Canadian Nuclear Safety Commission

Commission canadienne de sûreté nucléaire

Record of Decision

In the Matter of

Applicant	Bruce Power Inc.
Subject	Application to Renew the Power Reactor Operating Licence for Bruce A and Bruce B Nuclear Generating Stations
Public Hearing Dates	March 14, 2018 May 28 – 31, 2018

Canada

RECORD OF DECISION

Applicant:	Bruce Power Inc.
Address/Location:	P.O. Box 1540, Building B10, 177 Tie Road, Municipality of Kincardine, Tiverton, Ontario, N0G 2T0
Purpose:	Application to Renew the Power Reactor Operating Licence for Bruce A and Bruce B Nuclear Generating Stations
Application received:	June 30, 2017
Dates of public hearing:	March 14, 2018 (Part 1) May 28 – 31, 2018 (Part 2)
Location:	Part 1: Canadian Nuclear Safety Commission (CNSC) Public Hearing Room, 280 Slater St., 14th Floor, Ottawa, Ontario Part 2: TownePlace Suites Marriott, Highland Conference Room, 19 Millenium Way, Kincardine, Ontario
Members present:	M. Binder, Chair T. Berube S. Demeter K. Penney R. Velshi
Secretary:	M.A. Leblanc
Recording Secretaries:	C. Moreau and S. Smith
Senior General Counsel:	L. Thiele

Applicant Represented By	Document Number
M. Rencheck, President and Chief Executive Officer	CMD 18-H4.1
J. Soini, Executive Vice President Finance and Commercial Services	CMD 18-H4.1A
L. Clewett, Executive Vice President, Operations and Chief Nuclear Officer	CMD 18-H4.1B
F. Saunders, Vice President, Nuclear Oversight and Regulatory Affairs	CMD 18-H4.1C
J. Scongack, Vice-President, Corporate Affairs and Environment	CMD 18-H4.1D
G. Newman, Chief Engineer and Senior Vice President, Engineering	
M. Burton, Senior Director, Regulatory Affairs	
D. Boreham, Manager, Integration Department	
J. Peevers, Manager, Communications and Media Relations	
P. Boucher, Deputy Chief Nuclear Officer	
C.L. Fietsch, Environmental Scientist	
E. Johnston, Community and Indigenous Relations Group	
F. Chua, Manager, Environment and Indigenous Relations	
D. Lacroix, Section Manager and Environment	

CNSC staff	Document Number
R. Jammal, Executive Vice-President and Chief Regulatory Operations Officer P. Elder, Vice-President and Chief Science Officer G. Frappier, Director General, Directorate of Power Reactor Regulation L. Sigouin, Regulatory Program Director, Bruce Regulatory Program Division K. Lun, Senior Regulatory Program Officer, Bruce Regulatory Program Division K. Glenn, Director, Wastes and Decommissioning Division W. Grant, Technical Specialist, Physics and Fuel Division C. Cole, Director, Emergency Management Programs Division G. McDougall, Technical Specialist, Operational Engineering Assessment Division M. Rinker, Director General, Directorate of Environmental and Radiation Protection and Assessment K. Heppell-Masys, Director General, Directorate of Security and Safeguards J. Stevenson, Senior Power Reactor Site Inspector, Bruce Site Office C. Purvis, Director, Radiation Protection Division C. Ducros, Director, Nuclear Processing Facilities Division R. Tennant, Director, Nuclear Security Division Y. Akl, Director, Probabilistic Safety Assessment & Reliability Division A. McAllister, Director, Environmental Risk Assessment Division B. Dowsley, Environmental Risk Assessment Specialist, Environmental Risk Assessment Division J. Jin, Director, Operational Engineering Assessment Division S. Yalaoui, Technical Specialist, Probabilistic Safety Assessment & Reliability Division R. Lane, Radiation and Health Sciences Specialist, Health Sciences and Environmental Compliance Division C. Cattrysse, Director, Policy, Aboriginal and International Relations Division D. Papaz, Management System Specialist, Management Systems Division N. Mesmous, Director, Reactor Behaviour Division V. Tavasoli, Director, Physics and Fuel Division A. Bouchard, Director, Operations Inspection Division K. Sauvé, Director, Health Sciences and Environmental Compliance Division L.B. Zablotska, University of California (consultant)	CMD 18-H4 CMD 18-H4.A CMD 18-H4.B CMD 18-H4.C
Intervenors	
See appendix A	

Government Representatives	
A. Doherty, Senior Biologist, Fisheries Protection Program, Department of Fisheries and Oceans J. Thomas, Manager, Regulatory Review, Department of Fisheries and Oceans	
N. Ali, Manager, Compliance Promotion & Expert Support, Environment and Climate Change Canada D. Kim, Senior Nuclear Coordinator – Energy, Environment and Climate Change Canada	
D. Nodwell , Deputy Chief, Planning and Program Development, Office of the Fire Marshal and Emergency Management	
B. Ahier, Director, Radiation Protection Bureau, Health Canada	
R. Chappell, District Manager, Owen Sound District Office, Ontario Ministry of Environment and Climate Change	
D. Gonder, Resource Management Supervisor, Upper Great Lakes Management Unit, Ontario Ministry of Natural Resources and Forestry	

Licence: Renewed

Operation of Bruce Nuclear Generating Stations A and B up to a maximum of 300,000 Equivalent Full Power Hours: Authorized

Bruce Power Inc. licensed activities in CNSC licences 13152-3-20.2, 13152-1-20.4 and 13152-2-21.1: Consolidated into PROL 18.00/2028

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1.0 INTRODUCTION

1. Bruce Power Inc. (Bruce Power) applied to the Canadian Nuclear Safety Commission[1] (CNSC) for the renewal of the Power Reactor Operating Licence (PROL) for the Bruce Nuclear Generating Stations (NGS) A and B, located in the Municipality of Kincardine, Ontario. The current operating licence, PROL-18.00/2020, expires on May 31, 2020. Bruce Power requested a licence renewal for a period of 10 years.

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 NGS A and B are owned by Ontario Power Generation Inc. (OPG) and are located on the Bruce Nuclear Power Development site. They have been operated by Bruce Power under a lease agreement since 2001.

3. With its licence renewal application, Bruce Power sought authorization to carry out activities related to the refurbishment of Bruce NGS Units 3-8 through its planned Major Component Replacement (MCR) project which is scheduled to begin before 2020. Bruce Power also applied to the Commission for approval to operate the Bruce NGS A and B up to 300,000 Equivalent Full Power Hours (EFPH), as this would ensure that all reactors would be able to operate through the requested licence period.

4. Additionally, Bruce Power applied to the Commission to consolidate into the proposed renewed PROL three specific licences currently issued by CNSC Designated Officers that support the operations of the Bruce NGS including:

    - 13152-3-20.2 – Industrial Radiography
    - 13152-1-20.4 – Consolidated Use of Nuclear Substances
    - 13152-2-21.1 – Operation of a calibration irradiator facility

5. In September 2017, up to $100,000 in funding to participate in this licensing process was made available to Indigenous 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 $76,500 in participant funding be provided to eight applicants. These applicants were required, by virtue of being awarded funding, to submit a written intervention and make an oral presentation at Part 2 of the public hearing on Bruce Power's application. In addition to the PFP offering to consider Bruce Power's licence renewal application, project-specific funding related to the MCR, the Bruce NGS *Fisheries Act*[2] (FA) authorization and the CNSC's environmental assessment was provided to the Saugeen Ojibway Nation (SON) and the Métis Nation of Ontario (MNO).

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[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] R.S.C., 1985, c. F-14.

Issues

6. In considering the application, the Commission was required to decide:

   a) what environmental assessment review process to apply in relation to this application;

   b) whether Bruce Power is qualified to carry on the activity that the licence would authorize; and

   c) whether, in carrying on that activity, Bruce Power 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.

7. The Commission was also required to decide:

   a) whether to authorize Bruce Power to operate Bruce NGS A and B up to 300,000 EPFH.

   b) whether to consolidate in the proposed renewed PROL the licensed activities in Bruce Power's DO-issued licences 13152-3-20.2, 13152-1-20.4 and 13152-2-21.1, under the same terms and conditions as the PROL.

Public Hearing

8. Pursuant to section 22 of the *Nuclear Safety and Control Act*[3] (NSCA), the President of the Commission established a Panel of the Commission to review the application.[4] The Commission, in making its decision, considered information presented for a two-part public hearing held on March 14, 2018 in Ottawa, Ontario and between May 28 to 31, 2018 in the Municipality of Kincardine, Ontario. The public hearing was conducted in accordance with the *Canadian Nuclear Safety Commission Rules of Procedure*.[5] During the public hearing, the Commission considered written submissions and heard oral presentations from Bruce Power (CMD 18-H4.1, CMD 18-H4.1A, CMD 18-H4.1B, CMD 18-H4.1C) and CNSC staff (CMD 18-H4, CMD 18-H4A, CMD 18-H4B, CMD 18-H4C). The Commission also considered oral and written submissions from 149 intervenors (see Appendix A for a list of

[3] Statutes of Canada (S.C.) 1997, chapter (c.) 9.
[4] President Binder established the Panel of the Commission for this matter, and presided over the public hearing. President Binder's term on the Commission came to an end on August 8, 2018. Commission member Velshi, a member of this Panel, became President of the Commission on August 22, 2018. Pursuant to Subsection 23(2) of the NSCA, Dr. Binder was authorized to take part in the disposition of this matter. This decision and its reasons reflect the consensus reached by the Panel.
[5] Statutory Orders and Regulations (SOR)/2000-211.

interventions). The hearing was webcast live via the CNSC website with video archives available following the hearing.

Mandate of the Commission

9. Many intervenors provided the Commission with information about the socioeconomic impacts of the Bruce NGS. The Commission notes that, as the regulatory authority over nuclear matters in Canada, it has no socioeconomic mandate and will not base its decisions on the social or economic impact of a facility. It is the health, safety and security of the public, the protection of the environment, national security, and international obligations that guide the Commission's decisions, in accordance with the NSCA.

Requests for Adjournment

10. On November 14th, 2017, the Commission received a letter from the SON expressing concerns with the timelines for the hearing and the process planned for the review of the Bruce Power licence renewal and MCR. The SON letter requested that the Commission "adjourn the hearing dates planned for March and May 2018 to consider Bruce Power's relicensing application including the refurbishment." SON submitted that the "short timeframes announced by the Commission do not leave our First Nation with sufficient time to engage with the issues raised by the application or the materials supporting it." The Commission considered the hearing dates as set to be reasonable and fair, and to provide sufficient time for all participants, including the SON, to prepare. The request to adjourn the hearing dates of March 14, 2018 and May 30-31, 2018 was denied on December 21, 2017,[6] with detailed reasons provided.

11. On April 9, 2018, the Commission denied CELA and Greenpeace's request, dated April 3, 2018, to postpone the hearing to allow for more time to review the Bruce Nuclear Implementing Plan required pursuant to the Provincial Nuclear Emergency Response Plan (PNERP). The Commission did provide an extension to allow the filing of supplementary submissions specific to the revised and publicly available Implementing Plan.

CMD 18-H4.150, Anonymous e-mail

12. The Commission permitted the entering into the record, on an exceptional basis, of an anonymous letter as CMD 18-H4.150. As it was anonymous, it is not an intervention but is a document that was brought to the attention of the Commission.

[6] CNSC Record of Decision – Bruce Power, Request from the Saugeen Ojibway Nation for Adjournment of the Hearing on the Application to Renew the Bruce A&B Power Reactor Operating Licence (PROL), December 2017.

2.0 DECISION

13. Based on its consideration of the matter, as described in more detail in the following sections of this *Record of Decision*, the Commission concludes that Bruce Power is qualified to carry on the activity that the 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 Nuclear Power Reactor Operating Licence issued to Bruce Power Inc. for its Bruce Nuclear Generating Stations A and B located in the Municipality of Kincardine, Ontario. The renewed licence, PROL 18.00/2028, is valid from October 1, 2018 until September 30, 2028. As this renewed licence takes effect before the expiry of the existing licence, PROL 18.00/2028 replaces PROL 18.00/2020;

> the Commission authorizes Bruce Power to operate the Bruce Nuclear Generating Stations A and B Units 3 – 8 up to a maximum of 300,000 equivalent full power hours;

> the Commission consolidates into the renewed PROL 18.00/2028 the licensed activities in CNSC licences 13152-3-20.2, 13152-1-20.4 and 13152-2-21.1, and concurrently revokes these licences.

14. The Commission includes in the licence the conditions as recommended by CNSC staff in CMDs 18-H4 and CMD18-H4B. The Commission also delegates authority for the purposes of licence conditions 3.2 and 15.5, as recommended by CNSC staff.

15. The Commission considers the environmental review that was conducted by CNSC staff to be acceptable and thorough.

16. The Commission requests that all of the information about the anticipated volume of waste that will be produced during the MCR of the six units at the Bruce NGS be made available by the licensee for public review in a single document as soon as feasible.

17. The Commission directs that, at about the mid-point of the 10-year licence period and no later than 2023, Bruce Power shall present to the Commission a comprehensive mid-term update on its licensed activities, including the MCR, at the Bruce NGS. This mid-term update will take place during a public Commission proceeding in the vicinity of the community that hosts the Bruce NGS. The Commission intends, for this

proceeding, that Indigenous groups, members of the public and stakeholders will be able to intervene.

18. With this decision, the Commission directs CNSC staff to report annually on the performance of Bruce Power and the Bruce NGS as part of the annual *Regulatory Oversight Report* (ROR). CNSC staff shall present this report at a public proceeding of the Commission, where members of the public will be able to intervene. The Commission encourages Indigenous groups and members of the public to participate in the proceedings considering the annual ROR.

19. The Commission notes that CNSC staff can bring any matter to the Commission that merits its attention. The Commission directs CNSC staff to inform the Commission on an annual basis of any changes made to the Licence Conditions Handbook (LCH).

3.0 ISSUES AND COMMISSION FINDINGS

20. In making its licensing decision, the Commission considered a number of issues and submissions relating to Bruce Power's qualification to carry out the licensed activities. The Commission also considered 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.

21. Bruce Power submitted a licence renewal application for the Bruce NGS on June 30, 2017, which was supplemented with additional information on May 16, 2018. In its consideration of this matter, the Commission examined the completeness of the application and the adequacy of the information submitted by Bruce Power, as required by the NSCA, the *General Nuclear Safety and Control Regulations*[7] (GNSCR) and other applicable regulations made under the NSCA. The Commission also examined CNSC staff's assessment of Bruce Power's performance in all 14 safety and control areas (SCAs) and in relation to several other matters of regulatory interest over the current licence period.

3.1 Environmental Assessment

3.1.1 Application of the Canadian Environmental Assessment Act, 2012

22. In coming to its decision, the Commission was first required to determine whether an Environmental Assessment (EA) under the *Canadian Environmental Assessment Act, 2012*[8] (CEAA 2012), was required.

23. The application submitted by Bruce Power is for a licence renewal. The Commission notes that a licence renewal is not a designated project under CEAA 2012.

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[7] SOR/2000-202.
[8] Statutes of Canada (S.C.) 2012, chapter (c.) 19, section (s.) 52.

24. The Commission notes that the proposed refurbishment or MCR activities do not constitute a designated project under CEAA 2012.

25. The Commission considered the information submitted by Bruce Power related to the EA follow-up monitoring program (EA FUMP). Bruce Power noted that an EA under the *Canadian Environmental Assessment Act*[9] (CEAA 1992) had been completed at the Bruce Power NGS site for the refurbishment and restart of Units 1 and 2 at the Bruce A station. Bruce Power reported that this EA had concluded that the project was not likely to result in any significant adverse effects on the environment, and that this report was accepted by the CNSC in 2006. Bruce Power reported that an EA FUMP had 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.[10] Bruce Power provided details on the EA FUMP noting that, although the EA FUMP had been completed in 2016, the results supported the conclusions of the 2006 EA Screening Report, and that monitoring conducted under the FUMP would continue under ongoing environmental protection programs. CNSC staff confirmed the information as submitted by Bruce Power.

26. The Commission considered the information provided by CNSC staff and Bruce Power regarding environmental assessment requirements, and concerns from several intervenors about the lack of an EA under CEAA 2012 of the MCR. The Commission is satisfied that an EA under CEAA 2012 is not required in regard to this licence renewal and MCR activities.

3.1.2 NSCA Environmental Review

27. The Commission considered the completeness and adequacy of the environmental review that CNSC staff conducted under the NSCA for this licence renewal. CNSC staff findings included, but were not limited to:

- Bruce Power's environmental protection programs met CNSC regulatory requirements.
- Bruce Power's 2017 environmental risk assessment (ERA), which assessed the environmental (ecological and human health) risks from radiological, non-radiological and physical stressors associated with current facility operations, was carried out in accordance with CSA N288.6-12, *Environmental risk assessment at Class I nuclear facilities and uranium mines and mills*.[11]

[9] S.C. 1992, c. 37.
[10] 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.
[11] N288.6-12, *Environmental risk assessment at Class I nuclear facilities and uranium mines and mills*, CSA Group, 2012.

- Bruce Power's predictive environmental assessment (PEA), which was included in the 2017 ERA, assessed the potential environmental (ecological and human health) effects from radiological, non-radiological and physical stressors associated with continued operations and the MCR Project and was carried out in conformance with CSA N288.6-12.
- The results from CNSC's Independent Environmental Monitoring Program (IEMP) and other regional monitoring programs carried out by other government partners confirmed that the environment and health of persons around the Bruce site were protected.

28. CNSC staff reported to the Commission that its assessments had shown that the potential risk from physical stressors and radiological and non-radiological releases to the atmospheric, terrestrial, hydrogeological, aquatic and human environments were generally low to negligible. CNSC staff further reported that its review of the 2017 ERA identified areas that would benefit from further clarification or additional information. Bruce Power submitted that it would implement the changes requested by CNSC staff and summarize these efforts through Bruce Power's environmental monitoring program reports and through future revisions of the ERA. CNSC staff confirmed to the Commission that it would review the implementation of the recommendations.

29. Noting the concerns about the PEA submitted by the Saugeen Ojibway Nation (SON) in its intervention, the Commission asked for additional information about the PEA. CNSC staff stated that the PEA was conducted in accordance with CSA N288.6-12, which was aligned with domestic and international best practices, and that the baseline risk assessment in the PEA was based on several years of monitoring information. CNSC staff further explained that the methodology used in the PEA had been reviewed by CNSC staff and found to be reasonable and similar to methodology used in other refurbishments such as the Bruce A refurbishment of Units 1 and 2, the Pickering refurbishment, and the Darlington refurbishment. While CNSC staff acknowledged that some uncertainty remained in regard to predicted effects, the uncertainty was not expected to be sufficient to result in harm to the environment. The Commission notes that ongoing monitoring would be used to confirm the accuracy of the PEA or adjust mitigation measures as required.

30. Noting the concerns about the environmental review submitted by the SON in its intervention, the Commission asked for comments about the difference between an environmental review conducted under the NSCA and an EA conducted under CEAA 2012, as well as the use of bounding estimates and a perceived lack of consideration of the effects of climate change. The Commission also considered the interventions from the Canadian Environmental Law Association (CELA) on the same subject. CNSC staff explained that, while environmental reviews conducted under the NSCA did not follow exactly the same process as EAs under CEAA 2012, environmental reviews under the NSCA were for licensed activities that were not included on the designated project list regulations under CEAA 2012. CNSC staff stated that EA under CEAA 2012 and environmental review under the NSCA used a common

scientific basis of evidence, and that environmental review under the NSCA was a robust process that met the requirements for environmental protection under the NSCA. CNSC staff also offered as context that an EA under CEAA 1992 had been undertaken in 2006 for the refurbishment of Bruce A reactor units 1 and 2, and that this informed the environmental review under the NSCA that was carried out for this licensing application.

31. Further on the differences between a CEAA 2012 EA and an environmental review carried out under the NSCA, and considering the interventions from CELA and Greenpeace, the Commission enquired about whether technical and expert reviews were conducted by other federal entities in respect of the environmental review under the NSCA for the Bruce NGS. CNSC staff confirmed that NSCA environmental reviews included reviews by other federal partners such as Environment and Climate Change Canada (ECCC) and that the 2017 ERA was reviewed by the same federal departments who would have been involved in an EA under CEAA 2012. CNSC staff also explained other sources of data that were considered in the NSCA environmental review, such as regular reporting through licensee Compliance Verification Programs and the IEMP, as well as regional data from a variety of sources such as the Ontario Ministry of Environment and Climate Change's (OMECC)[12] Drinking Water Surveillance Program, the Ontario Ministry of Labour's Ontario Reactor Surveillance Program, Health Canada's (HC) Canadian Radiological Monitoring Network and HC's Fixed Point Surveillance Program. Based on the information provided, the Commission is satisfied that expert review of the environmental review under the NSCA took place.

32. During its consideration of the intervention from the SON, the Commission asked for comments from ECCC regarding the adequacy of the environmental review that CNSC staff conducted under the NSCA for this licence renewal. The ECCC representative submitted that, after reviewing the environmental review components that were within ECCC's mandate, ECCC was satisfied that the environmental review was adequate for the purposes of the renewed Bruce NGS operations. The Commission was satisfied in this regard.

