PROL for Bruce A and B, with a single LCH, is appropriate. The Commission accepts the licence conditions as recommended by CNSC staff. The Commission also accepts CNSC staff's recommendation regarding the delegation of authority, and notes that CNSC staff can bring any matter to the Commission as applicable.

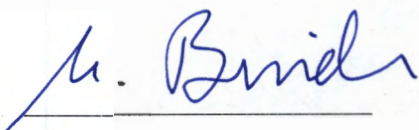
4.0 CONCLUSION

360. The Commission has considered the information and submissions of CNSC staff, the applicant 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.
361. The Commission is satisfied that, given the mitigation measures and safety programs that are in place to control hazards, Bruce Power provides adequate protection to the environment. The Commission notes that the NSCA provides a strong regulatory framework for environmental protection. Whether an environmental assessment is required or not under *Canadian Environmental Assessment Act, 2012*, the CNSC regulatory system ensures that adequate measures are in place to protect the environment and human health in accordance with the NSCA and its Regulations.
362. The Commission is satisfied that the applicant meets the requirements of subsection 24(4) of the *Nuclear Safety and Control Act*. That is, the Commission is of the opinion that the applicant is qualified to carry on the activity that the proposed licence will authorize and that the applicant 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.
363. Therefore, the Commission, pursuant to section 24 of the *Nuclear Safety and Control Act*, renews Bruce Power Inc.'s Power Reactor Operating Licences, as a single licence, for both its Bruce Nuclear Generating Stations A and B located in the Municipality of Kincardine, Ontario. The renewed licence PROL-18.00/2020 will be valid from June 1, 2015 until May 31, 2020.
364. The Commission includes in the licence the conditions as recommended by CNSC staff in CMD 15-H2, 15-H2.B and H2.D.
365. The Commission accepts CNSC staff's recommendation regarding delegation of authority for licence conditions 15.2 (refurbishment) and 15.3 (end of commercial operation). The Commission also accepts CNSC staff's recommendation regarding the delegation of authority in the single LCH. The Commission notes that CNSC staff can bring any matter to the Commission as applicable. The Commission directs CNSC staff to inform the Commission on an annual basis of any changes made to the LCH.

366. With this decision, the Commission directs CNSC staff to provide annual reports on the performance of the Bruce NGS, as part of the CNSC staff *Annual Regulatory Oversight Report for Canadian Nuclear Power Plants*. CNSC staff shall present these reports at public proceedings of the Commission, with opportunity for written interventions.
367. The Commission notes that, while a single five-year consolidated licence is issued to Bruce Power for Bruce A and B, Bruce Power's operations will be continuously monitored by the CNSC throughout the five-year licence period. Furthermore, the Commission emphasizes that this licence can be suspended, amended, revoked or replaced at any time, should the need arise.
368. Refurbishment was not considered in the context of this hearing. The Commission wishes to be clear that, in the event of an application for refurbishment at the Bruce NGS, this application will be considered at a public proceeding with public participation. Additionally, the Commission notes that the licensee would be governed by Section 15.2 of the proposed PROL on this matter, and that the refurbishment process would include an integrated safety review, the implementation and maintenance of a return-to-service plan, and periodic updates on the progress of the project and any proposed changes.
369. The Commission reaffirms its commitment to upholding the honour of the Crown and the CNSC's common law duty to consult with Aboriginal groups, and notes that interested Aboriginal groups can submit interventions for consideration by the Commission at public proceedings. The Commission also directs CNSC staff to consult with Aboriginal groups on the Aboriginal engagement processes in relation to Bruce Power operations, and to ensure that appropriate Aboriginal engagement is being conducted by Bruce Power. The Commission encourages interested Aboriginal groups to continue to collaborate with CNSC staff and Bruce Power, as appropriate, but notes that, should Aboriginal groups be dissatisfied with the level of engagement between themselves and Bruce Power, CNSC staff is committed to working with them to determine an acceptable resolution, where issues relate to matters under the regulatory purview of the CNSC.
370. The Commission is satisfied that, with continued monitoring and regulatory oversight, the pressure tubes can be operated up to a maximum of 247,000 EFPH. The Commission authorizes the operation of Bruce NGS A and B Units 1-8 up to a maximum of 247,000 EFPH.
371. The Commission directs CNSC staff to provide it with annual updates on the Bruce A Unit 1 and 2 fuel defects, Bruce B endplate cracking and the analysis of the primary heat transport system pressure relief valve sizing.