33. The Commission asked for comments in regard to an intervention from Greenpeace which submitted concerns as to whether an environmental review under the NSCA allowed for sufficient consideration of off-site accident impacts. CNSC staff clarified that, while the NSCA environmental review did not include consideration of off-site accident impacts, these impacts were considered under the Safety Analysis SCA, and that to consider it in the environmental review Report would be duplicative.

34. The Commission is satisfied that the environmental review that was conducted by CNSC staff for the Bruce NGS licence renewal was acceptable and thorough. The Commission notes that the NSCA provides a strong regulatory framework for environmental protection and the health and safety of persons.

[12] Following the 2018 Ontario election, the Ministry's name was changed from the Ministry of the Environment and Climate Change to the Ministry of the Environment, Conservation and Parks on June 29, 2018.

3.1.3 Conclusion on Environmental Assessment

35. The Commission concludes that the licence renewal, which includes the MCR project, is not a designated project under CEAA 2012 and that an EA under CEAA 2012 is not required prior to its approval. Further, the Commission is satisfied that Bruce Power has made, and will continue to make, adequate provision for the protection of the environment throughout the proposed renewed licence period.

36. Following its consideration of the information provided on the record for this hearing, the Commission concludes that an environmental review conducted under the NSCA and its regulations was appropriate for this Bruce NGS licence renewal application.

3.2 Major Component Replacement and Life Extension Project

37. The Commission considered the proposed refurbishment or MCR project at the Bruce NGS. Bruce Power informed the Commission that, should the operating licence be renewed, over the next 10-year period MCR activities would be completed on three of six units and that refurbishment activities would be in progress on two additional units. Bruce Power added that the life extension outage for each unit was planned to last approximately 4 years.

38. The Commission considers refurbishment and MCR to be interchangeable terms without a difference.

39. Bruce Power provided to the Commission the goals of the MCR program. Bruce Power submitted that the MCR was needed to:

- Maintain existing assets and operations to ensure continued protection of the public and environment;
- Maintain safe operation and ensure that, following MCR, units have equal or improved margin of safety;
- Meet Ontario's long-term energy supply mix requirements, as outlined in the Long-Term Energy Plan;
- Provide clean energy to Ontario to help achieve Climate Change Action Plan goals;
- Ensure a safe and reliable operational life of Units 3-8 to 2064;
- Sustain direct and indirect employment opportunities in order to effectively sequence work.

40. CNSC staff confirmed to the Commission that Bruce Power had submitted the information required under Licence Condition 15.2 of PROL 18.00/2020 in order to apply for refurbishment activities. These included:

- a Periodic Safety Review (PSR)
- implementation and maintenance of a return-to-service plan

- periodic updates on the progress of the project and any proposed changes

CNSC staff added that Bruce Power would use the current programs and procedures to manage future MCR outages.

41. The Commission asked Bruce Power about the use of a mock-up reactor for the MCR project. The Bruce Power representative explained that the mock-up reactor was used for training purposes for employees to train with new tools. The Bruce Power representative added that the mock-up currently under construction by Bruce Power in Kincardine would be similar to the one used by OPG for the Darlington refurbishment, and would also integrate the lessons learned from OPG.

42. The Commission noted that the duration allotted for the MCR of each unit decreased as the schedule went forward and enquired about the reasons for this. The Bruce Power representative explained that the contract signed between Bruce Power and the Independent Electricity System Operator (IESO) specified that Bruce Power had to complete the MCRs more effectively and more efficiently as the project progressed.

43. Upon request for information about CNSC oversight during the MCR project, CNSC staff informed the Commission that CNSC staff would maintain oversight of the programs by conducting detailed MCR inspections. CNSC staff added that the inspections would include, but would not be limited to the following areas:

- MCR project execution
- contractor and project management
- training needs for the MCR including onboarding (i.e., orientation) training program and oversight training, analysis for changes on training programs and return-to-service training

In addition, CNSC staff noted that it would update the Commission on the status of the MCR at every Commission Meeting as part of the Status Report on Power Reactors and also as part of the annual NPPs ROR.

Periodic Safety Review

44. Bruce Power provided detailed information on the MCR strategy and activities, and stated that the activities were internally separated into two programs: asset management work and major component replacement activities. CNSC staff reviewed the scope of the asset management program and the major component replacement program through the PSR and reported that the programs met regulatory requirements for the management of aging of structures, systems and components (SSCs). Questioned by the Commission about the adherence to the planned MCR schedule, Bruce Power expressed its confidence in meeting the MCR schedule targets and that this was motivated by reactor safety and business planning reasons.

45. Bruce Power stated that the overall conclusion of the PSR was that continued operation of Bruce NGS over the 10-year PSR period was acceptable. CNSC staff provided detailed information about CNSC staff's review of Bruce Power's PSR noting that the submitted PSR met the specifications of REGDOC-2.3.3, *Periodic Safety Review*.[13] CNSC staff reported that its assessment showed that Bruce Power's PSR had adequately identified gaps and strengths in the current state of the Bruce NGS, its performance and the conformance to modern standards and practices, and that Bruce Power had completed a comprehensive review of plant design, condition, and operational programs.

46. CNSC staff specified that the results of the PSR had been used by the licensee to establish safety improvements to the plant as captured in the Integrated Improvement Plan (IIP) which would be implemented over the proposed licence period, with this implementation included in the station-specific licence condition 15.2. CNSC staff added that, in accordance with international practice, 10 years was considered an appropriate interval between PSRs.

Global Assessment Report and Integrated Implementation Plan

47. The Commission notes that REGDOC-2.3.3 requires that the results of the safety factor review are incorporated into a Global Assessment Report (GAR) and an Integrated Improvement Plan (IIP). The Commission notes that the GAR presents the results of the review in an integrated manner and provides an overall risk assessment on the acceptability of continued operation for the proposed operating period. The Commission also notes that the IIP presents the proposed safety improvements and includes timeframes for implementation. CNSC staff stated that the CNSC compliance program was treated separately from the IIP. CNSC staff added that any modification in the IIP would require Bruce Power to request the Commission's approval.

48. Bruce Power stated that, as described in the GAR, the PSR demonstrated adequacy of the design and defence-in-depth provisions, based on a review of the fundamental safety principles associated with all five levels of defence-in-depth. CNSC staff mentioned that it provided comments to Bruce Power on the first draft of the GAR and IIP and that Bruce Power incorporated the comments in a revised version. CNSC staff added that the revised versions of the GAR and IIP were accepted by CNSC staff with conditions that Bruce Power agreed to. CNSC staff recommended that a licence condition be placed in the proposed licence, with additional details laid out in the LCH, requiring Bruce Power to implement the IIP resulting from the PSR.

49. Bruce Power reported to the Commission that the IIP detailed the physical modifications made in response to the Fukushima incident and provided information on the ongoing modification that would be completed during the upcoming outages. CNSC staff noted that Bruce Power had made significant progress in addressing

[13] Canadian Nuclear Safety Commission Regulatory Document REGDOC-2.3.3, *Periodic Safety Review*, 2015.

Fukushima Action Items (FAIs) and noted that staff will continue to monitor Bruce Power's progress in closing out the remaining FAIs.

Return-to-Service Plan

50. Bruce Power submitted a return to service plan, which described how the reactors would be returned to commercial operation by Bruce Power as part of the planned MCR. Bruce Power stated that the return to service plan included key milestones and proposed regulatory hold points. CNSC staff confirmed Bruce Power's information adding that each of these hold points would serve as regulatory verification to ensure operational readiness of the reactors. CNSC staff further added that CNSC staff would perform compliance activities to ensure that the MCR was well managed, and would update the Commission on the status of the MCR at every Commission Meeting as part of the Status Report on Power Reactors and also as part of the annual ROR for NPPs.

51. At the Commission's request, CNSC staff provided further details about the proposed hold points. CNSC staff added that all of the prerequisites for releasing the proposed hold points were in the proposed Licence Condition Handbook and that CNSC staff's goal was to make sure that the Bruce NGS was ready to respond, that the responsible people were trained in the systems returning to service and that the procedures and processes were in place to manage operations. The Bruce Power representative added that the return to service sequence was normal procedure, typical of how CANDU reactors were operated during a normal return to service after an outage.

52. The Commission's consideration of MCR activities as they relate to specific SCAs is found in the following sections of this *Record of Decision*.

3.3 Management System

53. The Commission examined Bruce Power's Management System which covers the framework that establishes the processes and programs required to ensure that the Bruce NGS achieves its safety objectives, continuously monitors its performance against these objectives, and fosters a healthy safety culture. Throughout the current licence period, CNSC staff rated Bruce Power's performance in this SCA as "satisfactory."

54. The Commission assessed the information submitted by Bruce Power and CNSC staff regarding Bruce Power's compliance with CSA N286-05, *Management system requirements for nuclear power plants*,[14] during the current licence period. Bruce Power reported that the updated CSA N286-12[15] would be fully implemented at the Bruce NGS by December 2018, using the PLAN-DO-CHECK-ACT approach as set

[14] N286-05, *Management system requirements for nuclear power plants,* CSA Group, 2005.
[15] N286-12, *Management system requirements for nuclear facilities,* CSA Group, 2012.

out in ISO 9001, *Quality Management*.[16] CNSC staff confirmed to the Commission the adequacy of this timeline.

55. CNSC staff submitted to the Commission that, during the current licence period, Bruce Power had implemented and maintained a management system that met CNSC staff expectations and had completed or was in the process of completing corrective actions raised during CNSC staff compliance verification activities. CNSC staff also submitted that CNSC staff would continue to monitor the implementation of corrective actions on an ongoing basis during the proposed licence period.

Management System for MCR

56. Bruce Power reported that the planned MCR project would use existing Bruce Power governance and added that Bruce Power was reviewing all programs to ensure that the capabilities and resources needed for the MCR projects were in place.

57. Bruce Power stated that the lessons learned from the Darlington NGS refurbishment, as well as other international refurbishment activities, would be taken into account during the MCR. The Bruce Power representative added that employee exchanges with OPG were part of the preparation for the MCR.

58. The Commission considered the intervention from OPG and enquired about the sharing of refurbishment experience. CNSC staff mentioned that Bruce Power and OPG had formed a joint working group to share information and documents on the refurbishment projects. CNSC staff added that Bruce Power had an adequate process in place to take into account past and current lessons learned from refurbishment experience.

3.3.1 Performance Assessment, Improvement and Management Review

59. The Commission assessed the adequacy of Bruce Power's self-assessment program as well as performance assessment, improvement and management review programs. Bruce Power submitted information about the different self-assessment tools used at the Bruce NGS.

60. CNSC staff confirmed the information submitted by Bruce Power and submitted that, during the current licence period, CNSC staff performed inspections on Bruce Power's self-assessment program and confirmed that the program met the specifications of CSA N286-05 and licensing requirements.

61. Based on the information provided on the record for this hearing, the Commission is satisfied that Bruce Power has an appropriate self-assessment program in place at the Bruce NGS.

[16] ISO 9001, *Quality Management*, International Organization for Standardization.

3.3.2 Organization

62. The Commission reviewed the information submitted by Bruce Power regarding its organizational structure at the Bruce NGS, noting the key activities that Bruce Power used to effectively implement Bruce NGS processes. Bruce Power submitted that the organizational structure at the Bruce NGS identified the high-level responsibilities and authorities of the positions associated with its operations, as detailed in its organization chart. Bruce Power also submitted that, during the current licence period, Bruce Power had consolidated over 100 separate organization documents into a single document to improve the process of managing organizational structure changes. CNSC staff confirmed the information provided by Bruce Power and confirmed that Bruce Power had a process in place to continuously improve the management system documentation.

63. Bruce Power informed the Commission that it had created a new division, the Life Extension Division, to support the implementation of the MCR project and to provide oversight to ensure that operational requirements were met, including adherence to regulatory commitments, standards, and Bruce Power processes. CNSC staff added that Bruce Power had programs and processes in place to ensure that the MCR will be managed effectively.

64. Bruce Power provided the Commission with information on its management of contractors program, noting the strengths and areas of improvement identified following an inspection of the program by CNSC staff. Bruce Power explained the actions from the corrective action program that had been implemented to address the areas for improvement. Bruce Power added that all contractors were required to meet the requirements provided for by Bruce Power's safety management system. CNSC staff submitted that CNSC staff was monitoring the implementation of the corrective actions and that the implementation would be completed in 2018.

65. The Commission further considered the information submitted by CNSC staff regarding Bruce Power's organization and management of contractors. CNSC staff confirmed that CNSC staff inspections of Bruce Power's contractor management process demonstrated that regulatory requirements were met.

66. The Commission requested additional information regarding the safety and radiation protection of contractors at the Bruce Power site. CNSC staff provided the Commission with information on how Bruce Power ensured that contractors at the Bruce NGS site obtained the required training and worked within the licensee's requirements, noting that, should the MCR project be authorized through this licence renewal, a plan was in place to ensure that adequate contractor management carried over to that project. On this point, Bruce Power reported that it had collaborated with OPG to model their successes and ensure that lessons learned were factored into all aspects of the MCR project.

67. Following a request for comment from the Commission on the recommendation from the Society of United Professionals to hold formal quarterly meetings with CNSC staff, CNSC staff informed the Commission that CNSC staff had been meeting with the unions annually. CNSC staff further reported that an agreement had been reached to meet with this intervenor as well as the Power Workers' Union formally on a quarterly basis moving forward. CNSC staff also confirmed that CNSC staff met regularly with unions from other NGS sites. The Commission was satisfied on this point. Several union representatives, contractors and suppliers who intervened reflected on the rigorous safety procedures required from Bruce Power and its safety performance.

68. Based on the information provided, the Commission is satisfied that Bruce Power has an appropriate organizational structure in place at the Bruce NGS to ensure continued safety of workers and the environment throughout the proposed licence period.

3.3.3 Facility Management

69. The Commission examined the information provided by Bruce Power in regard to facility management at the Bruce NGS. Bruce Power submitted that external operating experience (OPEX) was gathered via the CANDU Owners Group (COG) and shared with managers and subject matter experts to ensure due consideration. Bruce Power also reported that OPEX from other international nuclear associations such as the Institute of Nuclear Power Operations (INPO) and the World Association of Nuclear Operators (WANO) was reviewed and considered during Bruce NGS operations. CNSC staff submitted that Bruce power's OPEX program met regulatory requirements and that CNSC staff had its own OPEX program associated with COG and the IAEA.

70. Bruce Power provided the Commission with information on its change management program, noting that improvements had been made to the program during the current licence period to support the implementation of CSA N286-12. Bruce Power also confirmed its commitment to continuous improvement in this regard during the proposed licence period.

71. CNSC staff submitted that change management, configuration management and records management at the Bruce NGS met CNSC expectations during the current licence period. CNSC staff confirmed that the corrective actions put in place to reduce the high number of temporary configuration changes (TCCs) were effective and that CNSC staff would continue to monitor the implementation of the corrective actions throughout the proposed licence period.

72. The Commission considered the information submitted by CNSC staff regarding Bruce Power's record management program as well as Bruce Power's restart effectiveness. The Commission also considered the areas of improvement that were identified through CNSC compliance activities. CNSC staff submitted that Bruce

Power's record management program and Bruce Power's restart effectiveness met regulatory requirements and that CNSC staff would monitor the improvements in future compliance activities.

73. The Commission assessed the adequacy of Bruce Power's business continuity programs at the Bruce NGS developed to minimize disruptions in the event of natural, human or technical threats. Bruce Power submitted that the business continuity process was managed as part of Bruce Power's emergency management program and that the process framework was based on the PLAN-DO-CHECK-ACT approach. CNSC staff confirmed the information provided by Bruce Power, noting that Bruce Power had developed an adequate contingency plan to maintain or restore critical safety and business functions in the event of disabling circumstances such as a pandemic, severe weather, or labour action.

74. Asked about the procurement challenges and component obsolescence for an aging reactor fleet the Bruce Power representative submitted to the Commission that item equivalencies and reverse engineering could be used to solve these problems and provided details in this regard.

75. Based on the information provided, the Commission is satisfied that Bruce Power has adequate programs in place for facility management and business continuity management at the Bruce NGS. The Commission expects Bruce Power to continue its efforts at improving the TCCs at the Bruce NGS during the proposed licence period, and will look forward to updates in this regards in the normal course.

3.3.4 Safety Culture

76. The Commission considered submissions respecting the adequacy of safety culture at the Bruce NGS. Bruce Power reported that a site-wide self-assessment was completed in 2016 based on the INPO 12-012, *Traits of a Healthy Nuclear Safety Culture* framework as well as draft IAEA guidance for conducting safety culture and security culture. Bruce Power expressed its commitment to continuous improvement in safety and security culture at the Bruce NGS.

77. CNSC staff reported that CNSC staff was satisfied with the safety culture and security culture assessment performed at the Bruce NGS and that Bruce Power's safety culture program met requirements. CNSC staff also submitted that the 2016 Bruce NGS safety culture and security culture assessment showed that improvements had been made since the last self-assessment in 2013.

78. The Commission enquired about the action taken by Bruce Power to ensure that the safety culture in the nuclear industry was understood by contractors performing MCR work. The Bruce Power representative explained Bruce Power's process for contractor qualification and about how Bruce Power provided contractor oversight to ensure that the contractors were meeting the contract conditions and safety culture requirements.

The Bruce Power representative added that Bruce Power quality assurance employees were working closely with OPG to observe what was working during the Darlington NGS refurbishment, lessons learned and what needed to be improved in the management of contractors. The Commission was satisfied with the information provided on this point.

79. The Commission considered the interventions from members of local communities, unions, local businesses and suppliers that commended Bruce Power on the high safety culture standards at the Bruce NGS, ensuring the continuous safety of its operations and staff. The Commission noted that several intervenors were companies with contractors at the Bruce NGS and that these intervenors submitted that they had very good working experiences with Bruce Power.

80. Based on the information examined for this hearing, the Commission is satisfied that Bruce Power has maintained and will continue to maintain a strong safety culture at the Bruce NGS.

3.3.5 Conclusion on Management System

81. On the basis of the information provided on the record for this hearing, the Commission concludes that Bruce Power has appropriate organization and management structures in place and that the operating performance at the Bruce NGS in the current licence period provides a positive indication of Bruce Power's ability to adequately carry out the activities under the proposed renewed licence.

82. The Commission expects Bruce Power to implement CSA N286-12 at the Bruce NGS by December 2018 as presented during this hearing.

3.4 Human Performance Management

83. The Commission assessed Bruce Power's human performance management programs which encompass activities that enable effective human performance through the development and implementation of processes that ensure that Bruce NGS staff is sufficient in number in all relevant job areas and has the necessary knowledge, skills, procedures and tools in place to safely carry out their duties. During the current licence period, CNSC staff rated Bruce Power's performance in this SCA as "satisfactory."

84. The Commission examined the information submitted by Bruce Power regarding the Bruce NGS human performance program and the improvements put in place by Bruce Power during the current licence period to reduce human performance-related events and errors. Bruce Power also provided information on the use of observation and coaching as well as the "Core 4" and other human performance tools. CNSC staff confirmed the information provided by Bruce Power and submitted that Bruce Power

had implemented and maintained a human performance program that met regulatory requirements.

Human Performance Management for MCR

85. The Commission enquired if labour availability during the MCR posed a significant risk given that two refurbishment projects, one at Bruce NGS and one at Darlington NGS, would be underway at the same time. The Bruce Power representative explained that no issues were anticipated in the near future and that programs were in place to ensure adequate staffing.

86. The Commission asked for details about the training of new construction workers for the MCR. The Bruce Power representative explained that general radiation protection training was in place for every new employee, with additional training provided depending on the work to be done. The Bruce Power representative added that Bruce Power had a continuous training program for workers to keep their skills and their safety performance at a high level. CNSC staff stated that inspection of the training program demonstrated that Bruce Power met CNSC requirements.

3.4.1 Personnel Training

87. The Commission considered the information submitted by Bruce Power about its personnel training programs. Bruce Power informed the Commission that its training program included training elements for worker qualification as well as the training elements that support general professional development. As part of continuous improvement, Bruce Power presented its training program's planned improvements for the proposed licence period including the implementation of systematic approach to training based (SAT-based) training software. Several intervenors, notably contractors and suppliers commented positively on Bruce Power's training programs.

88. CNSC staff confirmed the information provided by Bruce Power and noted that Bruce Power's program met specifications of REGDOC-2.2.2, *Personnel Training* version 1.[17] CNSC staff submitted that its compliance verification activities determined that Bruce Power had implemented the training programs in accordance with a SAT-based training system.

89. Having examined all of the information provided on the record for this hearing, the Commission is satisfied that Bruce Power has appropriate training programs in place at the Bruce NGS and meets the objectives of REGDOC-2.2.2.

[17] Canadian Nuclear Safety Commission Regulatory Document REGDOC-2.2.2, *Personnel Training*, version 1, 2014.

3.4.2 Certification and Examinations

90. The Commission examined the information submitted by Bruce Power regarding personnel certification at the Bruce NGS. Bruce Power submitted that it was building a second full-scope simulator to allow simultaneous training to occur on units with modifications associated with life extension activities, as well as training on unmodified reactor units.

91. CNSC staff confirmed the information provided by Bruce Power and noted that Bruce Power's program met the criteria stipulated in RD-204, *Certification of Persons Working at Nuclear Power Plants.*[18] CNSC staff also validated that certified workers at Bruce NGS possessed the knowledge and skills required to perform their duties safely.

92. In regard to certification examinations, Bruce Power provided the Commission with detailed information about the pass rate for certification examinations during the current licence period. Bruce Power also submitted information about its proposal to modify the examination methodology of one of the required certification examinations, from a short essay question format to a multiple-choice question format, subject to CNSC approval.

93. CNSC staff confirmed that Bruce Power was compliant with all regulatory requirements in regard to certification examinations. CNSC staff also reported that Bruce Power's proposal to modify the examination methodology was approved on a pilot basis based on CNSC staff assessments that had been carried out. CNSC staff added that over the next licensing period, CNSC staff would make a determination on whether or not multiple-choice question general examinations can be incorporated into the CNSC's regulatory framework.

94. Based on the information presented during this hearing, the Commission is satisfied that Bruce Power has appropriate training and certification programs in place at the Bruce NGS. The Commission is also satisfied that Bruce Power's programs meet the objectives of RD-204.

95. The Commission expects updates on CNSC staff's assessments of Bruce Power's proposed changes to the required certification examination format during the proposed licence period.

3.4.3 Work Organization and Minimum Shift Complement

96. The Commission assessed the information provided by Bruce Power regarding the workforce planning and recruitment processes. Bruce Power submitted that plans were in place at the Bruce NGS to reach Bruce Power's future required staffing levels.

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[18] Canadian Nuclear Safety Commission Regulatory Document RD-204, *Certification of Persons Working at Nuclear Power Plants*, 2008.

CNSC staff confirmed that Bruce Power had a workforce planning process in place to ensure that an adequate level of certified workers was maintained at the Bruce NGS.

97. Bruce Power informed the Commission that Bruce Power maintained a sufficient number of qualified staff to meet minimum complement requirements adding that short-notice absences or severe weather presented challenges to maintaining the minimum complement.

98. CNSC staff confirmed that Bruce Power met minimum shift complement requirements at the Bruce NGS and that Bruce Power's minimum shift complement was capable of responding to the most resource-intensive conditions under all operating states. CNSC staff provided information on the validation of numbers for Bruce Power's minimum shift complement and on the reporting requirements imposed on Bruce Power.

99. CNSC staff informed the Commission that in 2016, Bruce Power addressed discrepancies between its minimum shift complement documentation and the requirements of Regulatory Guide G-323, *Ensuring the Presence of Sufficient Qualified Staff at Class I Nuclear Facilities - Minimum Staff Complement*[19] to the satisfaction of the CNSC staff.

100. The Commission noted the submission made by the Power Workers' Union (PWU) regarding the past issues with minimum shift complement at the Bruce NGS and the improvements made by Bruce Power to the certification program. The Bruce Power representative and the PWU representative commented that Bruce Power had increased the number of certified staff over the last five years. CNSC staff added that it was satisfied with the measures brought forward by Bruce Power on that matter.

3.4.4 Fitness for Duty

101. The Commission examined the information submitted by Bruce Power and CNSC staff regarding the fitness for duty program at the Bruce NGS. Bruce Power reported that improvements had been made to the program during the current licence period and that Bruce Power planned to make revisions to its program to take into account the recommendations made by CNSC staff as a result of inspections in 2017. CNSC staff informed the Commission that Bruce Power would implement REGDOC-2.2.4, *Fitness for Duty: Managing Worker Fatigue*[20] by December 2018 and that CNSC staff would monitor its implementation during the proposed licence period.

[19] Canadian Nuclear Safety Commission Regulatory Guidance Document G-323, *Ensuring the Presence of Sufficient Qualified Staff at Class I Nuclear Facilities - Minimum Staff Complement*, 2007.
[20] Canadian Nuclear Safety Commission Regulatory Document REGDOC-2.2.4, *Fitness for Duty: Managing Worker Fatigue*, 2017.

102. Concerning REGDOC-2.2.4 (Volume II), *Fitness for Duty: Managing Alcohol and Drug Use*,[21] Bruce Power informed the Commission that Bruce Power planned to comply with the specifications of REGDOC-2.2.4 (Volume II) by July 2019, with the exception of random testing which would be implemented in December 2019. Bruce Power noted that these dates could be impacted by legal challenges.

103. CNSC staff informed the Commission that Bruce Power's implementation plan for REGDOC-2.2.4 (Volume II) was submitted in March 2018 and met CNSC staff's expectations. CNSC staff also submitted that Bruce Power was taking into account the legalization of cannabis and that CNSC staff would review Bruce Power's implementation plan and that the implementation of this REGDOC would be monitored during the proposed renewed licence period.

104. Asked about the action that Bruce Power had taken to reduce the number of non-compliances related to the limits of hours of work, the Bruce Power representative responded that the increase in awareness and training of the Emergency Management Centre workers and the monitoring of weather conditions for early notifications had contributed to this reduction. The Bruce Power representative also reported that Bruce Power had increased the number of certified staff. CNSC staff informed the Commission about the compliance review focussed on fitness for duty and findings as a result of the high number of non-compliances related to limits of hours-of-work at Bruce NGS during the current licence period. The Commission was satisfied with the information provided on this point.

105. Bruce Power informed the Commission that Bruce Power improved the definition of clock reset criteria and improved observation and coaching checklists to support safety requirements and procedural adherence. Asked by the Commission for additional information on the human performance station level clock reset and the target for human performance events, the Bruce Power representative explained that the human performance station level clock reset was an industry standard metric that tracked the number of days that had passed without an event causing a reset. The Bruce Power representative added that Bruce Power was deliberately setting the targets lower to improve performance.

106. Following its examination of the information provided on the record for this hearing, the Commission is satisfied that Bruce Power met requirements in the area of fitness for duty.

107. The Commission anticipates the implementation of REGDOC-2.2.4 and REGDOC-2.2.4, Volume II regarding fitness for duty during the proposed licence period as presented during this hearing. The Commission expects CNSC staff to monitor the implementation of these REGDOCs at the Bruce NGS.

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[21] Canadian Nuclear Safety Commission Regulatory Document REGDOC-2.2.4, *Fitness for Duty, Volume II: Managing Alcohol and Drug Use*, 2017.

3.4.5 Conclusion on Human Performance Management

108. Based on its consideration of the information presented on the record for this hearing, 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 renewed licence.

3.5 Operating Performance

109. The Commission examined operating performance at the Bruce NGS, which 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 NGS. Throughout the current licence period, CNSC staff rated Bruce Power's performance in the operating performance SCA as "fully satisfactory."

3.5.1 Conduct of Licensed Activity

110. The Commission evaluated the information provided about Bruce Power's Operating Policies and Principles (OP&Ps). Bruce Power reported that, as operating experience accumulated, the detailed procedures in the OP&Ps were occasionally revised to improve the quality, simplicity and efficiency of station operation. Bruce Power also described the Nuclear Safety Review Board activities which reported to the Bruce Power Board of Directors on how Bruce Power conducts its business in a manner that promotes safety. Bruce Power added that the Nuclear Safety Review Board emphasized the long-term effort required to make permanent improvements in safety culture, including changing management behaviours and demonstrating leadership.

111. Bruce Power informed the Commission about the IAEA Operational Safety and Review Team (OSART) mission that evaluated Bruce B operational safety performance compared to IAEA safety standards in 2015, with a follow up in 2017. Bruce Power reported that both Bruce Power and the CNSC received a draft report of the OSART assessment. CNSC staff added that CNSC staff reviewed the report and confirmed that in the areas where the OSART team identified opportunities for improvements, Bruce Power remained compliant with Canadian regulatory requirements.

112. CNSC staff reported that it found that Bruce Power's operating performance exceeded CNSC regulatory requirements and expectations. CNSC staff also reported that Bruce Power appropriately managed unplanned transients at the Bruce NGS during the current licence period and that these did not present a risk to nuclear safety, human health or the environment.

113. Bruce Power informed the Commission about its procedure development and verification process at the Bruce NGS, noting that this process was subject to continuous improvement activities. On this topic, CNSC staff reported that Bruce Power had processes and procedures that met regulatory requirements.

114. The Commission notes that industry organizations, companies and several individual intervenors were supportive of Bruce Power's production of Cobalt-60. Upon request, the Bruce Power representative explained to the Commission that the cobalt absorber rods used to control neutrons in the reactors were removed and shipped to Nordion to be processed, whereby the Co-60 was harvested. The Bruce Power representative added that this process did not constrain the normal electricity production.

115. Having examined the information submitted for this hearing, the Commission is satisfied that the Bruce NGS was operated and will continue to be operated safely during the renewed licence period.

3.5.2 Reporting and Trending

116. The Commission assessed the information submitted by Bruce Power and CNSC staff regarding Bruce Power's adherence to the specifications of REGDOC-3.1.1, *Reporting Requirements for Nuclear Power Plants*.[22] Bruce Power reported that notifications and reports to the CNSC were made in accordance with REGDOC-3.1.1. CNSC staff confirmed the information and added that CNSC staff did not identify any safety significant issues from these reports.

117. Bruce Power informed the Commission about the improvements made to the corrective action program and the improvement initiatives that were underway. Bruce Power explained that the corrective action program promoted a healthy nuclear safety culture by establishing a process to identify, document, evaluate, and trend adverse conditions, and to develop and implement appropriate actions to fix those adverse conditions.

118. Based on the information provided, the Commission is satisfied that Bruce Power met all reporting parameters as specified in REGDOC-3.1.1.

3.5.3 Outage Management Performance

119. The Commission considered the adequacy of the Bruce Power's outage management programs, which were used to manage planned outages at the Bruce NGS. Bruce Power submitted information on past planned outages, noting that safety was a key outage success factor and an outage goal. Bruce Power added that, for the upcoming outages in the proposed licence period, focus on Bruce Power suppliers' human

[22] Canadian Nuclear Safety Commission Regulatory Document Regulatory Document REGDOC-3.1.1, *Reporting Requirements for Nuclear Power Plants*, Version 2, April 2016.

performance would be increased.

120. CNSC staff confirmed the information provided by Bruce Power and submitted that, during the current licence period, Bruce Power performed all safety-related outage undertakings in accordance with CNSC approved procedures. CNSC staff further reported that Bruce Power conducted all appropriate follow-up actions for forced unplanned outages at the Bruce NGS during the current licence period. CNSC staff added that the leakage rate tests performed at both stations and Bruce B vacuum building met the acceptance criteria and the requirements for containment prescribed by CSA N287.7, *In-service examination and testing requirements for concrete containment structures for CANDU nuclear power plants*.[23]

121. Based on the information provided by Bruce Power and CNSC staff, the Commission is satisfied that planned outages were performed appropriately throughout the licence period and that Bruce Power has adequate procedures in place to carry out planned and unplanned outages during the renewed licence period.

3.5.4 Safe Operating Envelope

122. The Commission examined the information provided by Bruce Power and CNSC staff regarding the Bruce NGS Safe Operating Envelope (SOE). Bruce Power provided information about how the specifications of CSA N290.15-10, *Requirements for the safe operating envelope for nuclear power plants*[24] were met at the Bruce NGS throughout the current licence period.

123. CNSC staff confirmed the information provided by Bruce Power and added that Bruce Power's operational safety requirements documents (OSR) would be included as written notification documents in the LCH.

124. Based on the information provided for this hearing, the Commission is satisfied that Bruce Power has an appropriate SOE program in place at the Bruce NGS that meets the specifications of CSA N290.15-10.

3.5.5 Accident Management and Recovery Program

125. The Commission assessed the information provided by Bruce Power regarding severe accident management and recovery programs at the Bruce NGS. Bruce Power submitted that the Bruce NGS had adopted the COG recommendations for Severe Accident Management Guidelines (SAMG) and that SAMG drills and exercises were prepared and carried out in accordance with emergency management drill and exercise plans.

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[23] N287.7, *In-service examination and testing requirements for concrete containment structures for CANDU nuclear power plants,* CSA Group, 2008.
[24] N290.15, *Requirements for the safe operating envelope for nuclear power plants*, CSA Group, 2010.

126. Bruce Power reported to the Commission that its Abnormal Incident Manuals (AIMs) provided directions to address unit upsets within the design basis and that their use prevented OP&P limits from being exceeded. Bruce Power added that AIM procedures were utilized in two separate events during the current licence period and provided information in this regard.

127. CNSC staff confirmed Bruce Power's information and added that Bruce Power maintained an accident management and recovery program that met regulatory requirements. CNSC staff also reported that Bruce Power's severe accident management program met the specifications of REGDOC-2.3.2, *Accident Management: Severe Accident Management Program for Nuclear Reactors*.[25]

128. The Commission acknowledges interventions regarding severe accident management from several intervenors in relation with the Provincial Nuclear Emergency Response Plan (PNERP).[26] The issues submitted in these interventions are considered by the Commission in section 3.12, *Emergency Management and Fire Protection* of this decision.

129. Based on the information provided by Bruce Power and CNSC staff, the Commission is satisfied that Bruce Power has adequate programs in place at Bruce NGS to manage and respond to design basis, beyond design basis and severe accident events at the Bruce NGS, with its program meeting the specifications of REGDOC-2.3.2.

3.5.6 Conclusion on Operating Performance

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

131. On the basis of its review of the above information, the Commission is satisfied that Bruce Power will continue to ensure that appropriate operation performance-related programs are in place at the Bruce NGS to ensure the health and safety of persons and the protection of the environment.

3.6 Safety Analysis

132. The Commission assessed safety analysis at the Bruce NGS, which includes a systematic evaluation of the potential hazards associated with the conduct of the

[25] CNSC Regulatory Document REGDOC-2.3.2, *Accident Management: Severe Accident Management Program for Nuclear Reactors*, September 2013.
[26] Provincial Nuclear Emergency Response Plan (PNERP) Master Plan, Office of the Fire Marshal and Emergency Management of Ontario, December 2017.

licensed activity or the operation of a facility, and considers the effectiveness of preventive measures and strategies in reducing the effects of such hazards. Safety analysis supports the overall safety case for the Bruce NGS. CNSC staff reported that, throughout the current licence period, the Bruce NGS was operated safely and within licence limits, with Bruce Power's performance in this SCA rated as "satisfactory" in 2014 and 2015, and "fully satisfactory" in 2016 and 2017 by CNSC staff. CNSC staff submitted that the improved rating in this SCA represented the progress made by Bruce Power in implementing REGDOC-2.4.1 *Deterministic Safety Analysis*[27] and REGDOC-2.4.2 *Probabilistic Safety Assessment (PSA) for Nuclear Power Plants*.[28]

133. Bruce Power explained to the Commission that fire hazard analysis and fire safe shutdown analysis were performed to identify areas suitable for the additional storage locations that would be required during the MCR. Bruce Power added that the additional storage locations related to the MCR would not impact the fire protection design basis.

3.6.1 Deterministic Safety Analysis

134. The Commission considered the information provided by Bruce Power about the deterministic analyses that were performed for the Bruce NGS. Bruce Power provided the Commission with detailed information on the deterministic safety analyses and processes at the Bruce NGS, noting that the 2017 *Bruce NGS Safety Reports*[29] provided a summary of the deterministic analyses that were performed by Bruce Power. Additional work in the area of deterministic safety analysis was performed by Bruce Power and considered by the Commission on the topics of the impact of standing flame in containment, neutron overpower protection trip setpoints, impact of aging on safety analysis margins, and large loss of cooling accident safety margins. Bruce Power also provided the Commission with information on how events were selected for the analyses and how identified changes were incorporated into the Bruce NGS design process, with any changes that impacted the safety case analyzed, documented and included in the *Bruce NGS Safety Reports*. CNSC staff confirmed the information submitted by Bruce Power and submitted that CNSC staff would continue to review Bruce Power's work in the area of deterministic safety analysis throughout the proposed licence period.

135. CNSC staff reported that, over the current licensing period, Bruce Power had made significant progress in the implementation of REGDOC-2.4.1. CNSC staff recognized that full implementation of REGDOC-2.4.1 may not be possible, as some of the provisions in the document did not apply to existing facilities or provide any additional safety benefit beyond the current safety case. CNSC staff reported that,

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[27] CNSC Regulatory Document REGDOC-2.4.1, *Deterministic Safety Analysis*, May 2014.
[28] CNSC Regulatory Document REGDOC-2.4.2, *Probabilistic Safety Assessment (PSA) for Nuclear Power Plants*, May 2014.
[29] The *Bruce NGS Safety Reports* were last revised and issued to the CNSC in December 2017, in accordance with Bruce Power's LCH for Bruce NGS for the current licence period.

therefore, in 2013, Bruce Power submitted a Safety Report Improvement (SRI) plan which consisted of a 3-year project to upgrade the Bruce A and B safety reports to align with the specifications of REGDOC-2.4.1, and an ongoing SRI program to perform REGDOC-2.4.1 gap analysis on an ongoing basis. CNSC staff informed the Commission that it would continue to monitor the progress of the SRI program over the next licensing period.

136. Based on the information provided on the record for this hearing, the Commission is satisfied that Bruce Power's current deterministic safety analysis for the Bruce NGS is adequate and that the Bruce NGS has adequate safety margins.

3.6.2 Probabilistic Safety Assessment

137. The Commission assessed the information provided by Bruce Power about its Probabilistic Safety Assessment (PSA) program. Bruce Power reported that a Level II PSA, compliant with S-294, *Probabilistic Safety Assessment (PSA) for Nuclear Power Plants*,[30] was carried out for the Bruce NGS, with reports submitted to the CNSC in 2014. Bruce Power also reported that the PSAs would be updated on a 5-year cycle in accordance with REGDOC-3.1.1. Bruce Power noted that the most recent PSA results were summarized in the Performance Review of Bruce A and Bruce B and that the PSA results demonstrated compliance with prescribed overall plant safety goals for the frequency of severe core damage and large radiological releases from the Bruce NGS reactor containment building.

138. CNSC staff confirmed the information provided by Bruce Power, reporting that the Bruce NGS PSA Program was revised to ensure that it met the objectives of REGDOC-2.4.2, with a full implementation by June 30, 2019, and that the program satisfied regulatory requirements. CNSC staff reported that, as part of the transition plan for REGDOC-2.4.2, Bruce Power had submitted updates to the PSA methodologies and computer codes in April 2017 for CNSC acceptance and that the next PSA reports, scheduled for June 2019, would be expected to be fully compliant with REGDOC-2.4.2.

139. The Commission examined the detailed information provided by Bruce Power on its PSA submission in 2014, based on the parameters of S-294. CNSC staff reported that the events considered included flood, fire, high wind and seismic. Bruce Power reported that for those events for which a PSA was performed, the results were compared with the Bruce Power safety goals for severe core damage frequency (the likelihood of releasing radioactive material from the nuclear fuel into the containment structure) (1.0×10^{-4} occurrences per unit-year), and large release frequency (the release of radioactive material out of containment into the environment) (1.0×10^{-5} per unit-year). Bruce Power reported that the goals were met for each of the Bruce A and Bruce B PSAs. The Commission was satisfied in this regard.

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

140. In reference to PSA results for different initiating events, the Commission enquired about whether per-unit results could be added together to obtain site-level values. CNSC staff provided additional details and context about the values for safety goals and targets provided in its CMD, explaining that even when the values are aggregated they still meet the safety goal limits. The Commission recommended that these aggregated values be made available in future submissions. CNSC staff confirmed that it was possible to produce the requested values from existing data and confirmed that the requested values would be made available to the Commission going forward.

141. The Commission noted the concerns raised by Greenpeace in its intervention on the development of a policy for probabilistic safety assessment, and requested additional information on this topic. CNSC staff reported on their review of the policy submitted by Bruce Power in March 2018, which Bruce Power developed in response to a Commission recommendation to Bruce Power during the 2015 licence renewal that Bruce Power develop a policy and formal document stipulating that enhancements to Bruce A and B will be considered if Probabilistic Safety Assessment (PSA) results are in between the safety goal limit and the safety goal target. CNSC staff reported that they had reviewed the policy and determined that the process is consistent with the Canadian nuclear industry's practice and meets CNSC expectations. The Commission was satisfied in this regard.

142. The Commission requested clarification on the issue of emergency mitigating equipment (EME) and whether it had been included in the current PSA. Bruce Power stated that, in some cases, the impact of EME had been included in PSA values, but in other cases it had not, depending on whether the EME had been fully deployed. Bruce Power also noted that EME did not always have a large impact on the frequency of events but could have a significant impact on the eventual severity of events if they did occur. The Commission was satisfied in this regard.

143. The Commission requested confirmation that all of the Fukushima action items for the Bruce NGS had been closed. The Bruce Power representative confirmed that the implementation of all Fukushima station-specific items were on schedule and provided details in this regard. CNSC staff explained that all of the generic Fukushima action items had been closed, but clarified that in some cases additional improvements, or station-specific actions, triggered as a result of work on Fukushima action items, were still underway. The Commission encouraged Bruce Power to complete the station-specific Fukushima actions as quickly as feasible.

144. With reference to the Saugeen Ojibway Nation's (SON) intervention, the Commission requested clarification on the stated probability of a severe accident as being one in 600. CNSC staff explained that the average annual risk value calculation for core damage frequency or large release frequency could not be extrapolated to estimate the cumulative risk over time, as was done in the case of this intervention. The Bruce Power representative added that risk was not additive and that adding risk in this way would indicate that not having an accident occur in a given year would increase the risk of an accident occurring in future years, which was not the case as long as

systems were maintained properly, and that therefore this number was not accurate.