372. The Commission recommends that CNSC staff and Bruce Power form a working group with interested Aboriginal groups to determine a way-ahead, acceptable to all parties, for the fish impingement and entrainment monitoring plan component of the EA FUMP, arising from the May 19, 2006 Environmental Assessment Screening Report for refurbishment at Bruce A approval. The Commission directs CNSC staff to provide it with annual updates on the EA FUMP via the CNSC staff *Annual Regulatory Oversight Report for Canadian Nuclear Power Plants*.
373. The Commission directs CNSC staff to provide it with annual updates on the process of the DFO authorization for Bruce Power under Section 35 of the *Fisheries Act*. The Commission notes that the DFO authorization process is independent from the CNSC licensing process and that it is not an impediment to CNSC licensing.
374. The Commission recognizes that Bruce Power is compliant with the PSA large release frequency safety goal limit of 1.0E-5 occurrence/year, as stated in CNSC Regulatory Standard S-294, *Probabilistic Safety Assessment (PSA) for Nuclear Power Plants*. However, the Commission noted that having a policy with respect to achieving its large release frequency safety goal targets of 1.0E-6/yr is a good practice and strongly recommends that Bruce Power develops such a policy and formally documents that enhancements to Bruce A and B will be considered by Bruce Power if the PSA result is between the safety goal limit and the target.
375. The Commission understands that Bruce Power will establish a forum, to include the CANDU Owner's Group (COG) where appropriate, to further evaluate the CANDU safety issues brought forth in Dr. Sunil Nijhawan's intervention. The Commission requests updates on the progress of this initiative and any conclusions resulting from this forum.
376. The Commission is of the view that achieving industry norms for the backlog of deficient and deferred preventative maintenance should be a priority for Bruce Power in the next licence period and that progress in this regard will be monitored through annual updates via the CNSC staff *Annual Regulatory Oversight Report for Canadian Nuclear Power Plants*.
377. The Commission notes that, under the PNERP, which is the jurisdiction of the OFMEM in Ontario, local municipalities have the responsibility of ensuring that they have an appropriate emergency response plan. The Commission encourages local municipalities surrounding the Bruce Power site to ensure that they have appropriate nuclear emergency response plans and that these plans are shared with the public. Furthermore, the Commission expects that Bruce Power will consult with local municipalities to ensure that their nuclear emergency response plans are adequate.

378. The Commission appreciates the OFMEM's commitment to provide updates on nuclear emergency preparedness matters on a regular basis. The Commission directs CNSC staff to evaluate these updates, to ensure that all regulatory requirements are being met, and to report to the Commission about municipal emergency planning on an annual basis via the CNSC staff *Annual Regulatory Oversight Report for Canadian Nuclear Power Plants*. The Commission also directs CNSC staff to evaluate emergency planning beyond the Bruce Power site and to ensure that Bruce Power's emergency plans are consistent with those of the local municipalities.
379. With respect to the November and December 2009 Alpha Event at Bruce A Unit 1, which resulted in unplanned exposures to workers, the Commission accepts the findings as presented during these and previous public proceedings and considers this matter closed. The Commission is satisfied that the root cause analysis for this event was adequately evaluated by CNSC staff and reported to the Commission, and that appropriate mitigation measures have been put in place to prevent reoccurrence of this event. The Commission notes that the maximum dose from the event to a worker was 6.9 mSv, well below the limit of 50 mSv/y for nuclear energy workers. The Commission is satisfied with CNSC staff's conclusions that this event did not and will not cause adverse health effects to the workers involved.