145. In its consideration of the intervention from Greenpeace, the Commission enquired about whether the 2028 PSA would include a site-wide PSA. CNSC staff explained that the 2028 PSA would be conducted in accordance with the standards and REGDOCs that were current at the time, and that REGDOC-2.4.2 was currently undergoing a revision to include site-wide PSA. Bruce Power explained that even though the most recent PSA was not site-wide, it nonetheless provided important information about concrete actions that could be taken at the site to reduce the risk of negative effects to the public, and that this goal could be achieved even without a single site-wide number being produced. The Commission expressed its expectation that a site-wide PSA be included.

146. The Commission, noting Greenpeace's submissions regarding a risk reduction plan to reduce the likelihood of internal fires, asked for comments with regard to the difference between the internal fire risk between the Bruce A and Bruce B stations, as well as the reason why, even after the planned improvements had been carried out, the internal fire risk for Bruce A remained above the safety goal target. The Bruce Power representative explained that the difference between the two stations was related primarily to design differences between the two units, as Bruce A was built before Bruce B. The Bruce Power representative further explained that part of the reason was a limitation of the models used to estimate fire risk, which, in the absence of clear data, had to make conservative assumptions, with the result that the internal fire risk value remained high. The Bruce Power representative indicated that additional resources would be allocated to reducing this value in the future. CNSC staff explained that it would monitor Bruce Power's continuing efforts in this area and ensure that Bruce Power met regulatory requirements. The Commission was satisfied with the information provided, since the internal fire risk remained below the safety goal limit, but strongly encourages Bruce Power to continue enhancements to bring internal fire risk to below the safety goal target at the Bruce A NGS, in accordance with the policy discussed in paragraph 141. The Commission requests that CNSC staff report on progress in this regard in the annual ROR.

147. The Commission considered seismic analysis for the Bruce NGS. CNSC staff submitted that the seismic analysis performed by Bruce Power for the Bruce NGS met CNSC regulatory requirements and were conducted in adherence with CSA N289.1-08, *General requirements for seismic design and qualification of CANDU nuclear power plants*.[31]

148. Based on the information provided, the Commission finds that CNSC staff's analysis of the PSA for the Bruce NGS is adequate and that the PSA demonstrates that Bruce Power meets the regulatory requirements related to PSA for the Bruce NGS from all contributors: internal events, internal flood, internal fire, high winds and seismic PSAs.

[31] CSA Group Standard N289.1-08, *General requirements for seismic design and qualification of CANDU nuclear power plants*, 2008.

149. The Commission in this decision hereby confirms its direction to Bruce Power to provide aggregated values for safety goals and targets in future licence applications.

3.6.3 Criticality Safety

150. Bruce Power informed the Commission about its procedures and guidance at the Bruce NGS for in- and ex-core criticality control of nuclear fuel. Bruce Power noted that since only natural and depleted uranium were used at the Bruce NGS, there were no criticality concerns in light water or air due to the fuel's low fissile content and that nuclear fuel was segregated from heavy water at all times. CNSC staff confirmed this information and noted that Bruce Power's criticality safety program met the requirements of RD-327, *Nuclear Criticality Safety*.[32]

151. Based on the information provided the Commission is satisfied that Bruce Power is maintaining appropriate programs to ensure criticality safety at the Bruce NGS.

3.6.4 Severe Accident and Hazard Analysis

152. The Commission assessed the information provided by Bruce Power regarding severe accident analyses that were undertaken at Bruce NGS to evaluate residual risk. Bruce Power submitted that it had expanded the scope of PSA to include the analysis of severe accidents and that the updated PSAs included updated Level 2 PSA methodology and full consideration of severe accidents using MAAP4-CANDU software, an industry standard tool. Bruce Power also submitted information regarding the results of a severe accident software simulator solution (SASS) project, jointly conducted with OPG in 2015, which would be used to verify the multi-unit severe accident modeling capability of the MAAP-CANDU severe accident computer code. Bruce Power submitted that, in the next licence period, it would continue the ongoing improvement of the MAAP-CANDU code, including the development of the MAAP5-CANDU code.

153. CNSC staff confirmed the information provided by Bruce Power and informed the Commission that CNSC staff would continue to monitor the ongoing development of an improved MAAP-CANDU code over the next licence period.

154. On the basis of the information provided, the Commission is satisfied that the severe accident and hazard analyses performed by Bruce Power were adequate to evaluate and further mitigate residual risks at the Bruce NGS.

[32] CNSC Regulatory Document RD-327, *Nuclear Criticality Safety*, December 2010.

3.6.5 Management of Safety Issues

155. The Commission considered the information provided by Bruce Power and CNSC staff regarding the procedures and processes used at the Bruce NGS for the identification and management of safety-related issues. Bruce Power submitted information about their progress toward the resolution of Generic Action Items, indicating that all of the outstanding Generic Action Items had been closed with follow-up actions, or had been re-categorized and tracked as CANDU Safety Issues (CSIs). Bruce Power reported information related to four CSIs related to Large Break Loss of Coolant Accident (LBLOCA), and how these CSIs were managed. Bruce Power provided details on how new information and emerging issues revealed by operating experience, research and development (R&D) initiatives and performance analysis were tracked and managed at the Bruce NGS.

156. CNSC staff confirmed the information provided by Bruce Power, explaining that Bruce Power reported on its R&D activities annually in conformance with REGDOC-3.1.1 and that Bruce Power continued to maintain a robust R&D capability to address emerging issues.

157. CNSC staff also provided the Commission with detailed information regarding four Category 3 CANDU Safety Issues (CSIs) that were open during the current licence period at the Bruce NGS, noting that these open CSIs did not present a safety concern and represented technical areas where additional research was required.

158. CNSC staff reported that Bruce Power had developed a path forward for the reclassification of three of the open CSIs under the framework of the composite analytical approach (CAA), an analytical approach for large LOCA analysis. CNSC staff reported that it had reviewed the work done under this framework, and determined that the methodology is compliant with REGDOC-2.4.1 at a high level, but that further validation and clarification are still required in some areas in order for CNSC staff to accept the methodology. CNSC staff reported that it had accepted a proposed path forward and expected the analysis to be submitted for review in 2019. The Commission was satisfied in this regard and expressed that it expects CNSC staff to continue monitoring Bruce Power's development of a CAA for LOCAs with industry partners over the proposed renewed licence period.

159. Based on the information provided, the Commission is satisfied that Bruce Power has an adequate program in place for the management of emergent safety issues.

160. The Commission notes that CSIs were discussed in detail at the March 8, 2017 Commission meeting[33] and remains satisfied that CSIs were accurately categorized by CNSC staff. The Commission is also satisfied that CSIs are being addressed adequately by Bruce Power for the Bruce NGS.

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[33] *Minutes of the Canadian Nuclear Safety Commission (CNSC) held on March 8, 2017*

3.6.6 Conclusion on Safety Analysis

161. 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 finds that Bruce Power's safety analysis program for the Bruce NGS meets regulatory requirements and that Bruce Power has adequate preventive measures and strategies in place at the Bruce NGS to ensure the protection of workers, members of the public and the environment and that the facilities at Bruce NGS meet safety requirements.

162. The Commission expects CNSC staff to continue monitoring Bruce Power's development of a CAA for LOCAs with industry partners over the proposed renewed licence period.

163. The Commission directs Bruce Power to continue work on development of a site-wide PSA methodology and expects CNSC staff to continue monitoring Bruce Power's ongoing work in this area over the renewed licence period.

3.7 Physical Design

164. The Commission considered the physical design of facilities at the Bruce NGS, including the 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. CNSC staff rated Bruce Power's performance in this SCA as "satisfactory" throughout the current licence period.

3.7.1 Design Governance

165. The Commission assessed the adequacy of the Bruce NGS design program and considered the information submitted by Bruce Power and CNSC staff. Bruce Power informed the Commission that the physical design of the Bruce NGS was managed through the Plant Design Basis Management, Engineering Change Control, and Configuration Management programs. Bruce Power provided detailed information about how these programs provided a disciplined approach to the control of the physical configuration, design requirements, and facility configuration information such that the structures, systems, and components at the Bruce NGS were fully functional and supported safe, reliable plant operation.

166. CNSC staff informed the Commission that CNSC staff had determined that the physical design programs at the Bruce NGS met regulatory requirements, and that there were no safety significant outstanding issues related to physical design.

167. CNSC staff submitted that the Bruce NGS programs and procedures met regulatory requirements, and would be expected to be compliant with CSA N291-08, *Requirements for safety-related structures for CANDU nuclear power plants*,[34] by July 2018.

168. CNSC staff informed the Commission that the Bruce NGS was compliant with CSA N290.12-14, *Human factors in design for nuclear power plants*,[35] noting that Bruce Power updated their internal *Human Factors Program Plan* in 2016 to reflect CSA N290.12-14.

169. Bruce Power provided the Commission with details about the Environmental Qualification program at the Bruce NGS. CNSC staff confirmed the information provided, noting that it had been implemented and maintained in accordance with CSA N290.13-05, *Environmental Qualification of Equipment for CANDU Nuclear Power Plants*.[36]

170. CNSC staff confirmed to the Commission that it was satisfied with the Environmental Qualification program implemented at the Bruce NGS. CNSC staff additionally submitted that in 2015, CNSC staff performed an inspection of Bruce Power's Environmental Qualification program. CNSC findings from compliance verification activities identified some opportunities for improvement of low risk significance. CNSC staff determined that the submitted corrective action plan was acceptable.

Pressure Boundary Program

171. The Commission assessed the information provided by Bruce Power and CNSC staff about the pressure boundary program at the Bruce NGS. CNSC staff submitted that Bruce Power has a documented pressure boundary program that met CSA N285.0, *General Requirements for Pressure-retaining Systems and Components in CANDU Nuclear Power Plants*.[37]

172. The Commission assessed the information submitted by CNSC staff regarding the formal agreement in place for the Technical Standards and Safety Authority (TSSA) to act as an Authorized Inspection Agent (AIA) to provide services for the pressure boundary components at the Bruce NGS. CNSC staff submitted that it had conducted an inspection on the implementation of the pressure boundary program in 2017, including the AIA service agreement, and found that Bruce Power's implementation of the pressure boundary program met requirements. The Commission was satisfied in this regard.

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[34] N291-08, *Requirements for safety-related structures for CANDU nuclear power plants*, CSA Group, Update 2, 2014.
[35] N290.12-14, *Human factors in design for nuclear power plants*, CSA Group, 2014.
[36] N290.13-05, *Environmental Qualification of Equipment for CANDU Nuclear Power Plants*, CSA Group, Update 1, 2009.
[37] N285.0, *General Requirements for Pressure-retaining Systems and Components in CANDU Nuclear Power Plants*, CSA Group, Update 2, November 2014.

173. Based on the information provided for this hearing, the Commission concludes that the programs that Bruce Power has in place for design governance at the Bruce NGS are adequate and satisfy the parameters of the applicable codes and standards.

3.7.2 Systems and Components Design

174. The Commission considered the adequacy of the design of Bruce NGS systems and components. Bruce Power submitted information about the programs employed at the Bruce NGS to manage the system and components design. CNSC staff submitted that the electrical systems at Bruce NGS met design requirements and that Bruce Power maintained an adequate electrical power system at the Bruce NGS throughout the current licence period. CNSC staff reported that Bruce Power identified two low-risk vulnerabilities. CNSC staff considered Bruce Power's response to these vulnerabilities to be acceptable and committed to follow-up on Bruce Power's corrective actions.

175. CNSC staff provided information to the Commission about an event in May 2017, when Unit 4 of the Bruce NGS was shut down due to a circuit breaker deficiency. CNSC staff indicated that the event was of low risk significance and that Bruce Power responded adequately to the event.

176. CNSC staff reported to the Commission that Bruce Power satisfied all regulatory requirements in regard to Bruce NGS instrumentation and control design. CNSC staff noted that, as a follow-up to the 2015 licence renewal, CNSC staff identified a minor concern related to low flow indication of Units 3 and 4 of the Bruce NGS. CNSC staff further reported that Bruce Power submitted a corrective action plan and initiated the installation of devices to correct this issue. CNSC staff indicated that it would continue to monitor the progress of this work.

177. CNSC staff reported to the Commission that the fuel defect rate at Bruce A Units 1 and 2 was higher than the industry average due to fretting defects as a result of damage caused by debris introduced during unit refurbishment. CNSC staff reported that despite this higher than average rate of defects, the defect rate was trending down because the debris was gradually being removed from the primary heat transport system. CNSC staff also reported that the fuel defect rate for Units 3 to 8 was within the industry average of about one bundle per year. CNSC staff advised the Commission that, in CNSC staff's view, Bruce Power fuel usage remained safe for all units and that fuel performance met CNSC requirements.

178. In response to the intervention by Northwatch, the Commission requested additional details about the frequency of fuel defects at the Bruce NGS and the potential of such defects to cause safety issues or to result in additional waste. The Bruce Power representative responded that fuel defects in the core were relatively rare, and therefore did not result in significant additional waste volumes, but that when they did occur, the affected fuel was removed from the core and stored in a similar fashion to

used fuel, first in the wet irradiated fuel bays (IFBs) and eventually in dry storage vessels. The Bruce Power representative also distinguished these types of defects from the heat transport system defects that occurred after restarting Units 1 and 2, which were caused by the presence of debris in the heat transport system, and explained that plans were in place to prevent similar issues from occurring as part of Bruce Power's planned refurbishment activities.

179. Further on the issue of fuel defects, CNSC staff emphasized that this was not a new issue and that the CNSC had stringent regulatory requirements in place concerning the inspection and storage of fuel. In particular, CNSC staff explained that monitoring was in place at the IFBs and that fuel bundles with defects were closely monitored. CNSC staff also confirmed that fuel defects were reportable events that would be brought before the Commission for information as part of the NPP Status Report, Event Initial Reports, and the annual Regulatory Oversight Reports. The Commission was satisfied with this response.

Fire Safety and Fire Protection Systems

180. The Commission considered the adequacy of the Fire Protection Program at the Bruce NGS. Bruce Power submitted information about the fire training facility that opened at the Bruce NGS in 2015, and provided training opportunities for the Bruce NGS Emergency and Protective Services department.

181. CNSC staff provided information regarding historical design related non-conformances at Bruce NGS when compared to modern codes and standards such as the *National Building Code of Canada 2010*,[38] *National Fire Code of Canada 2010*,[39] and CSA N293-12, *Fire protection for nuclear power plants*.[40] CNSC staff reported details regarding the compensatory measures that Bruce Power has employed, and an implementation plan to address remaining non-conformances by 2021. CNSC staff noted that progress on the implementation plan would be reported annually in the ROR. CNSC staff reported that Bruce Power's Fire Protection Program, including compensatory measures and the implementation plan, satisfied regulatory requirements.

Seismic Qualification

182. The Commission considered the information submitted by Bruce Power regarding seismic qualification. Bruce Power reported that Bruce A had not originally been qualified to a design basis earthquake, and provided information about the seismic margin assessment used to qualify it to a review level earthquake, which is stronger than a design basis earthquake. Bruce Power submitted that Bruce B had been

[38] IRC-10NBC, *National Building Code of Canada 2010*, National Research Council, 2010.
[39] IRC-10NBF, *National Fire Code of Canada 2010*, National Research Council, 2010.
[40] N293-12, *Fire protection for nuclear power plants*, CSA Group, 2012.

qualified to a design basis earthquake due to its later design and construction. Bruce Power submitted that CSA N289.3, *Design Procedures for Seismic Qualification of Nuclear Power Plants*[41] was implemented at the Bruce NGS.

183. CNSC staff reported that Bruce Power had agreed to implement several new and updated standards related to seismic qualification over the proposed 10-year licencing period, including CSA N289.1-18, *General requirements for seismic design and qualification of CANDU nuclear power plants*,[42] CSA N289.2-10, *Ground motion determination for seismic qualification of CANDU nuclear power plants*,[43] CSA N289.4-12, *Testing procedures for seismic qualification of nuclear power plant structures, systems, and components*,[44] and CSA N289.5-12, *Seismic instrumentation requirements for nuclear power plants and nuclear facilities*[45]. CNSC staff reported that these standards were expected to be implemented by September 1, 2018.

184. On the basis of the information provided for this hearing, the Commission is satisfied that the systems and components design programs at Bruce NGS are adequate and meet, or will meet, the specifications of the appropriate codes and standards.

3.7.3 Conclusion on Physical Design

185. On the basis of the information presented, the Commission concludes Bruce Power continues to implement and maintain an effective design program at the Bruce NGS and that the design of the Bruce NGS is adequate for the operation period included in the renewed licence. The Commission is satisfied with CNSC staff's assessment of the adequacy of the physical design of the Bruce NGS.

186. The Commission expects Bruce Power to continue taking actions to reduce the fuel defect rate at the Bruce NGS Units 1 and 2 to below industry average during the proposed licence period. The Commission also expects CNSC staff to continue its close monitoring of the fuel defect rate at these two units.

187. The Commission expects Bruce Power to implement improvements to address fire protection system non-conformances at the Bruce NGS in accordance with the schedule provided in this hearing. The Commission also expects CNSC staff to monitor the implementation of these improvements and report to the Commission about any deviations in this regard.

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[41] N289.3, *Design Procedures for Seismic Qualification of Nuclear Power Plants*, CSA Group, 2010.
[42] N289.1-18, *General requirements for seismic design and qualification of CANDU nuclear power plants*, CSA Group, 2018.
[43] N289.2-10, *Ground motion determination for seismic qualification of CANDU nuclear power plants*, CSA Group, 2010.
[44] N289.4-12, *Testing procedures for seismic qualification of nuclear power plant structures, systems, and components*, CSA Group, 2012.
[45] N289.5-12, *Seismic instrumentation requirements for nuclear power plants and nuclear facilities*, CSA Group, 2012.

188. The Commission notes the seven CSA Group standards planned to be implemented at the Bruce NGS and expects Bruce Power to implement these standards as proposed during the hearing, noting that implementation of these standards will be reflected in the LCH.

3.8 Fitness for Service

189. Fitness for Service covers activities that are performed to ensure that the systems, structures and components (SSCs) at the Bruce NGS continue to effectively fulfill their intended purpose. CNSC staff rated Bruce Power's performance in this SCA as "satisfactory" throughout the current licence period.

190. Bruce Power informed the Commission that the chemistry specifications for each system were reviewed in preparation for the MCR and that logistical and planning work continued to ensure proper chemistry conditions between shutdown and the inoperative state (layup) during the MCR. Bruce Power added that chemistry control was important to preserve the integrity of structures, systems and components important to safety by limiting and controlling corrosion that can cause degradation.

3.8.1 Equipment Fitness for Service

191. The Commission considered the information provided by the Bruce Power and CNSC staff regarding the fitness for service of equipment at the Bruce NGS. Bruce Power described the activities integrated in the Equipment Reliability program and stated that Bruce Power addressed aging management for critical components in accordance with REGDOC-2.6.3, *Aging Management*.[46] Further on equipment fitness for service, Bruce Power presented information on the supporting programs and past performance and noted that Bruce Power notified the CNSC of the equipment condition in accordance with specifications of CSA N285.4-09, *Periodic Inspection of CANDU Nuclear Power Plant Components*.[47]

192. CNSC staff confirmed Bruce Power's information and provided the Commission with detailed information regarding several equipment performance issues encountered at the Bruce NGS during the current licence period, noting that these were monitored through ongoing regulatory oversight activities. CNSC staff confirmed to the Commission that Bruce Power had programs in place to monitor the fitness for service of equipment at the Bruce NGS to support the continued safe operation for the proposed licence period. The Commission is satisfied with CNSC staff's assessment in this regard.

193. Based on the information presented on the record for this hearing, the Commission is satisfied that Bruce Power has adequate processes in place to ensure that the

[46] CNSC Regulatory Document REGDOC-2.6.3, *Aging Management*, March 2014.
[47] N285.4, *Periodic Inspection of CANDU Nuclear Power Plant Components*, CSA group, 2009

equipment at the Bruce NGS will remain fit for service throughout the licence period.

194. The Commission expects Bruce Power to implement corrective actions in regard to the equipment performance issues presented during this hearing and expects CNSC to monitor Bruce Power's progress in this regard. The Commission requests that progress on this initiative be reported on annually in the NPP ROR until such time as the implementation is completed.

3.8.2 Maintenance

195. The Commission considered the adequacy of Bruce Power's maintenance programs. Bruce Power described the program to the Commission and noted that, in the past year, Bruce Power focused on oversight of preventative maintenance deferrals and reduced the maintenance backlogs. Bruce Power also noted that a large amount of maintenance procedures were revised during the current licensing period.

196. In its written submission, Bruce Power presented to the Commission a list of components that were replaced or refurbished through maintenance outages since 2001 and added that this maintenance improved the performance of the Bruce NGS and extended the components' operational lives.

197. CNSC staff confirmed the information provided by Bruce Power and reported that Bruce Power met the expectations of RD/GD-210, *Maintenance Program for Nuclear Power Plants*[48] throughout the current licence period. CNSC staff also submitted information on performance indicators for maintenance backlogs and deferrals at the Bruce NGS and reported that, with a preventive maintenance completion ratio of 88%, Bruce Power had a maintenance program that adequately controlled the number of open corrective maintenance activities. CNSC staff further noted that the number of deferrals of critical preventive maintenance work was within the range of industry best practices and was continuously reduced in the current licence period.

198. After considering the information provided on the record for this hearing, the Commission is satisfied that Bruce Power has adequate maintenance programs in place at Bruce NGS for the renewed licence period.

199. The Commission notes the improvements in critical preventive maintenance deferrals during the current licence period and encourages Bruce Power to continue its improvements in this regard.

3.8.3 Reliability

200. The Commission assessed Bruce Power's reliability program for the Bruce NGS.

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[48] CNSC Regulatory Document/Guidance Document RD/GD-210, *Maintenance Program for Nuclear Power Plants*, 2012.

CNSC staff reported that, over the current licence period, Bruce Power submitted an implementation plan for RD/GD-98, *Reliability Programs for Nuclear Power Plants.*[49] CNSC staff also provided the Commission with detailed information regarding temporary impairments to special safety systems that occurred during the current licence period.

201. Bruce Power informed the Commission that the Bruce Power Equipment Reliability program was based on the INPO AP-913, *Equipment Reliability Process Description.*[50] Bruce Power indicated that Bruce Power had an improving trend in Equipment Reliability Index performance. Bruce Power explained that the Equipment Reliability Index was the industry-standard metric for measuring and demonstrating status of overall equipment performance.

202. CNSC staff informed the Commission that over the current licensing period, Bruce Power took appropriate actions to address the temporary impairments to special safety systems and that corrective actions were taken to prevent recurrence.

203. Based on the information presented, the Commission is satisfied that Bruce Power has implemented an adequate reliability program at the Bruce NGS.

3.8.4 Aging Management

204. The Commission examined the information submitted by Bruce Power and CNSC staff regarding the Bruce NGS aging management program. Bruce Power provided information about Bruce NGS activities that addressed aging management and stated that aging management at Bruce NGS was in accordance with REGDOC-2.6.3. Bruce Power reported that Bruce NGS had a life cycle management plan (LCMP) in place to manage the aging of major components prior to them being replaced during the proposed MCR.

205. CNSC staff confirmed the information provided by Bruce Power and submitted that Bruce Power had an integrated aging management program that ensured the continued health of safety-significant SSCs. CNSC staff reported that Bruce Power had a program in place to manage the aging of major components, comprising of feeders, steam generators and preheaters, fuel channels and civil structures, in accordance with REGDOC-2.6.3. CNSC staff added that the effectiveness of the LCMPs will be monitored during the renewed licence period through the review of updates, periodic inspection reports and the outcomes of research activities.

[49] CNSC Regulatory Document/Guidance Document RD/GD-98, *Reliability Programs for Nuclear Power Plants*, 2012.
[50] INPO AP-913, *Equipment Reliability Process Description*, Revision 1, Institute of Nuclear Power Operators, 2001.

3.8.4.1 Fuel Channels

206. The Commission noted that the current licence authorized Bruce Power to operate the fuel channels at the Bruce NGS up to 247,000 Equivalent Full Power Hours (EFPH). In its licence renewal application, Bruce Power submitted to the Commission a request and the technical basis for the operation of up to 300,000 EFPH for Units 3 – 8. Bruce Power presented the primary degradation mechanisms and the approaches to ensuring fitness-for-service for pressure tubes as well as the projected maximum hydrogen equivalent concentrations ([Heq]) for every unit according to their proposed outage date.

207. In its written materials, Bruce Power explained to the Commission how fitness for service was demonstrated at the Bruce NGS through periodic inspections in accordance with Bruce Power's LCMP. Bruce Power added that the LCMP met the specifications of CSA N285.4-09, Update 2, *Periodic inspection of CANDU nuclear power plant components*,[51] as well as the acceptance criteria of CSA N285.8-10, *Technical requirements for in-service evaluation of zirconium alloy pressure tubes in CANDU reactors*.[52] Bruce Power also provided information about the fracture toughness model that was used as an input into assessments used to support safe operation and provided detailed information about the ongoing burst test research program to validate the upcoming models, noting that burst tests were planned through 2022, with more to be potentially carried out beyond 2023 following the evaluation of the initial tests.

208. CNSC staff confirmed Bruce Power's information and reported that the current fracture toughness models did not support Bruce Power's request to be able to operate any pressure tube with an [Heq] in excess of 120 ppm. CNSC staff added that, for Bruce Power to be authorized to operate with the pressure tubes with an [Heq] in excess of 120 ppm, Bruce Power would have to satisfactorily demonstrate to the CNSC that the condition of the pressure tubes could be assessed to support safe operations beyond 120 ppm [Heq].

209. During Part 1 of this public hearing, the Commission expressed concern in respect of the proposed Licence Condition 15.3 because it did not specify a maximum [Heq] for the pressure tubes. To address the Commission's concerns, CNSC staff proposed a revised Licence Condition 15.3 during Part 2 of the hearing to strengthen the language of the Licence Condition as recommended by the Commission during Part 1:

Before hydrogen equivalent concentrations exceed 120 ppm, the licensee shall demonstrate that pressure tube fracture toughness will be sufficient for safe operation beyond 120 ppm.

CNSC staff added that the associated compliance verification criteria in the proposed

[51] N285.4-09, *Periodic inspection of CANDU nuclear power plant*, Update 2, CSA Group, 2009.
[52] N285.8-10, *Technical requirements for in-service evaluation of zirconium alloy pressure tubes in CANDU reactors*, CSA Group, 2010.

Bruce NGS LCH were also strengthened to add clarity with respect to CNSC regulatory requirements and expectations in respect of pressure tube [Heq]. CNSC staff commented that the planned schedule for the additional research and the further development of the fracture toughness model allowed for sufficient time for CNSC staff review to ensure safety margins. The Commission notes that pursuant to Licence Condition 15.3, approval by the Commission will be required for Bruce Power to operate with pressure tubes in excess of 120 ppm of [Heq].

210. CNSC staff further added that, should pressure tube [Heq] in any Bruce NGS reactor unit reach 120 ppm and that the proposed fracture toughness model was not ready in time or not accepted by the CNSC, Bruce Power would have to shut down the reactor or shut down the reactor to start the refurbishment earlier. CSNC staff explained that its confidence in Bruce Power's demonstration of sufficient pressure tube fracture toughness would be established by looking at three areas: the theoretical understanding of what was happening in the pressure tubes; the development of a model allowing pressure tube safety assessments; and the analysis methods that used the fracture toughness values to demonstrate safety. CNSC staff further explained that the current model used for pressure tube safety assessments was comprised of two components: one for the operating conditions and one for the heat up and cool down cycles during reactor shutdowns.

211. The Commission asked for clarification about the different [Heq] limits present in the CSA N285.8-10 and the proposed LCH. CNSC staff explained that the limits of 70 ppm at the inlet and 100 ppm at the outlet came from an estimation based on an early design of CANDU reactors. CNSC staff further explained an [Heq] of 70 ppm represented double the solubility limit for hydrogen in pressure tubes at the inlet end and an [Heq] of 100 ppm represented double the solubility limit for hydrogen in pressure tubes at the outlet end. CNSC staff added that the 120 ppm [Heq] was the current limit with respect to the modelling capability and that the CSA Group standard would eventually be revised to reflect the new limits.

212. The Commission further enquired about the role played by the inlet and outlet pressure tube [Heq] limits. CNSC staff explained that the limits were originally set as thresholds where the licensee was required to present a plan to the CNSC which would explain what the licensee would do in respect of ensuring that the pressure tubes remained fit for service. CNSC staff added that the limits were still in the CSA Group standard because they were considered a useful trigger to ensure that licensees came to the CNSC to present the status of the pressure tubes. The Commission was satisfied that adequate mechanisms and controls were in place to require Bruce Power to monitor and report on the Bruce NGS pressure tubes' fracture toughness and fitness for service.

213. The Commission asked about the different rates of deterioration between the inlet and the outlet of the pressure tubes. CNSC staff explained that temperature had to be taken into account in the fracture toughness model and that the water temperature going into

the pressure tube (inlet) was lower than water temperature exiting the pressure tube (outlet) resulting in a faster material deterioration at higher [Heq] at the outlet.

214. The Commission enquired about how burst tests were carried out and whether the National Research Universal (NRU) reactor at Chalk River Laboratories (CRL) was required to perform the burst tests that would be used to validate the fracture toughness model. The Bruce Power representative explained that the pressure tube material used for burst test experiments came from pressure tubes that were removed from operating reactors, not from the NRU reactors and that the burst tests were carried out at the CRL site. The Bruce Power representative also explained that additional hydrogen could be added to the test specimens if needed to reach a specific [Heq] and that the highest [Heq] used for a burst test, so far, was 204 ppm.

215. The Commission enquired about the leak before break principle for pressure tubes with higher [Heq]. The Bruce Power representative explained that licensees had to perform leak before break analysis at every outage to demonstrate that the leak before break methodology would provide the defence-in-depth protection that was required until at least the next outage. CNSC staff added that if a licensee could not demonstrate leak before break or fracture protection for a pressure tube in accordance with CSA Group standards, the licensee would have to replace the pressure tube, make changes in the way that the reactor was operated or stop operation. The Commission was satisfied with the information provided in this regard.

216. In response to an enquiry from the Commission, Bruce Power informed the Commission of its plan to extend the validity limits of the existing fracture toughness model to 140 ppm of [Heq] in pressure tubes by the end of 2018 and to 160 ppm of [Heq] by the end of 2019. CNSC staff informed the Commission that CNSC staff would review the validity of the proposed models before proposing that the Commission approve Bruce Power to operate with pressure tubes in excess of 120 ppm of [Heq]. CNSC staff indicated that the status of this work would be reported to the Commission through the annual regulatory oversight report for Canadian nuclear power generating sites.

217. The Commission considered the intervention from Dr. Nijhawan and specifically where the intervenor raised concerns about the fitness for service of pressure tubes at the Bruce NGS and requested additional information in this regard. CNSC staff provided the Commission with information on a range of topics including how and where the use of hot hours and EFPH was required, the [Heq] limits in the CSA Group standard, the leak-before-break assessments that had been carried out and how fuel channel elongation was managed. CNSC staff informed the Commission that its overall assessment was that the matters raised in the intervention were well understood by CNSC staff and were adequately addressed.[53] The Commission was satisfied with CNSC staff's assessment of this intervenor's concerns.

[53] CMD 17-M14, Status Update: CNSC Staff Assessment ─Industry's Disposition of Dr. S. Nijhawan's Questions, March, 2017.

218. The Commission enquired about the maximum number of plugged steam generator tubes permitted for safe reactor operation. The Bruce Power representative indicated that the steam generators could be safely operated with up to 10 percent of their tubes plugged. CNSC staff provided the Commission with information on the current status of plugged steam generator tubes at the Bruce NGS and reported that there was no risk to safety. The Commission was satisfied with the information provided in this regard.

219. Based on the information provided, the Commission is satisfied that Bruce Power has an appropriate aging management plan in place at the Bruce NGS and authorizes Bruce Power to operate Bruce A and B NGS up to a maximum of 300,000 EFPH.

220. The Commission will await updates from CNSC staff on the status of the Bruce Power's activities towards satisfying the compliance verification criteria through the annual ROR.

3.8.5 Chemistry Control

221. Bruce Power informed the Commission about the Bruce NGS chemistry control program, noting that chemistry management program consisted of several key processes. Bruce Power reported that Bruce Power chemistry index and chemistry compliance index for the Bruce NGS were reported to the CNSC in accordance with REGDOC-3.1.1.

222. CNSC staff confirmed to the Commission the information provided by Bruce Power and submitted that Bruce Power's chemistry control program met regulatory requirements. CNSC staff provided detailed information on the chemistry performance of different Bruce NGS systems noting that Bruce Power's isotopic purity was within licensing limits. CNSC staff informed the Commission about a downward trend in moderator deuterium oxide (D_2O) isotopic purity for all Bruce NGS units, adding that Bruce Power had since put corrective actions in place. CNSC staff informed the Commission that the reduced D2O isotopic purity did not impact the safe operation of the plant and that safety systems functions were not impaired. CNSC staff noted that it would be monitoring Bruce Power's performance over the next licensing period to ensure that the D_2O isotopic purity does not continue to trend negatively downwards.

223. Based on the information provided by Bruce Power and CNSC staff, the Commission is satisfied that Bruce Power has maintained and will continue to maintain an adequate chemistry control program in place at the Bruce NGS.

3.8.6 Periodic Inspection and Testing

224. Bruce Power provided the Commission with detailed information about the Bruce NGS periodic inspection programs for safety-related plant SSCs. Bruce Power

reported that safety-related SSCs underwent periodic inspections in conformance with CSA N285.4-09, *Periodic inspection of CANDU nuclear power plant components*[54] and gave detailed information about the inspection of each system.

225. CNSC staff confirmed the information provided by Bruce Power and reported that a 2016 inspection confirmed Bruce Power's compliance with CSA N285.4-09 requirements and that Bruce Power submitted a transition plan to meet Update 1 of the 2009 edition CSA N285.4. CNSC staff added that Bruce Power also had well-maintained periodic inspection programs that met the expectations of CSA N285.5-08, *Periodic inspection of CANDU nuclear power plant containment components*[55] and CSA N287.7-08, *In-service examination and testing requirements for concrete containment structures for CANDU nuclear power plants*.[56] CNSC staff also informed the Commission that Bruce Power had reported several relief valve test failures, confirmed that Bruce Power had undertaken a review and implemented corrective actions and added that CNSC staff would continue to monitor the results of the relief valve testing program.

226. The Commission enquired about the percentage of pressure tubes that had been inspected at the Bruce NGS. CNSC staff answered that 30 percent of the pressure tubes had been inspected since the beginning of operation and that the fracture toughness model was modelling the status of the uninspected tubes.

227. The Commission requested comments about the recommendation in the intervention from Northwatch in respect of performing an assessment of the integrity of the IFBs and if it was done as part of the PSR. The Bruce Power representative explained that the PSR's primary purpose was not the status of the equipment but to look at new standards to determine if there were new requirements. The Bruce Power representative further explained Bruce Power does assess the integrity of the IFBs and found that the epoxy liner at the Bruce A primary fuel bay had developed cracks from which the water was leaking through. The Bruce Power representative added that the leaked water was collected and either stored or reused and that the leak was not a safety issue but an economic one and that Bruce Power was taking effective means to find solutions to the cracks in the fuel bays. CNSC staff confirmed to the Commission that Bruce Power had an aging management program which met all of the CNSC requirements, in particular REGDOC-2.6.3 and that the program covered the IFBs and that the integrity of the fuel bays had been confirmed. The Commission was satisfied with the information provided in this regard by Bruce Power and Bruce Power is to continue implementing corrective actions in regard to the IFB cracks as part of its aging management responsibilities.

228. Based on the information provided, the Commission is satisfied that Bruce Power has adequate processes and programs in place to support safe operations at the Bruce

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[54] N285.4-09, *Periodic inspection of CANDU nuclear power plant*, CSA Group, 2009.
[55] N285.5-08, *Periodic inspection of CANDU nuclear power plant components*, CSA Group, 2008.
[56] N287.7-08, *In-service examination and testing requirements for concrete containment structures for CANDU nuclear power plants*, CSA Group, 2008.

NGS.

229. The Commission expects Bruce Power to implement updated standards at the Bruce NGS as proposed during this hearing, and anticipates being updated on progress on such implementation as a matter of course.

3.8.7 Conclusion on Fitness for Service

230. Based on the information provided on the record for this hearing, the Commission is satisfied with Bruce Power's programs for the inspection and life-cycle management of key safety systems at the Bruce NGS. Based on the above information, the Commission concludes that the equipment as installed at the Bruce NGS is fit for service and that appropriate programs are in place, and will continue to be in place to ensure that the equipment remains fit for service throughout the renewed licence period.

231. The Commission notes that the current fracture toughness models shall be updated before Bruce Power can be authorized by the Commission to operate with pressure tubes in excess of 120 ppm of [Heq].

232. Based on the information provided, the Commission is satisfied that Bruce Power has an appropriate aging management plan in place at the Bruce NGS and authorizes Bruce Power to operate Bruce A and B NGS up to a maximum of 300,000 EFPH.

3.9 Radiation Protection

233. As part of its evaluation of the adequacy of the measures 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 how the Bruce NGS radiation protection program ensured that both radiation doses to persons and contamination were monitored, controlled and kept as low as reasonably achievable (ALARA), with social and economic factors taken into consideration. CNSC staff rated Bruce Power's performance in this SCA as "satisfactory" in 2014 and 2015, and as "fully satisfactory" in 2016 and 2017.

234. The Commission considered the information provided by Bruce Power and CNSC staff to assess whether the Bruce NGS radiation protection program satisfied the requirements of the *Radiation Protection Regulations*.[57] CNSC staff submitted that, throughout the current licence period, Bruce Power implemented an appropriate and effective radiation program at the Bruce NGS that satisfied or exceeded regulatory requirements.

235. The Commission asked for additional detail about how Bruce Power's rating had

[57] SOR/2000-203.

improved from satisfactory to fully satisfactory in the Radiation Protection SCA in 2016. Bruce Power explained that the change was largely attributable to three areas: a reduction in personal contaminations; capital investments in reduction of worker dose; and updated shielding practices. The Commission commended Bruce Power on the improvements that had been implemented to achieve the fully satisfactory rating in this SCA.

Radiation Protection for MCR

236. Bruce Power stated that, due to the large-scale cutting and removal of contaminated components during the MCR, Bruce Power would focus on contamination control, as well as the mitigation and control of tritium and other airborne radiological hazards. Bruce Power added that opportunities to use robotic tools to reduce worker dose would be explored. CNSC staff mentioned that its regulatory activities over the next licensing period would include the review and verification of ALARA management plans related to the MCR.

237. Commenting on the intervention by the Provincial Building and Construction Trades Council of Ontario, the Commission enquired about the lessons learned from the alpha release incident that happened during the refurbishment of Bruce Power NGS Unit 1.[58] CNSC staff provided a summary of the incident, noting that there was no expected health impact to any of the workers affected. Bruce Power explained the improvements that it had made to its radiation protection program, stating that the alpha program was well documented in Bruce Power's radiation protection program with established training and increased equipment for monitoring. CNSC staff confirmed that Bruce Power's radiation protection program integrated best practices from external organizations, such as the Electric Power Research Institute (EPRI) guidelines. The Bruce Power representative added that a random bioassay program was in place for anyone with the potential for exposure to alpha radiation to validate the efficiency of the program. CNSC staff told the Commission that it had verified that all licensees integrated into their programs the appropriate measures to ensure that the contaminants are detected, that the workers are protected, and that there were provisions in their work planning to identify those hazards. CNSC staff stated that CNSC site inspectors would consider this an area for enhanced oversight as part of the upcoming MCR activities. The Commission was satisfied with the information provided in this regard.

238. Commenting on the intervention by the Provincial Building and Construction Trades Council of Ontario, the Commission requested information about the alpha release incident that occurred during the refurbishment of Bruce A Units 1 and 2 in 2009, particularly on the lessons learned and how they were integrated into operating procedures in order to prevent a similar incident from occurring again. CNSC staff provided a summary of the incident, noting that there was no expected health impact to any of the workers affected. Bruce Power explained the improvements that it had

[58] Canadian Nuclear Safety Commission, CMD 10-M13, Early Notification Reports - Bruce Power - Alpha Contamination Event in Bruce A Unit 1, February 18, 2010.

made to its radiation protection program, with CNSC staff confirming that the program integrated best practices from external organizations, such as the Electric Power Research Institute (EPRI) guidelines. CNSC staff stated that CNSC site inspectors would consider this an area for enhanced oversight as part of the upcoming MCR activities. The Commission was satisfied with the information provided in this regard.

3.9.1 Application of ALARA

239. The Commission assessed the information submitted by Bruce Power and CNSC staff regarding the application of ALARA at the Bruce NGS. Bruce Power submitted information about the practices used at the Bruce NGS to ensure that individual and collective dose were reduced to be ALARA, including work planning and dose reduction initiatives such as the use of an ALARA program, and mock-up rehearsals for higher risk or long duration work activities. Bruce Power also submitted information about ongoing or planned ALARA initiatives at the Bruce NGS. CNSC staff submitted that Bruce Power continued to implement a highly effective and well-documented ALARA program at the Bruce NGS during the current licencing period.

240. Based on the information considered for this hearing, the Commission is satisfied that the ALARA concept is adequately applied to all Bruce NGS activities.

241. The Commission expects Bruce Power to consider lessons learned from the 2009 alpha event and from the recent alpha event at the Darlington NGS in its proposed MCR project and expects CNSC staff to carry out additional compliance verification in this regard during the proposed licence period.

3.9.2 Worker Dose Control

242. Bruce Power provided the Commission with detailed information regarding the average and maximum effective doses to workers at the Bruce NGS and reported on a number of dose reduction and dose control initiatives completed during the current licensing period. Bruce Power additionally noted that while worker dose control initiatives at the Bruce NGS had resulted in a reduction in the collective radiation exposure over the past 2 years, Bruce Power foresaw that collective radiation exposure would remain a challenge during the planned MCR project and life extension and outage programs, and that Bruce Power would work with CNSC staff to address this challenge.

243. The Commission called for comments on the production of high specific activity cobalt at the Bruce NGS enquiring about whether this production posed any new radiation protection risks and, if so, how these have been accounted for in Bruce Power's procedures. CNSC staff explained that this production was undertaken within the CNSC's regulatory framework and that all new activities were reviewed by CNSC

staff to ensure that they presented no unreasonable risk. CNSC staff further explained that, in this case, there was little difference between the previous practice, which produced irradiated cobalt as a waste product, and the new practice of producing high specific activity cobalt and sending it to Nordion for further processing. CNSC staff stated that this new product represented a diversion of what was previously considered a waste stream, and that both the former and new practice were undertaken in accordance with the CNSC's regulatory framework.