JUL 09 2015

Michael Binder
President,
Canadian Nuclear Safety Commission

Date

Appendix A – Intervenors

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| | |
| Greenpeace Canada, represented by S. Stensil | CMD 15-H2.2 CMD 15-H2.2A CMD 15-H2.2B |
| Stewardship Grey Bruce | CMD 15-H2.3 |
| Big Brothers Big Sisters of Kincardine & District | CMD 15-H2.4 |
| Sustainability Toolkit, represented by S. Boles | CMD 15-H2.5 |
| Saugeen Conservation, represented by W. Brohman | CMD 15-H2.6 |
| Butterfly Gardens of Saugeen Shores | CMD 15-H2.7 |
| Lake Huron Fishing Club, represented by M. Hahn | CMD 15-H2.8 |
| Water Level Alliance Inc. | CMD 15-H2.9 |
| Habitat for Humanity Grey Bruce | CMD 15-H2.10 |
| Our Kids Bruce Grey Foundation | CMD 15-H2.11 |
| Grey Bruce Sustainability Network | CMD 15-H2.12 |
| The Martin Aboriginal Education Initiative | CMD 15-H2.13 |
| Sheet Metal Workers International Association – Local Union 473 | CMD 15-H2.14 |
| Labourers’ International Union of North America (LIUNA) | CMD 15-H2.15 |
| IBEW Local 804 | CMD 15-H2.16 |
| CTS North America | CMD 15-H2.17 |
| Frank Greening | CMD 15-H2.18 CMD 15-H2.18A CMD 15-H2.18B |
| Grey Bruce Health Unit | CMD 15-H2.19 |
| Green Feet Forests and Gardens | CMD 15-H2.20 |
| Municipality of Brockton | CMD 15-H2.21 |
| CANDU Owners Group | CMD 15-H2.22 |
| Canadian Association of Nuclear Host Communities | CMD 15-H2.23 |
| Georgian Bay Forever | CMD 15-H2.24 |
| Green Party of Ontario | CMD 15-H2.25 |
| Bluewater District School Board | CMD 15-H2.26 |
| David Kidd | CMD 15-H2.27 |
| Sat Khalsa | CMD 15-H2.28 |
| Janey Edwards | CMD 15-H2.29 |
| Christine Walker-Petriw | CMD 15-H2.30 |
| Millwright Regional Council of Ontario | CMD 15-H2.31 |
| Levitt-Safety Ltd. | CMD 15-H2.32 |
| Lynn Horton | CMD 15-H2.33 |
| Judith Gaglani | CMD 15-H2.34 |
| Christian Vinogradov | CMD 15-H2.35 |
| Kristen Traherne | CMD 15-H2.36 |
| Rakka Gaglani | CMD 15-H2.37 |