244. The Commission requested comments about an intervention by E. Bourgeois and A. Tilman that questioned the dose limit for contractors and whether this limit was different than that for employees. CNSC staff explained that the regulatory dose limit for all nuclear energy workers (NEW) was 50 mSv over a single year and 100 mSv over 5 years, and that this did not differ depending on whether the NEW was a contractor or a Bruce Power employee. Bruce Power explained that there was a difference in their internal administrative limits used to manage dose control before the regulatory limits were met, and that the administrative limit used at the Bruce NGS was 20 mSv per year for Bruce Power employees and 40 mSv per year for contractors. CNSC staff stated that licensees had the ability to set internal administrative limits as they saw fit, as long as they continued to meet the regulatory dose limit and follow the ALARA principle.

245. Based on the information provided for this hearing, the Commission is satisfied that doses to workers at the Bruce NGS are adequately controlled.

3.9.3 Radiological Hazard Control

246. The Commission assessed Bruce Power's identification and control of existing and potential radiological hazards during work activities at the Bruce NGS. Bruce Power submitted that radiological hazards were identified and measured through routine and work-specific surveys, and that measures were taken to eliminate or control hazards, using engineered barriers, signage and shielding as appropriate.

247. CNSC staff reported that Bruce Power had noticeably improved performance in personal contamination events since 2013, and that no action levels were exceeded for surface contamination and no safety-significant performance issues were identified at the Bruce NGS. CNSC staff further reported that Bruce Power's radiation protection program included measures to monitor and control radiological hazards, such as contamination control, radiation dose rate control and airborne radiation monitoring and control. CNSC staff also provided information about the contamination control process at the Bruce NGS, which included establishing radiological zones, having a routine hazard monitoring program, classifying areas according to their radiation hazard potential, posting signs identifying the radiation areas and potential radiation hazards, restricting access to authorized personnel, and monitoring personnel and material prior to leaving contaminated or potentially contaminated areas.

248. CNSC staff reported on the results of a focused inspection conducted by CNSC staff in July 2015. CNSC staff reported that the inspection identified several positive findings and one area requiring improvement of low safety significance related to the labelling and calibration of radiation protection instrumentations. CNSC staff reported that all corrective actions from this inspection had been completed in 2016. CNSC staff submitted that Bruce Power had taken appropriate actions to address the inspection findings.

249. On the basis of the information provided for this hearing, the Commission is satisfied that Bruce Power will continue to adequately identify and control radiological hazards at the Bruce NGS.

3.9.4 Control of Dose to the Public

250. The Commission considered the effectiveness of Bruce Power's programs to prevent uncontrolled releases of contaminants or radioactive materials to the public from the Bruce NGS site. Bruce Power submitted that the dose to the public had been maintained below 10 µSv per year since 2001, a very small percentage of the annual legal limit of 1 mSv.

251. The Commission asked for comments in regard to an intervention from the Bruce Peninsula Environment Group that suggested that the 1 mSv regulatory limit for dose to the public was not adequately protective and that a difference in exposure existed for male and female subjects. CNSC staff explained that this statement was incorrect, and that based on the consensus of international research, 1 mSv is a protective limit regardless of whether the subject is male or female.

252. Based on the Commission's assessment of the information provided for this hearing, the Commission is satisfied that Bruce Power is adequately controlling radiological doses to the public.

3.9.5 Conclusion on Radiation Protection

253. Based on the information provided on the record for this hearing, the Commission concludes that, given the mitigation measures and safety programs that are in place and will be in place to control radiation hazards, Bruce Power provides, and will continue to provide, adequate radiation protection to the health and safety of persons and the environment throughout the renewed licence period.

254. The Commission is satisfied that Bruce Power's radiation protection program at the Bruce NGS meets the requirements of the *Radiation Protection Regulations*.

3.10 Conventional Health and Safety

255. The Commission examined the implementation of a conventional health and safety program at the Bruce NGS, which covers the management of 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 applicable labour codes and conventional safety training. Throughout the current licence period, CNSC staff rated the Bruce Power's performance in this SCA as "fully satisfactory" for Bruce A and "fully satisfactory" in 2014, 2015 and "satisfactory" in 2016 for Bruce B.

256. Bruce Power provided the Commission with detailed information regarding its conventional health and safety program, reporting that the Bruce NGS complied with *Occupational Health and Safety Assessment Series (OHSAS)* 18001:2007 standard.[59] Bruce Power also provided details about the recent decline in safety performance and the actions taken to address the issue, including the renewal of the Health and Safety Management Program with respect to hazard recognition, behavioral observation and coaching.

257. CNSC staff mentioned that Bruce Power's conventional health and safety program was regulated by the *Occupational Health and Safety Act* (Ontario)[60], the *Labour Relations Act* (Ontario)[61], and supported by Bruce Power's occupational health and safety policy. CNSC staff provided the Commission with additional details regarding the Bruce NGS accident severity, accident frequency and industrial safety accident rates. CNSC staff noted that, despite the recent safety incidents that lowered the Bruce B rating from "fully satisfactory" to "satisfactory", the results of these performance indicators were good in comparison with other workplaces in Canada and were an indicator of a well-established conventional health and safety program.

258. The Commission noted that the Power Workers' Union (PWU) was actively involved in the root cause investigations of lost time accidents in 2016 and 2017 at Bruce B and that the PWU was currently negotiating an agreement to provide accident investigation training for PWU representatives. The Bruce Power representative informed the Commission that such an agreement was also in place with the Society of United Professionals.

259. The Commission concludes that the health and safety of workers was adequately protected during the operation of the facility for the current licence period and that the health and safety of persons will continue to be adequately protected throughout the upcoming licence period. The Commission encourages Bruce Power to continue implementation of improvements to its H&S program.

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[59] Occupational Health and Safety Assessment Series (OHSAS) 18001:2007, *Occupational Health and Safety Management Certification*, 2007.
[60] RSO 1990, c. O.1
[61] SO 1995, c. 1

3.11 Environmental Protection

260. The Commission examined Bruce Power's environmental protection programs at the Bruce NGS, under which Bruce Power identifies, controls and monitors all releases of radioactive and hazardous substances, and aims to minimize any negative effects on the environment which may result from the licensed activities. These programs include effluent and emissions control, environmental monitoring and estimated doses to the public. CNSC staff rated Bruce Power's performance in this SCA as "satisfactory" throughout the current licence period.

261. The Commission considered whether the Bruce NGS environmental protection programs met the specifications of REGDOC-2.9.1, *Environmental Protection Policies, Programs and Procedures*.[62] CNSC staff reported that implementation of REGDOC-2.9.1, version 1[63] had begun and full implementation was expected by December 2018, but that as a new version 1.1 of REGDOC-2.9.1 was published in April 2017, the implementation date was moved to December 2020. CNSC staff submitted that it was satisfied with Bruce Power's implementation plan in this regard.

Environmental Protection for MCR

262. CNSC staff stated that the predictive environmental risk assessment conducted by Bruce Power demonstrated that the risks to the environment or human health of the Bruce NGS's MCR were low to negligible.

263. Asked for clarification on whether the MCR activities would result in an increase in fish impingement, the Bruce Power representative informed the Commission that it was Bruce Power's expectation that the impingement and entrainment would be lower during the MCR activities as a result of the reduced demand for the condenser cooling water when one or two units will be shut down for MCR. CNSC staff indicated that it did not expect the number of impinged and entrained fish to change because of the MCR activities. CNSC staff added that under the Memorandum of Understanding (MOU) with DFO, CNSC staff was responsible for monitoring and DFO was responsible for compliance and enforcement in this subject area. The Commission notes that the issue of the FA authorization is discussed in section 3.11.5 of this decision.

264. The Commission asked for details about a possible increase of emissions due to upset conditions of the reactors at the restart after the MCR. The Bruce Power representative explained that it expected the level of activity to be less than the refurbishment of Bruce Units 1 and 2 due to the separation of the refurbishment activities into the asset management program and the MCR, which would occur at different times. CNSC

[62] CNSC Regulatory Document REGDOC-2.9.1, *Environmental Protection Policies, Programs and Procedures*, version 1.1 2017.
[63] CNSC Regulatory Document REGDOC-2.9.1, *Environmental Protection Policies, Programs and Procedures*, 2013.

staff stated that the expected emissions due to MCR activities had been considered and that the impact on the environment had been determined to be low to negligible. The Commission was satisfied in this regard.

3.11.1 Effluent and Emissions Control (Releases)

265. The Commission considered Bruce Power's programs to control the release of effluent and emissions from the Bruce NGS to the environment. Bruce Power informed the Commission that releases were identified, controlled and monitored, and provided information about the limits and levels for releases and how Bruce Power met them.

266. Bruce Power submitted information about the methodology used to determine the derived release limits, which was done in accordance with CSA N288.1-08, *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities*.[64]

267. CNSC staff reported that it had determined that Bruce Power had an environmental management system in place to ensure that effluents and emissions met the requirements of the *Class I Nuclear Facilities Regulations*[65] and that radiological and non-radiological releases at the Bruce NGS remained within regulatory limits during the current licence period. CNSC staff also reported that a new CSA Group standard, CSA N288.5-11, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills*,[66] had been released during the current licencing period and that Bruce Power had committed to meet the specifications of this standard by December 31, 2018.

268. CNSC staff submitted information in relation to an inspection of the effluent monitoring program at the Bruce A NGS as part of the CNSC baseline monitoring program. CNSC staff determined that the control, monitoring and reporting of emissions at Bruce Power were well-developed and implemented, and were in compliance with regulatory requirements.

269. The Commission asked for comment in response to questions from E. Bourgeois and A. Tilman about the appropriateness of Derived Release Limits (DRLs) and Action Levels (ALs) at the Bruce NGS, as well as the availability of data to the public on releases to the environment. CNSC staff provided an informative explanation of the origins of the DRLs and ALs and provided references to several documents explaining how these values were reached. CNSC staff also provided information about what data is released to the public about environmental releases. The Commission was satisfied with CNSC staff's explanation of the technical basis of DRLs and ALs, and

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[64] N288.1-08, *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities*, CSA Group, 2008.
[65] SOR/2000-204.
[66] N288.5-11, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills*, CSA Group, 2011.

directed CNSC staff to continue efforts toward transparency in this area, and to continue to make data on this subject publicly available.

270. On the basis of the information provided for this hearing, the Commission is satisfied that Bruce Power has, and will continue to have adequate programs in place for the control of effluent and emissions at the Bruce NGS to protect the environment and meet regulatory requirements.

3.11.2 Environmental Management System

271. The Commission assessed the information provided by Bruce Power and CNSC staff about the Bruce NGS Environmental Management System (EMS). Bruce Power submitted that the Bruce NGS EMS met the specifications of REGDOC-2.9.1 (2013) and ISO 14001:2015, *Environmental management systems -- Requirements with guidance for use*.[67] CNSC staff confirmed the information provided by Bruce Power.

272. Based on the information provided, the Commission is satisfied that Bruce Power has maintained, and will continue to maintain, an adequate EMS at the Bruce NGS.

3.11.3 Environmental Monitoring

273. The Commission considered information submitted by Bruce Power about the environmental monitoring program that is designed to demonstrate that emissions from the Bruce NGS site are properly controlled. Bruce Power submitted that environmental monitoring was conducted at areas inside and outside the nuclear facility boundaries and that environmental monitoring includes assessment of the level of risk to human health and safety and the environment, demonstration of compliance with limits on releases, and to verify effluent monitoring results and predictions made in the Environmental Risk Assessment.

274. The Commission asked for comments from ECCC and OMECC on the environmental monitoring at the Bruce NGS. The ECCC representative explained that ECCC had been involved and was working with CNSC staff and Bruce Power and regularly review reports produced by CNSC staff and Bruce Power. The OMECC representative provided details about OMECC's role in environmental monitoring and that they are the lead in the management of the Bruce NGS's thermal plumes.

275. The Commission requested information about the concerns raised by the SON in its intervention regarding the impacts of climate change. The ECCC representative noted that researchers at ECCC were conducting studies in this area, and were hopeful that this work, as well as other research being undertaken by Bruce Power, may help in identifying criteria or triggers for when additional mitigation may be required when

[67] ISO 14001:2015, *Environmental management systems -- Requirements with guidance for use*, International Organization for Standardization, 2015.

considering climate change and as part of the adaptive management approach. The Commission was satisfied in this regard.

276. In its consideration of the intervention submitted by the SON, the Commission considered statements by the SON, Bruce Power and CNSC staff regarding efforts in moving forward with the inclusion of the SON in joint monitoring at the Bruce NGS. The Commission indicated its support for the continuation of these efforts and expressed its desire to see progress in this collaboration in the very near future. The Commission directs CNSC staff to provide updates in the annual ROR and when significant milestones or developments are achieved.

277. The Commission invited submissions about the community health survey suggested in the intervention from E. Bourgeois and A. Tilman. CNSC staff explained that regular disease surveillance of communities surrounding NGSs had not shown any indication of adverse health effects, noting that the intervention from Dr. Lynn of the Grey Bruce Health Unit submitted that no unusual adverse health effects had been observed in the area around the Bruce NGS. CNSC staff also referred to several studies, such as the RADICON[68] study, which observed cancer incidence on the community within a 25-kilometre radius of a nuclear facility over a prolonged period of time and found no increased incidence of cancer. CNSC staff further stated that there was no indication that the health of residents of the Grey Bruce County was any different than what would be found in the normal variation of disease in Ontario.

278. Further on the incidence of cancers in populations near NGSs, CNSC staff stated that a number of studies conducted around the world have shown no adverse health impacts from living in the vicinity of a nuclear power plant, and that the general consensus of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) supported this conclusion. The Commission is satisfied with the information provided on this matter, and will not require a health survey be undertaken.

279. Further in reference to the intervention from E. Bourgeois and A. Tilman, CNSC staff provided details about other monitoring programs that are conducted by other government entities, such as the OMECC's Drinking Water Surveillance Program, Labour Ontario's program to measure tritium and other radionuclides, and HC's Fixed Point Surveillance Program. CNSC staff explained that these programs, as well as Bruce Power's environmental monitoring program and the CNSC's IEMP all showed consistent values that were well below regulatory limits.

280. The Commission requested from CNSC staff, its view of the data on estimated cumulative waterborne tritium emissions submitted in the intervention from E. Bourgeois and A. Tilman. CNSC staff explained that the estimate was a valid method of estimating an end of pipe release from the Bruce NGS, but that the data in the graph were not consistent with what was observed in the environment. CNSC staff also

[68] The Radiation and Incidence of Cancer Around Ontario Nuclear Power Plants From 1990 to 2008 (The RADICON Study) was published in the *Journal of Environmental Protection*, Volume 9, 2013.

explained that there was no evidence of accumulation of levels of radioactivity in the environment over time, and that in fact levels have been decreasing since their peak in the 1960s that had been caused by above-ground nuclear weapons testing. The Commission is satisfied with CNSC staff's assessment.

281. The Commission examined Bruce Power's radiation environmental monitoring program (REMP). Bruce Power submitted that the REMP assessed the radiological impact of all operations at the Bruce NGS site and that the public dose was well below the regulatory dose limit.

282. CNSC staff confirmed this information and provided additional details about Bruce Power's REMP, including information obtained during an inspection of Bruce Power's environmental protection program. CNSC staff noted that, based on this inspection, CNSC staff was satisfied that Bruce Power's control, monitoring, analysis and reporting of environmental data and associated processes were well-developed, consistently implemented, and were in compliance with regulatory requirements.

Independent Environmental Monitoring Program

283. The Commission examined the information provided by CNSC staff in regard to the CNSC's IEMP. CNSC staff provided detailed results from the CNSC's independent monitoring that was carried out in 2013, 2015 and 2016 in publicly accessible areas outside the perimeter of the Bruce NGS, noting that the measured radioactivity in all samples was below CNSC reference levels,[69] and that there should be no health impacts as a result of Bruce NGS operations. Furthermore, CNSC staff reported that the IEMP results were consistent with Bruce NGS environmental monitoring results.

284. The Commission asked CNSC staff to comment on the intervention from E. Bourgeois and A. Tilman, which stated there was evidence that food grown in the area around the Bruce NGS contained high levels of radioactivity. CNSC staff explained that, while food grown in the area around the Bruce NGS did contain radioactivity, the levels measured were very low and comparable to the background levels that would be expected in food grown anywhere in Ontario. CNSC staff explained that the total dose to a person living near the Bruce NGS and eating a diet consisting entirely of locally grown food would constitute only a very small increase above the typical background dose and would not be expected to cause any adverse health effects.

285. Based on the information submitted by CNSC staff in the EA Report, the Commission is satisfied that the EA adequately shows that Bruce Power made and will continue to make adequate provision for the protection of the environment and persons at the Bruce NGS site.

[69] CNSC reference levels are established based on conservative assumptions about the exposure scenario and using N288.1-14. On this basis, the reference level for a particular radionuclide in a particular medium represents the activity concentration that would result in a dose of 0.1 mSv per year.

286. The Commission is satisfied that Bruce Power's and the CNSC's environmental monitoring show that the public and the environment around the Bruce NGS site remain protected.

287. The Commission directed CNSC staff to continue moving forward with establishing a formal structure for CNSC staff and Indigenous groups to meet and discuss, with the Commission as the body to which areas of non-agreement can be elevated. The Commission indicated that this structure could facilitate the establishment of a collaborative approach to management of the environment, the design of and participation in environmental and scientific studies and the incorporation of traditional knowledge. CNSC staff described some of the activities that have been undertaken to date toward working collaboratively with Indigenous groups, and agreed to continue working and to report back on progress. The SON agreed with the general principle and to work toward the establishment of terms of reference that could be mutually agreed to. It is the Commission's expectation that future IEMP reports take into due consideration the input from local Indigenous peoples and that they be provided an opportunity to review and comment prior to the IEMP report being finalized.

3.11.4 Environmental Risk Assessment

288. The Commission assessed the adequacy of the environmental risk assessments (ERA) carried out by Bruce Power in support of the continued operation of Bruce Units A and B and of MCR activities. Bruce Power indicated that all ERAs were conducted in accordance with CSA N288.6-12. Bruce Power submitted that a site-wide ERA was completed every 5 years or earlier if significant operational or facility changes occur that necessitated an update. Bruce Power indicated that a screening-level assessment had been completed in 2013, and that a higher-level assessment had been completed in 2015. An updated ERA was submitted by Bruce Power at the same time as its licence renewal application, which included the proposed MCR activities.

289. CNSC staff provided the Commission with additional information about Bruce Power's ERA, noting that CNSC staff had reviewed Bruce Power's ERA and requested several amendments, including improvements to the clarity and transparency in the analysis of risk, ensuring that all pathways and receptors were adequately assessed, and ensuring that the conclusions of no unreasonable risk to the environment and human health were fully supported by the ERA and Predictive Environmental Assessment (PEA). CNSC staff indicated that Bruce Power had submitted supplemental information to address CNSC staff's comments and that CNSC staff was satisfied that the data used in the ERA was sufficiently conservative and that the ERA showed that Bruce Power was implementing adequate measures for the protection of the environment.

290. Commenting on the differences in Derived Release Limits (DRLs) for Bruce NGS units A and B in the EA Report prepared by CNSC staff, the Commission requested

additional details on the reasons for the differences. CNSC staff stated that while the same methodology, which can be found in CSA N288.6-12, was used for both units, the small differences in DRLs were caused by differences in the unit locations as well as other differences between the units such as differences in the flow rates through each unit's stack.

291. The Commission asked for comment from the applicant and CNSC staff about the request to the OMECC by Bruce Power to increase the maximum thermal plume output temperature from the Bruce NGS during the summer months. Bruce Power provided additional context about the reasons for the request. CNSC staff explained that the potential of this action to cause ecological harm had been examined and was found not to pose an unreasonable risk to the fish populations. The OMECC explained that it was the responsible body for Bruce Power's application for a thermal Environmental Compliance Approval and that it was reviewing that application from a technical perspective, as well as to determine whether the duty to consult and accommodate Indigenous groups had been met. The OMECC stated that a final determination on the application had not yet been made and that, as part of that consideration, there are ongoing discussions with Bruce Power and consultation activities with the SON, the Historic Saugeen Métis (HSM) and the MNO.

292. The Commission invited submissions on the research on whitefish presented in the intervention from the McMaster University and the University of Regina Whitefish Research Group on environmental protection, and how the research projects had been selected. The University of Regina Whitefish Research Group clarified that its research had focused on identifying the fish populations near the Bruce NGS and the impacts of elevated water temperature and other stressors on whitefish. The Ontario Ministry of Natural Resources (OMNR) explained that emerging research was incorporated into population management, along with consultation with local Indigenous groups. CNSC staff explained that the research subjects that had been pursued had been agreed to by the SON as part of ongoing engagement activities, in order to reduce the uncertainty around the health of the lake. The Commission is satisfied with the information presented in these studies.

293. The Commission requested additional information about how the OMNR, the OMECC, ECCC, Fisheries and Oceans Canada (DFO) and CNSC staff worked together to assess the impact on lake species such as lake whitefish from thermal releases from the Bruce NGS, and whether the impacts considered climate change. Each of the named entities provided information about their roles and responsibilities in evaluating environmental risk, as well as cooperative agreements such as MOUs that existed between themselves and the CNSC.

294. In relation to concerns raised by the SON in its intervention, the Commission asked for additional details regarding the evaluation of the thermal plumes at the Bruce NGS. The ECCC representative expressed that in relation to the thermal plumes from the Bruce NGS, the potential for risk to the environment was low, and that while some uncertainty does exist, the uncertainty was unlikely to change the potential for risk of

the activities at the Bruce NGS.

295. The Commission requested comments in relation to the remaining uncertainty regarding the potential impact of the thermal plumes at the Bruce NGS on the environment. CNSC staff stated that risk assessments were informed by the latest updates in scientific studies and monitoring, citing for example the ongoing research that had taken place since the last Bruce NGS licence renewal hearing on the thermal sensitivity of the lake whitefish. Bruce Power explained that its research program in this area was ongoing and that updates would be implemented as appropriate based on the findings. In the hearing, the Commission expressed its expectation that efforts should continue to reduce the uncertainty in this area, and it reiterates in these reasons for decision, the importance of ongoing study in this regard.

296. With respect to the ERA, the Commission requested additional clarity on the use of qualitative rather than quantitative values for MCR activities. CNSC staff explained that in some cases, qualitative information was used and in some cases, predictive values were used, since qualitative values from monitoring results were not available for MCR activities as these activities were not yet underway.

297. The Commission asked for comments in its consideration of the intervention from CELA that suggested that the Follow Up Monitoring Program (FUMP) from the 2006 CEAA EA should not be discontinued. Bruce Power indicated that the FUMP was complete and had been replaced by the ERA process, which follows a similar methodology and includes a review every five years. CNSC staff provided additional information about how the previous FUMP requirements had been integrated into the ERA requirements and the CNSC's regulatory framework. The Commission is satisfied with the information provided in this regard and expects Bruce Power to continue to act in accordance with the documents specified in the updated LCH in order to ensure the ERA continues to meet its goal of ensuring adequate protection of the environment.

Fish Impingement and Entrainment

298. The Commission assessed the information submitted for this hearing regarding the impingement and entrainment of fish resulting from Bruce NGS operations. CNSC staff submitted that based on the EA, environmental monitoring and ERA conducted by Bruce Power to examine the impact of the cooling water intake and resulting fish impingement and entrainment, that CNSC staff agreed with Bruce Power's conclusion that impingement and entrainment of fish was not resulting in population-level effects on fish populations in Lake Huron.

299. In its consideration of the intervention by the SON, the Commission asked for comment about the remaining uncertainty regarding fish impingement and entrainment at the Bruce NGS, and measures underway to continue to reduce that uncertainty. The SON representative indicated that the SON would prefer SON

involvement in the design and conduct of studies intended to reduce uncertainty in this area. CNSC staff clarified that these studies would be most appropriately undertaken by Bruce Power with CNSC staff oversight, and that therefore collaboration between the SON and Bruce Power would be the most appropriate path forward. CNSC staff made reference to the ongoing work to establish a formal arrangement to discuss this and similar working arrangements between the SON, Bruce Power and CNSC staff, with the ability to elevate issues to the Commission for consideration as appropriate. Bruce Power confirmed its ongoing support and participation in this work. The Commission expresses support for this work and makes clear its expectation that work in this area should continue.

300. In its consideration of the intervention by the CANDU Owner's Group (COG), the Commission requested information about COG's role in conducting research and developing standards related to fish impingement and entrainment. Bruce Power explained that a Bruce Power employee was the chair of the COG Health, Safety and Environment Committee and the CSA N288.9[70] Committee, which Bruce Power had used as the basis of its current monitoring plan for fish impingement and entrainment and that the plan was undergoing review by CNSC staff and DFO. Bruce Power also explained that current research was integrated into the development of updated standards, including research coordinated by COG.

301. Based on the information presented on the record for this hearing, the Commission is satisfied that the ERA was carried out satisfactorily and showed that Bruce Power was adequately protecting the environment in the vicinity of the Bruce NGS site.

3.11.5 Fisheries Act *Authorization*

302. The Commission notes that, since operations at the Bruce NGS result in harm to fish that support a commercial, recreational or Indigenous fishery, a subsection 35(1) FA authorization from the DFO may be required for the Bruce NGS. The need for a FA authorization is based on the definition of "serious harm" in the FA, which deals directly with impacts to fish rather than the general environmental protection requirements of the NSCA and CEAA 2012 which assess impacts at a population level.

303. Bruce Power provided the Commission with information about the FA authorization process, noting that Bruce Power had been in dialogue with DFO on this issue since 2011. Bruce Power reported that it had first submitted a draft application in 2015, with revisions continuing throughout 2016 and 2017. Bruce Power submitted that the revised application addressed discussions with the CNSC and DFO with respect to methodology for the quantification of annual losses due to entrainment and impingement of fish at Bruce A and Bruce B, and that the revised application includes an Indigenous consultation log and proposed projects for offsets.

[70] N288.9-18, Guideline for design of fish impingement and entrainment programs at nuclear facilities, CSA Group, 2018.

304. CNSC staff provided the Commission with information about the FA authorization process, noting that, as per a CNSC-DFO MOU, CNSC staff would oversee Bruce Power's self-assessment and draft application for the FA authorization. CNSC staff reported that Bruce Power had submitted a draft application for a FA authorization for CNSC staff review in May 2017, which included changes in response to previous CNSC staff comments. After reviewing this draft application, CNSC staff requested further information from Bruce Power, to be included in Bruce Power's final application.

305. Bruce Power expects that the FA authorization application will be ready to be submitted to DFO in the latter part of 2018, pending outcomes of the continuing discussions with the CNSC and DFO. CNSC staff expressed the view that satisfactory progress was being made by Bruce Power on the FA authorization application. The Commission notes that it is DFO, not the Commission, that makes decisions under the FA.

306. The Commission requested additional details regarding the timing for the FA authorization process and why it had not been required at an earlier time. CNSC staff explained that the FA was updated in 2013 and that some of the language regarding serious harm to fish was changed, which started the process that led to the establishment of the CNSC-DFO MOU and the current FA authorization process. CNSC staff provided the Commission with additional details regarding the timelines and process that would be followed by DFO in determining whether to grant the FA authorization, including evaluation of impacts and offsets and indigenous consultation, as well as associated monitoring. The DFO representative confirmed the information provided by CNSC staff.

307. In its consideration of the interventions from the Lake Huron Fishing Club and the Nottawasaga Valley Conservation Authority, the Commission requested additional details regarding the offset project to remove the Truax Dam from the Saugeen River being considered by Bruce Power. Bruce Power explained that the project would be expected to improve fish habitat, resulting in up to 15,000 kg of conserved fish biomass, and that a monitoring program would be put in place to confirm the predicted effects of the dam removal. Bruce Power also provided information about the engagement efforts they had made in explaining this decision to the SON, HSM and MNO.

308. The Commission asked for more information on the issue of the effectiveness of offset measures that was raised in the intervention from the SON. CNSC staff explained that it was still awaiting a full application from Bruce Power regarding offsets and that no conclusions about whether the offsets would fully counterbalance the impingement and entrainment losses could be reached prior to receipt of the final application. The DFO representative added that the DFO was in the early process of reviewing Bruce Power's application, that the DFO was working with Bruce Power in this regard and also planned to consult local Indigenous groups about offset measures. Further on the

FA application and offset measures, the Bruce Power representative stated that Bruce Power intended to submit the application by the end of 2018, pending the outcome of discussions with DFO. CNSC staff stated that there would be a report on the progress of the application at the next annual ROR in November 2018.

309. Noting the continued concern expressed by the SON representative that offsets were being considered, given that under the FA, offsets should only be considered after mitigation options had been exhausted, the Commission asked for information in this regard. The Bruce Power representative responded that Bruce Power intended to address the SON's concerns through Bruce Power's ongoing participation in the DFO FA authorization process, and that Bruce Power would seek to demonstrate that it had done its due diligence through the offset process and through the mitigation strategies that came before the offset process. The Commission encourages Bruce Power to continue engagement activities with the SON in this regard.

310. The Commission concludes that the environmental protection requirements of the NSCA as they relate to the protection of the environment generally are satisfied. The Commission notes that the renewal of Bruce Power's PROL for the Bruce NGS is a separate statutory process from the FA, which is under DFO authority. NSCA licensing is about the general prevention of unreasonable risk to the environment from the nuclear industry, whereas the FA deals very specifically with that part of the environment including fish and fish habitat. The Commission is satisfied with CNSC staff's assessment in relation to the requirement for a subsection 35(1) FA authorization for the Bruce NGS, and while it is satisfied that the FA process does not impede the Commission from concluding that Bruce Power will adequately provide for environmental protection, it will monitor the FA authorization process and will expect regular updates on that process and Indigenous groups' involvement in it.

3.11.6 Protection of the Public

311. The Commission assessed Bruce Power's programs to mitigate risk to members of the public from hazardous substances discharged from the Bruce NGS. Bruce Power provided the Commission with information regarding its environmental management program and how it provides for the protection of the public.

312. CNSC staff confirmed the information provided by Bruce Power noting that compliance verification activities had shown that the risks to the public due to hazardous substances released to the environment were low to negligible.

313. Based on the information provided, the Commission is satisfied that Bruce Power's programs to mitigate risk to members of the public from Bruce NGS operations are adequate.

3.11.7 Conclusion on Environmental Protection

314. Based on the assessment of the application and the information provided on the record for the hearing, 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 throughout the proposed licence period.

315. The Commission is satisfied that the Bruce NGS environmental protection programs adequately meet the specifications of REGDOC-2.9.1.

316. The Commission is satisfied that the environmental review conducted by CNSC staff under the NSCA and the CNSC EA Report were adequate for the Commission's consideration of environmental protection for this licence renewal application.

317. The Commission is also satisfied that the measures implemented at the Bruce NGS are adequate for the purposes of environmental protection of aquatic species under the NSCA.

318. The Commission notes Bruce Power's commitment to develop mechanisms to include Indigenous traditional knowledge and the sampling or monitoring of traditional foods and medicines of Indigenous peoples in the Bruce NGS environmental monitoring programs. The Commission notes that CNSC staff includes Indigenous traditional knowledge in the IEMP sampling program and has committed to further work with Indigenous groups in this regard. It is the Commission's expectation that future IEMP reports take into due consideration the input from local Indigenous peoples and that they be provided an opportunity to review and comment prior to the IEMP report being finalized.

319. The Commission is satisfied with CNSC staff's assessment in relation to the requirement for a subsection 35(1) FA authorization for the Bruce NGS. It will be DFO that will make any decisions under the FA and the Commission expects CNSC staff to provide updates in this regard during the annual presentation of the NPP ROR, starting in November 2018.

320. The Commission expects Bruce Power to implement updated standards during the renewed licence period as described in the information submitted for this hearing and as summarized above.

3.12 Emergency Management and Fire Protection

321. The Commission considered Bruce Power's emergency management and fire protection programs which cover the measures for preparedness and response capabilities implemented by Bruce Power in the event of emergencies and non-routine conditions at the Bruce NGS. This includes nuclear emergency management,

conventional emergency response, and fire protection and response. Throughout the current licence period, CNSC staff rated Bruce Power's performance in this SCA as "satisfactory."

322. Bruce Power submitted that its Emergency Management program had been established to ensure readiness to respond to all events that could impact the Bruce NGS, Bruce Power employees, the public and the environment. Bruce Power provided the Commission with information regarding the overall Bruce NGS emergency preparedness program, explaining that the program commits to readiness to respond to any emergency by using a site-wide integrated approach focused on prevention, preparedness, response, mitigation, and transition to recovery. Bruce Power submitted information about the measures taken to ensure that organizational functions, processes, procedures, equipment, and material were in place, and training that was conducted (including drills and exercises) in order to be ready to respond quickly and effectively to all events. Bruce Power also expressed a commitment to working with federal, provincial and municipal partners to manage consequences and to protect workers, the public and the environment while reducing the impact on the facilities in the event of an emergency.

3.12.1 Conventional Emergency Management

323. The Commission considered the adequacy of Bruce Power's conventional emergency (non-nuclear) management programs at the Bruce NGS. Bruce Power submitted detailed information regarding its Conventional Emergency plan and its Fire Safety Management plan. CNSC staff provided information about Bruce Power's agreement with Bruce County to provide additional emergency services and ambulance services, and provided information about large scale emergency exercises held at the Bruce NGS.

324. The Commission requested additional information regarding emergency exercises, and how lessons learned from the conduct of these exercises were integrated into procedures. Staff from the Office of the Fire Marshal and Emergency Management of Ontario (OFMEM) explained that large full-scale exercises occurred approximately every 1.5 years, that lessons learned from these exercises were captured in an After Action Report, and that these were then monitored in terms of their implementation. CNSC staff provided additional details about the exercise specifications for licensees provided in REGDOC-2.10.1 *Emergency Preparedness and Response*,[71] including the criterion that the licensee conducts an emergency exercise once every three years. CNSC staff submitted that all large scale emergency exercises that were held on site at the Bruce NGS had components in them to test and evaluate Bruce Power's response to conventional emergencies.

325. Based on the information provided on the record for this hearing, the Commission is satisfied with Bruce Power's programs to manage conventional emergencies at the

[71] CNSC Regulatory Document REGDOC-2.10.1, *Emergency Preparedness and Response*, 2014.

Bruce NGS.

3.12.2 Nuclear Emergency Management

326. The Commission considered the information submitted by Bruce Power and CNSC staff about nuclear emergency management at the Bruce NGS. Bruce Power provided information about its nuclear emergency management planning, including its emergency management program and its preparedness and response plans and procedures, which Bruce Power stated were designed to ensure that communication to appropriate stakeholders would occur, and that response organization, facilities and equipment would be sufficient to address any emergency scenario. Bruce Power submitted that nuclear emergency preparedness and response was delivered through the following key emergency response plans and their implementing procedures: the Bruce Power Nuclear Emergency Plan; the Winter Storm Transportation Plan; the Bruce Power Electricity Emergency Plan; the Business Continuity Management Plan; and the Radioactive Material Transportation Emergency Response Plan. Bruce Power also noted that it worked with local municipalities, provincial and federal stakeholders, and the CNSC, to develop and review its emergency plans.

327. CNSC staff submitted that it had reviewed Bruce Power's consolidated emergency plan and supporting documentation, and that the plan met CNSC staff's expectations. CNSC staff also submitted that it was satisfied that Bruce Power had the capability to respond effectively to a nuclear emergency. CNSC staff further submitted that inspections of Bruce Power's emergency plan conducted during the current licence period, as well as a review of off-site plans, confirmed that all components of the nuclear emergency response plans were adequate and satisfied CNSC requirements.

328. CNSC staff submitted that during the current licensing period, Bruce Power had submitted a transition plan to meet the specifications of REGDOC-2.10.1 by August 2018.

329. CNSC staff reported that in 2015, Bruce Power met the requirement respecting the distribution of potassium iodide (KI) tablets. CNSC staff verified that, in partnership with the Municipality of Kincardine and the Grey Bruce Health Unit, Bruce Power had enhanced the availability of KI tablets pre-distributed to households and businesses in the primary zone (10 km) and pre-stocked in the secondary (50km) zones. CNSC staff reported that a back-up contingency supply of KI tablets was maintained at municipal emergency response centres and that KI tablets were distributed to both Bluewater and Grey Bruce Catholic School Boards for re-distribution to the 52 schools within the secondary zone. CNSC staff confirmed that the dissemination of emergency preparedness pamphlets to residents around the plant was completed, enhancing public awareness of nuclear emergency preparedness and response.

330. Bruce Power submitted information about its emergency response facilities, including the Emergency Operations Centres, located within each of the Bruce A and B stations next to the control room, and the Emergency Management Centre (EMC), located approximately 1km from the Bruce site. Bruce Power reported that the primary purpose of the EMC was to provide emergency response support to the stations, including communication with external agencies and additional support or resources, which would enable the stations to focus solely on plant response. Bruce Power submitted that the EMC was geographically separate from the site and maintained a VSAT satellite uplink for phone, fax and internet, as well as radio, servers for software operation and back-up power to support sustained operations during infrastructure outages. Bruce Power also submitted that it maintained a Mobile EMC, as well as Alternate EMC locations in both the Town of Saugeen Shores and the Municipality of Kincardine as back-ups to the EMC or the EOC, or to augment command requirements depending on the situation.

331. Bruce Power submitted information about the communication systems that would be available in the event of an emergency, including Web EOC, the radio network, the public alerting system (AlertFM), the VSAT satellite uplink system and its Disaster LAN (DLAN) system. Bruce Power reported that the VSAT system provided satellite connectivity to ensure multiple phone hubs and internet connectivity were in place and operable when primary systems were not available. Bruce Power reported information about its DLAN system, which would be used to share plant information to those that required this information during an event. Bruce Power submitted that it planned to conduct a feasibility assessment in 2018 to investigate options for automated connectivity to plant data, but that at the time of this hearing the system continued to require operator input.

332. CNSC staff confirmed the information submitted by Bruce Power regarding the communication system at the Bruce NGS. CNSC staff reported that Bruce Power's DLAN system relied on human intervention to acquire and enter the data (i.e., non-automatic). CNSC staff highlighted in the lessons learned from the Huron Resolve exercise the importance for automatic data transfer to the CNSC EOC in the event of a nuclear emergency, and that automatic plant data transfer aligned with international best practices and was part of the lessons learned from the Fukushima nuclear accident. CNSC staff submitted that in August 2017 Bruce Power was requested to submit in writing a plan to implement automatic data transfer, and that Bruce Power responded in September 2017 that it would begin a feasibility assessment to investigate options for automatic connectivity between plant data systems and DLAN in 2018. CNSC staff determined that automated data sharing is vital during a nuclear emergency and will review Bruce Power's plan to implement automatic data transfer during the proposed licensing period.

333. The Commission requested additional information concerning the DLAN system that would be used to transfer data from Bruce Power systems to the CNSC and other groups during an emergency scenario. The Bruce Power representative noted that the system was in place and that a feasibility study would be conducted within the next

year. The Bruce Power representative also confirmed that the DLAN system currently still required the manual input of certain data. CNSC staff confirmed that it had access to the DLAN system and that the overall system functionality and robustness was sufficient for its purpose, but that the automatic transfer of all data was desirable going forward.

334. The Commission noted the recommendation raised by CELA in its intervention to set a deadline for the completion of Bruce Power's transition to a fully automated DLAN system and that the process be reported annually in the ROR. The Commission notes its dissatisfaction with the delay in implementing electronic data transfer to the CNSC Emergency Operations Centre without human intervention. The Commission strongly desires improvement in this regard, and directs that progress on this initiative be reported on annually in the NPP ROR until such time as the implementation is completed.

335. The Commission considered the intervention from the South Bruce Grey Health Centre and requested additional details about the intervenor's ability to conduct triage in the event of a nuclear exposure. The South Bruce Grey Health Centre representative explained that drills in this regard were conducted on an annual basis in collaboration with Bruce Power, and that the specialised room at the South Bruce Grey Health Centre was equipped to ensure that any contamination would be properly contained and that diagnostic tools could be employed.

336. The Commission requested additional information from HC regarding physician recruitment programs, in particular physician training opportunities regarding the management of potentially exposed or contaminated individuals. The HC representative indicated that HC offers training called METER that covers emergency medical treatment for exposures to radiation and that the course had been offered to hospitals in the Kincardine region.

337. The Commission asked for comment from the Grey Bruce Health Unit on their interaction with Bruce Power with regard to emergency planning. The Grey Bruce Health Unit explained their involvement in planning evacuations, KI pill distribution, and patient care in local health centres. Grey Bruce Health Unit expressed that continuous improvement was important in the development of these procedures, and noted that significant progress had been made in this area in the last 20 years.

Provincial Nuclear Emergency Response Plan

338. Bruce Power submitted information about the OFMEM's updated December 2017 Provincial Nuclear Emergency Response Plan (PNERP)[72] and on Bruce Power's April 30, 2018 implementation plan for the updated December 2017 PNERP. Bruce Power reported that the revised PNERP provided enhancements to allow for further

[72] Provincial Nuclear Emergency Response Plan (PNERP) Master Plan, Office of the Fire Marshal and Emergency Management of Ontario, December 2017.

alignment to the specifications of CSA N1600, *General requirements for nuclear emergency management programs*,[73] REGDOC 2.10.1, and IAEA GSR Part 7, *Preparedness and Response for a Nuclear or Radiological Emergency*.[74] Bruce Power reported information related to the changes in the updated December 2017 PNERP, including changes to the planning zones, descriptions of emergency response activities, and guidelines for protective actions, roles and responsibilities for stakeholder organizations. Bruce Power submitted that the development of the updated December 2017 PNERP had included public consultation. Bruce Power submitted that it was working with local designated and host communities to finalize municipal implementing plans that meet the requirements of the December 2017 PNERP.

339. In response to questions from the Commission regarding the severity of the accident types chosen for the updated December 2017 PNERP, the OFMEM representative provided information about the types of accident scenarios that were considered in the development of the updated PNERP, including an unmitigated accident involving no operator intervention for a period of 12 hours as the most severe accident scenario. The OFMEM representative also provided information about the public consultation that was conducted in support of the updated PNERP, the advisory group that provided comments, and mentioned that continuous improvement based on the recommendations of these groups was ongoing. CNSC staff also explained that it had been involved in the technical work done in support of the updated PNERP and continued to be involved in this regard. The Commission is satisfied with the information provided in regard to the accident bases considered in the updated PNERP.