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| Community Living Kincardine & District | CMD 15-H2.38 |
| Philippe Gagnon | CMD 15-H2.39 |
| Alberici Constructors | CMD 15-H2.40 |
| Nordion, represented by S. McIntosh | CMD 15-H2.41 |
| North American Young Generation in Nuclear, represented by A. Lee and O. Good | CMD 15-H2.42 CMD 15-H2.42A |
| Historic Saugeen Métis, represented by P. McArthur, G. Govier and R. Lamont | CMD 15-H2.43 |
| Township of Huron-Kinloss, represented by M. Twolan | CMD 15-H2.44 |
| AMEC Foster Wheeler, represented by M. Tulett | CMD 15-H2.45 |
| Women in Nuclear Canada, represented by J. Shikaze and W. Huys | CMD 15-H2.46 |
| JGRchem.inc., represented by J. Roberts | CMD 15-H2.47 |
| Canadian Council for Aboriginal Business, represented by J.P. Gladu | CMD 15-H2.48 CMD 15-H2.48A |
| Lake Huron Centre for Coastal Conservation, represented by P. Scharfe | CMD 15-H2.49 |
| Municipality of Kincardine, represented by A. Eadie | CMD 15-H2.50 |
| Stefan Wesche | CMD 15-H2.51 |
| University Network for Excellence in Nuclear Engineering (UNENE) | CMD 15-H2.52 |
| Gail Reynolds | CMD 15-H2.53 |
| Susan Wellisch | CMD 15-H2.54 |
| Anna Mattiuzzo | CMD 15-H2.55 |
| Justine Dainard | CMD 15-H2.56 |
| Marie-Josée Yelle | CMD 15-H2.57 |
| Anthony Wilson | CMD 15-H2.58 |
| Liz Duchene | CMD 15-H2.59 |
| Ernst Braendli | CMD 15-H2.60 |
| Ipsos Reid Public Affairs, represented by M. Hrobsky | CMD 15-H2.61 |
| Town of Saugeen Shores, represented by M. Smith and L. Allison | CMD 15-H2.62 CMD 15-H2.62A |
| Provincial Building & Construction Trades Council of Ontario, represented by P. Dillon and I. Delov | CMD 15-H2.63 |
| Rev. Ruth MacLean | CMD 15-H2.64 |
| GreenField Specialty Alcohols Inc., represented by T. Dodkin | CMD 15-H2.65 |
| Glenn Sutton | CMD 15-H2.66 |
| International Union of Operations Engineers Local 793 | CMD 15-H2.67 |
| Saugeen Shores Chamber of Commerce, represented by J. Robbins | CMD 15-H2.68 |
| Canadian Nuclear Association, represented by J. Barrett | CMD 15-H2.69 |
| Rhys Naylor | CMD 15-H2.70 |
| Nancy Arcand | CMD 15-H2.71 |
| Rick Zyraruk | CMD 15-H2.72 |
| Christine Penner Polle | CMD 15-H2.73 |
| United Way of Bruce and Grey | CMD 15-H2.74 |
| Tim Seitz | CMD 15-H2.75 |
| Joan Fahey | CMD 15-H2.76 |

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| David Lewis | CMD 15-H2.77 |
| Kristine Hammel | CMD 15-H2.78 |
| Gregory Whalen | CMD 15-H2.79 |
| Carrie Watson | CMD 15-H2.80 |
| Eric Snider | CMD 15-H2.81 |
| Branda Preston | CMD 15-H2.82 |
| Temara Brown | CMD 15-H2.83 |
| Steve Cornwell | CMD 15-H2.84 |
| SauGreen For The Environment Inc. | CMD 15-H2.85 |
| Cameco Corporation | CMD 15-H2.86 |
| Right to Play | CMD 15-H2.87 |
| Peter Tabuns, MPP for Toronto-Danforth | CMD 15-H2.88 |
| Sierra Club Canada Foundation | CMD 15-H2.89 |
| Wounded Warriors Canada | CMD 15-H2.90 |
| Peter Varty | CMD 15-H2.91 |
| Ben Lobb, MP for Huron-Bruce | CMD 15-H2.92 |
| Richard Sullivan | CMD 15-H2.93 |
| GE Hitachi Nuclear Energy Canada Inc. | CMD 15-H2.94 |
| Dana Laliberte | CMD 15-H2.95 |
| Ontario Clean Air Alliance | CMD 15-H2.96 |
| Gary Wilson | CMD 15-H2.97 |
| Heather Church | CMD 15-H2.98 |
| AREVA NP Canada Ltd. | CMD 15-H2.99 |
| Bruce Peninsula Environment Group | CMD 15-H2.100 CMD 15-H2.100A |
| EnergyMobile Studios Inc. | CMD 15-H2.101 |
| Dale Dewar | CMD 15-H2.102 CMD 15-H2.102A |
| Coalition for a Nuclear Free Great Lakes | CMD 15-H2.103 |
| Carrie Lester | CMD 15-H2.104 |
| Jo Hayward-Haines | CMD 15-H2.105 |
| Michel Duguay | CMD 15-H2.106 |
| Maryam Syeda | CMD 15-H2.107 |
| Kincardine & District Chamber of Commerce, represented by L. Bowers | CMD 15-H2.108 |
| Canadian Nuclear Society, represented by J. Plourde, C. Hunt and J. Roberts | CMD 15-H2.109 CMD 15-H2.109A |
| Anna Tilman and Eugene Bourgeois | CMD 15-H2.110 CMD 15-H2.110A |
| Canadian Nuclear Workers Council, represented by D. Shier, K. MacKay, H. Phorson | CMD 15-H2.111 CMD 15-H2.111A |
| Babcock & Wilcox Canada Ltd., represented by J. MacQuarrie, | CMD 15-H2.112 |
| The Society of Energy Professionals, represented by S. Travers and M. Gade | CMD 15-H2.113 |

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| Chris Robinson | CMD 15-H2.114 |
| EMC Power Canada, represented by C. Sauter and A. Cassidy | CMD 15-H2.115 |
| NSERC Lake Whitefish Research Program, represented by J. Wilson, R. Manzon, R. Eberts and C. Thome | CMD 15-H2.116 CMD 15-H2.116A |
| Métis Nation of Ontario, represented by P. Richardson, A. Alibhai, C. Metallic and T. Sugarman | CMD 15-H2.117 |
| Saugeen Ojibway Nation, represented by A. Monem, R. Kahgee, Chief V. Roote and S. Crawford | CMD 15-H2.118 |
| Kinectrics Inc., represented by D. Harris | CMD 15-H2.119 |
| Brant A. Ulsh | CMD 15-H2.120 |
| Power Workers' Union, represented by B. Walker, D. Trumble and L. Alderdice | CMD 15-H2.121 CMD 15-H2.121A |
| Canadian Environmental Law Association, represented by T. McClenaghan and J. Dixon | CMD 15-H2.122 CMD 15-H2.122A CMD 15-H2.122B |
| Society of Professional Engineers and Associates, represented by M. Ivanco and P. White | CMD 15-H2.123 CMD 15-H2.123A |
| Canadian Association of Physicians for the Environment, represented by G. Forman | CMD 15-H2.124 |
| Jutta Splettstoesser and P. Seccaspina | CMD 15-H2.125 CMD 15-H2.125A CMD 15-H2.125B CMD 15-H2.125C |
| New Clear Free Solutions, represented by C. Rouse | CMD 15-H2.126 |
| Provincial Council of Women of Ontario, represented by G. Janes | CMD 15-H2.127 |
| Janet McNeill | CMD 15-H2.128 |
| Monica Whalley | CMD 15-H2.129 |
| Chaitanya Kalevar | CMD 15-H2.130 |
| Beyond Nuclear, represented by K. Kamps | CMD 15-H2.131 CMD 15-H2.131A |
| Canadian Coalition for Nuclear Responsibility, represented by G. Edwards | CMD 15-H2.132 |
| John C. Luxat | CMD 15-H2.133 CMD 15-H2.133A |
| Northwatch | CMD 15-H2.134 |
| Bruce Power Pensioners Association, represented by D. Mullaly | CMD 15-H2.135 CMD 15-H2.135A |
| Canadian Manufacturers & Exporters, represented by P. Clipsham | CMD 15-H2.136 |
| Southwest Economic Alliance, represented by J.C. Grace | CMD 15-H2.137 |
| Kinetic Knights Robotics, Team 781, represented by J. Courtney, D. Watterworth and A. Pagnan | CMD 15-H2.138 |
| Bruce County Federation of Agriculture, represented by P. Jilesen | CMD 15-H2.139 |
| Asthma Society of Canada, represented by R. Oliphant | CMD 15-H2.140 |
| ASI Group Ltd., represented by C. Sferrazza | CMD 15-H2.141 |
| SNC-Lavalin, represented by R. Whalen | CMD 15-H2.142 |

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| ATS Automation, represented by N. Bains | CMD 15-H2.143 CMD 15-H2.143A |
| South Bruce Grey Health Centre | CMD 15-H2.144 |
| Sunil Nijhawan | CMD 15-H2.145 CMD 15-H2.145A CMD 15-H2.145B |