340. The Commission requested additional details on the preparedness of municipalities near the Bruce NGS to implement the updated PNERP. The OFMEM representative explained that, as part of updating the PNERP, the impact on local municipalities had been considered and that the municipalities were involved in discussions during which they had generally stated that they did not expect a significant increased hardship related to implementing the updated PNERP. Bruce Power provided additional information about the work undertaken to assist with this implementation.

341. The Commission considered the interventions from the Municipality of Kincardine, the Corporation of the Township of Huron Kinloss , the Municipality of Brockton, the Municipality of South Bruce, the County of Huron, the Town of Saugeen Shores, the Grey County, the City of Owen Sound, and the County of Bruce, and enquired about their readiness to implement the updated PNERP. The intervenors indicated that they had reviewed the PNERP and discussed it with Bruce Power and provincial authorities and were prepared to implement the requirements of the updated PNERP. The Commission is satisfied in this regard, with respect to the municipalities' understanding of their responsibilities.

[73] N1600, *General requirements for nuclear emergency management programs*, CSA Group, 2016.
[74] GSR Part 7, *Preparedness and Response for a Nuclear or Radiological Emergency*, IAEA, 2015.

342. The Commission asked HC for clarification in regard to the status of the Federal Nuclear Emergency Plan (FNEP) as it pertained to the Bruce NGS and its interaction with the PNERP. The HC representative provided information regarding the Federal Emergency Response Plan (FERP), the FNEP, and about HC's role and collaboration with Bruce Power and the OFMEM in this regard. The HC representative explained that an interface existed between the FNEP and the PNERP through a FNEP Ontario Annex that explained how the federal government would support the provinces in a nuclear emergency scenario. The HC representative further explained that there was significant ongoing cooperation between HC and the OFMEM, such as the Environmental Radiation and Assurance Monitoring Group and the Federal Provincial Radiological Nuclear Emergency Management Coordinating Committee. CNSC staff provided information about the roles and responsibilities of the various bodies involved, and the objective-setting and scoring methods used in large-scale emergency exercises. The Commission was satisfied with the information provided on the coordination between HC and the OFMEM in regard to nuclear emergency planning.

343. The Commission asked for comments in its consideration of the intervention by CELA which recommended changes to the new planning zones in the updated 2017 PNERP and the Bruce Implementing Plan. The OFMEM representative provided detailed information about the methodology that was used to develop the planning zones in the updated PNERP and explained that significant public consultation was undertaken in developing the updated PNERP. The OFMEM representative also explained that it was undertaking a technical study to further refine the technical basis of the updated PNERP and that additional public consultation would be undertaken with this study. The OFMEM representative also noted that there was a high availability of KI pills within 50km of the Bruce NGS. The OFMEM also clarified that the planning zones in the PNERP were not necessarily the same as response zones would be in the event of a nuclear emergency, and that the plan was intended to be adaptive as required. CNSC staff confirmed that the zones used in the PNERP fell within the ranges suggested in the IAEA document Arrangements for Preparedness for a Nuclear or Radiological Emergency Safety Guide GS-G-2.1.[75]

344. The Commission considered the intervention from CELA and enquired about dose limits for emergency workers. CNSC staff explained that the NSCA and its regulations required licensees to inform all NEWs of the dose limits applicable in the case of emergencies and to obtain a written acknowledgement that the NEWs had received that information. The Bruce Power representative confirmed that Bruce Power's procedures follow the CNSC's requirements in this area. In regard to first responders who were not NEWs, CNSC staff explained that first responders fell under Ontario's *Occupational Health and Safety Act*[76] and that it was the responsibility of their employer to ensure their health and safety, including the provision of training and PPE as required, and that in the case of a nuclear emergency this could include radiation and dosimetry equipment.

[75] IAEA Safety Standards Safety Guide No. GS-G-2.1, *Arrangements for Preparedness for a Nuclear or Radiological Emergency*, 2007.
[76] Occupational Health and Safety Act, R.S.O. 1990, c. O.1

345. Further in regard to dose limits for emergency workers, the OFMEM representative explained that the PNERP includes material dealing with emergency workers, particularly Section 7.10, as well as Section 6.8 of the Implementing Plan and Annex H to the Master Plan. The OFMEM confirmed that emergency workers and helpers are required to provide documented informed consent of the emergency dose, which is arranged at the Emergency Worker Centre which is the facility that coordinates all of those off-site support workers.

346. Noting the concerns about emergency preparedness and the updated PNERP submitted in the intervention from E. Bourgeois and A. Tilman, the Commission requested additional information in this regard. The OFMEM representative provided details about how the Inverhuron area would be treated in the event that an actual emergency response was required. The OFMEM representative further explained that in this event, an evacuation of the automatic action zone would immediately be ordered, which was the 3-kilometre zone surrounding the plant, and that communities outside this zone would be directed to shelter in place until such a time as other actions became warranted, and that other actions would be undertaken as required based on the severity of the emergency situation. The OFMEM representative noted that serious emergency events at CANDU facilities would typically take time to evolve given the volume of cooling water on site and that, even under a worst case scenario, a timeframe of 12 to 14 hours would likely be available to determine the severity of the emergency and begin an appropriate response. The OFMEM representative indicated that based on the OFMEM's assessment, there was a high degree of confidence that there would be a sufficient amount of time to implement necessary protective actions. The Commission was satisfied with the information provided in this regard.

347. The Commission noted the concerns in the interventions from E. Bourgeois and A. Tilman and CELA regarding evacuation time models and requested clarification in this regard. The OFMEM representative provided details about the study, including that it was based on guidelines provided by the United States Nuclear Regulatory Commission (US NRC) in terms of evacuation time estimate modelling, and included consideration of factors such as weather, different road conditions, different time of day, and weekend versus weekday. CNSC staff confirmed that the study did include non-motorized transportation such as horses and buggies as well as large seasonal vehicles. Bruce Power provided details about options that could be used in the event of an actual emergency scenario to overcome obstacles such as adverse weather conditions.

348. Further on evacuation times, the OFMEM representative provided information and examples about some of the criteria that could be considered in determining whether a full evacuation were required and referenced some recent evacuations that were undertaken in Ontario that occurred during adverse weather conditions. CNSC staff further explained that KLD, the company contracted by Bruce Power to write this section of the report, was an experienced author of these types of studies and has

experience in preparing similar estimates for U.S. facilities. CNSC staff confirmed that the study indicated that one hundred percent of the population of the detailed planning zone would be expected to be able to be evacuated in up to four hours. CNSC staff also confirmed that evacuation studies were a CNSC criterion in REGDOC-2.10.1, that the PNERP also requires evacuation studies and that CNSC staff found that the KLD study was credible. The Commission is satisfied that the evacuation estimates considered by Bruce Power are credible.

349. Based on the information submitted for this hearing, the Commission is satisfied that Bruce Power has appropriate emergency plans in place to protect the health and safety of persons and the environment in the event of a nuclear emergency at the Bruce NGS.

350. The Commission notes its dissatisfaction with the delay in implementing electronic data transfer to the CNSC Emergency Operations Centre without human intervention. The Commission wishes to see Bruce Power improve in this regard, and requests that progress on this initiative be reported on annually in the ROR until such time as the implementation is completed. The Commission will monitor progress in this regard with regular status updates.

3.12.3 Fire Protection

351. The Commission examined the adequacy of the Bruce NGS fire protection program. Bruce Power submitted information regarding its compliance with CNSC expectations in the area of fire emergency preparedness and response, including its Fire Safety Management Plan and integrated emergency plan.

352. CNSC staff submitted that it had examined Bruce Power's fire protection program and fire response capability and determined that they were sufficient, and that the fire protection program met the specifications of CSA N293-12.

353. Based on the information provided, the Commission is satisfied that Bruce Power has an adequate fire protection program in place at the Bruce NGS that meets regulatory requirements.

3.12.4 Conclusion on Emergency Management and Fire Protection

354. Based on the above information provided on the record for this hearing, the Commission concludes that the Bruce NGS nuclear and conventional emergency management preparedness programs and the fire protection measures in place, and that will be in place during the renewed licence period, are adequate to protect the health and safety of persons and the environment.

355. Based on the information submitted for this hearing, the Commission is satisfied that Bruce Power's Bruce NGS Emergency Response Plan is sufficient to address potential

emergency scenarios that could arise at the Bruce NGS, including its pre-distribution and stocking of KI pills.

356. Based on the information considered for this hearing, the Commission is satisfied that the detailed planning zone is protective of the public and the environment and that there would be minimal impact outside of the detailed planning zone in the event of an emergency at the Bruce NGS.

3.13 Waste Management

357. The Commission assessed Bruce Power's waste management program for the Bruce NGS. Throughout the current licence period, CNSC staff assessed Bruce Power's performance in this SCA, including waste minimization, segregation, characterization and storage programs as "fully satisfactory".

358. Bruce Power submitted information about its waste management program at the Bruce NGS, including the approach to waste management and waste minimization, as captured in BP-PROC-00878, *Radioactive Waste Management Program,* which was a procedure level document and fell under the overall environmental program in BP-PROG-00.02, *Environmental Safety Management*. Bruce Power reported that radioactive solid waste produced by Bruce Power was typically transferred to the Western Waste Management Facility (WWMF), which was operated by OPG on the Bruce NGS site. Bruce Power further noted that the operation of the WWMF was not part of this licence renewal application as it was operated by OPG under a separate CNSC licence.

359. CNSC staff submitted that compliance verification activities had shown that Bruce Power's waste management programs exceeded expectations in all specific areas for managing radioactive waste, and that Bruce Power had minimized the production of radioactive wastes through various plans, programs and procedures, and had minimized impacts from such wastes on workers and the environment. CNSC staff reported that the program for radioactive waste management at the Bruce NGS met the guidance laid out in CSA N292.3-14, *General principles for the management of radioactive waste*[77].

360. The Commission requested additional details about the generation of additional waste that would be expected as part of the MCR activities, and measures that would be taken to minimize generated waste volumes. Bruce Power provided information about the additional waste that would be generated through MCR activities such as the removal of pressure tubes, calandria tubes, feeders and steam generators, and ongoing discussions with OPG which operated the WWMF on the Bruce NGS site. Bruce Power further explained that new waste volume reduction measures were currently being tested and would be planned for use during MCR activities using specialized tooling and equipment, and that smaller components would be volume-reduced using

[77] N292.3-14, *General principles for the management of radioactive waste*, CSA Group, 2012.

similar methods to those used for normal operational waste. CNSC staff described the inspections that were undertaken in regard to Bruce Power's waste management practices at the Bruce NGS and confirmed that CNSC staff had no concerns with the proposed waste minimization practices during the proposed licence period.

361. With reference to the intervention by Northwatch expressing concerns about the adequacy and availability of information, the Commission requested clarification in regard to public availability of waste inventory data. CNSC staff explained that the estimated amount of waste resulting from the MCR project could be found in the ERA, while broader estimates of waste volumes could be found in the annual Nuclear Waste Management Organization (NWMO) report[78] and tri-annual Natural Resources Canada's (NRCan) published estimates.[79] The Commission noted the information provided in this regard.

362. The Commission noted the concern in the intervention from Northwatch that expressed doubt about the accessibility and understandability of Bruce Power and the CNSC's waste management documentation. The Bruce Power representative explained that the in-depth technical documents could be complex and encouraged intervenors to approach Bruce Power directly with requests for information so that Bruce Power could help to find the specific information requested.

363. On the adequacy of Bruce Power's licence application as raised in the interventions from Northwatch, CNSC staff clarified that, while the regulations made under the NSCA specified what information must be submitted as part of a licence application, a licensee could incorporate by reference information that was part of a previous licence, as per section 7 of the *General Nuclear Safety and Control Regulations* (GNSCR).[80] The Commission accepted this information and expressed support for this approach.

364. Noting the concerns about cross-border transport of radioactive waste expressed in the intervention from Northwatch, the Commission requested additional details in this regard. The Bruce Power representative explained that low-level waste was volume-reduced by Energy Solutions, a company in Tennessee and a United States NRC licensee. The Bruce Power representative further explained that transportation between the Bruce NGS and the Energy Solutions facility was done by a third-party company that was also licensed by the CNSC and that the volume-reduced waste was then transported back to Bruce NGS, where it was transferred to OPG for storage in the WWMF. The Bruce Power representative emphasized that all radioactive waste was returned to Canada and that Bruce Power did not export radioactive waste permanently to the United States. CNSC staff confirmed the information submitted by Bruce Power.

365. Further on the import and export of radioactive waste, CNSC staff submitted that, for

[78] *Annual Report 2017*, Nuclear Waste Management Organization, 2017.
[79] *Inventory of Radioactive Waste in Canada*, Natural Resources Canada, 2016.
[80] SOR/2000-202.

security reasons, the CNSC did not disclose the inventories associated with the shipments of controlled nuclear substances contained in waste, as defined in the *Nuclear Non-proliferation Import and Export Control Regulations*[81] (NNIECR) and that the CNSC did not post export or import licences on its website. The Commission was satisfied with the information provided and is satisfied that the import and export of radioactive waste for the purposes of waste minimization meets requirements.

366. In considering the intervention from Northwatch, the Commission requested that Bruce Power and CNSC staff provide information about timelines for keeping used fuel in IFBs. The Bruce Power representative explained that, while Bruce Power generally aimed to move irradiated fuel from wet to dry storage as soon as practicable, it was primarily a scheduling issue that may keep some irradiated fuel in the IFBs longer than the usual 10 years. The Bruce Power representative further explained that it adhered to the licence requirement to maintain a certain amount of capacity available in the IFB and emphasized that the irradiated fuel was stable while in wet storage so no safety issue was present by maintaining it in wet storage for more than 10 years. CNSC staff confirmed the information provided by Bruce Power and emphasized that the main interest of CNSC staff was in confirming that sufficient free capacity was maintained in IFBs at all times to contain the irradiated fuel from the core if there were a need to remove it, and that Bruce Power met those requirements. The Commission is satisfied with the information that was provided and that the storage of used fuel in IFBs for longer than 10 years presented no unreasonable risks to people or the environment.

Waste Management for MCR

367. The Commission enquired about the waste minimization program during the MCR. The Bruce Power representative explained to the Commission that pressure tubes, calandria tubes, feeders and steam generators would be removed during the MCR activities and that these components would be transferred to OPG who was the custodian of the waste generated at the Bruce NGS. The Bruce Power representative further explained that the pressure tubes and feeder tubes would be compressed and cut into small pieces that would fit in retube waste containers and that tool development was aiming to reduce the volume of waste created. The Bruce Power representative added that metal parts under the radiation threshold would be recovered, melted down and free released.

368. Further on the topic of waste minimization, the Bruce Power representative mentioned that, as a private company, Bruce Power had a financial incentive to minimize waste as Bruce Power was paying OPG to manage the waste. CNSC staff added that it had no concerns over the past period concerning the safety aspects of Bruce Power's waste management program and that CNSC staff's expectation was that Bruce Power would continue to implement the practices that were in place.

[81] SOR/2000-210.

369. The Commission notes that Bruce Power submitted corrected values for the estimated volume of low and intermediate-level radioactive waste that would be produced during the MCR of Bruce Unit 6.

370. The Commission questioned about the low-level radioactive waste that will be produced during the MCR and the capacity of Bruce Power's contractor to incinerate that extra waste. The Bruce Power representative explained that the capacity was not an issue for the contractor.

371. The Commission enquired about the detailed inventory of waste resulting from the MCR of the six units at the Bruce NGS. The Bruce Power representative explained that, in the Predictive Effects Assessment, the total volume of waste for the Bruce Unit 6 MCR was a representation of what will be seen in the other MCRs. CNSC staff stated that although the complete information might be distributed in different documents, CNSC staff had the information necessary to make informed decisions. The Commission expressed its dissatisfaction that the information about the volume of waste was not easily available and directs Bruce Power to make available in a single document to interested persons all the information about the volume of waste that will be produced during the MCR for all 6 units at the Bruce NGS.

372. Based on the above information and consideration of the hearing materials, the Commission is satisfied that Bruce Power has appropriate programs in place to safely manage waste at the Bruce NGS.

3.14 Security

373. The Commission examined Bruce Power's security program at the Bruce NGS, which is 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 GNSCR and the *Nuclear Security Regulations*.[82] During the current licence period, CNSC staff rated Bruce Power's performance in this SCA as "fully satisfactory" in 2014 and 2015, and "satisfactory" in 2016 and 2017.

374. Bruce Power submitted information about its defense-in-depth security measures, including site access points, physical security barriers, security procedures and the nuclear response team. Bruce Power also provided the Commission with information about improvements that were made to the security at the Bruce NGS, noting that the existing infrastructure and process satisfied regulatory requirements. Notwithstanding, Bruce Power reported about several continuous improvement activities that were being undertaken in respect of the Bruce NGS security program.

375. Bruce Power submitted information about its security training program and how it met the specifications of REGDOC-2.12-1, *High Security Sites: Nuclear Response*

[82] SOR/2000-209.

Force.[83] CNSC staff confirmed that Bruce Power's security training met CNSC regulatory requirements.

376. Bruce Power submitted information about response arrangements it had put in place with the Ontario Provincial Police (OPP) through a MOU. Bruce Power submitted additional information about the measures it had taken to improve interoperability and to continuously enhance response capabilities in cooperation with local police, fire services and paramedics.

377. Bruce Power submitted information about its participation in a security program evaluation by the International Atomic Energy Agency (IAEA) International Physical Protection Advisory Service (IPPAS) mission (2015).

378. CNSC staff submitted that it had conducted a "Force on Force" performance testing exercise in 2016 and two inspections of the security program at Bruce Power in 2017. CNSC staff reported that in 2017, CNSC staff lowered the overall security SCA rating of the Bruce NGS from "fully satisfactory" to "satisfactory" based on challenges Bruce Power faced within the areas of security practices and drills and exercises. CNSC staff reported that despite the lowered rating, it had determined that Bruce Power's security program met the requirements of the *Nuclear Security Regulations* and the specifications of associated regulatory documents and that it would continue compliance verification activities and confirm the implementation of Bruce Power's corrective actions in this regard.

Security for MCR

379. Bruce Power informed the Commission of its plan to enhance the security search process for bulk materials during the MCR activities by implementing a large vehicle scanning capability using technology similar to what was used at Canadian border crossings.

380. The Commission requested information from Bruce Power about site security measures that would be undertaken or enhanced as MCR activities are undertaken. Bruce Power explained that it could provide only limited information in the public forum related to their security procedures in order to maintain site security, but provided general information about personnel screening and site access limitation, and explained that an optimization process had been undertaken to ensure that security measures would adequately support MCR activities. CNSC staff confirmed that it reviewed Bruce Power's security procedures and that Bruce Power was meeting regulatory requirements related to security.

3.14.1 Cybersecurity

381. The Commission assessed the cybersecurity program at the Bruce NGS. CNSC staff

[83] CNSC Regulatory Document REGDOC 2.12.1, *High Security Sites: Nuclear Response Force*, 2013.

submitted that, over the current licence period, Bruce Power had continued to implement a cyber security program at the Bruce NGS, and that there were no significant issues in this area.

382. CNSC staff reported that, in 2016, Bruce Power submitted an implementation plan to address the identified gaps between the current Bruce Power cybersecurity program and the specifications of CSA N290.7-14, *Cyber security for nuclear power plants and small reactor facilities*,[84] that full implementation at the Bruce NGS was expected by December 2020, and that CNSC staff was satisfied in this regard.

3.14.2 Conclusion on Security

383. On the basis of the information provided on the record for this hearing, the Commission is satisfied that Bruce Power's performance with respect to maintaining security at the Bruce NGS has been acceptable. The Commission concludes that Bruce Power has made adequate provision for the physical security of the Bruce NGS, and is of the opinion that Bruce Power will continue to make adequate provision for security during the proposed licence period.

384. The Commission notes and is satisfied with the improvements being made to the security program at the Bruce NGS following the decrease in rating in this SCA. The Commission expects CNSC staff to carry out verification compliance activities in this regard during the renewed licence period.

385. The Commission is satisfied that Bruce Power's cybersecurity program is adequate to protect the Bruce NGS from cyberattacks and other cybersecurity-related concerns.

386. Bruce Power is to implement CSA N290.7-14 at the Bruce NGS by December 2020 in accordance with the schedule presented in this hearing.

3.15 Safeguards and Non-Proliferation

387. The Commission examined the adequacy of Bruce Power's safeguards program at the Bruce NGS. 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*[85] (NPT). Pursuant to the NPT, 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 is no undeclared nuclear material or activities in this country. CNSC staff rated Bruce Power's performance in this SCA as "satisfactory" throughout the current licence period.

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[84] N290.7-14, *Cyber security for nuclear power plants and small reactor facilities*, CSA Group, 2014.
[85] *Treaty on the Non-Proliferation of Nuclear Weapons* (1968), IAEA Doc. INFCIRC/140, 729 UNTS 169, entered into force 5 March 1970 (NPT).

388. Bruce Power provided the Commission with information on the Bruce NGS safeguards program, how IAEA safeguards were implemented at the Bruce NGS and explained that the safeguards program also satisfied the requirements of the GNSCR, the *Class I Nuclear Facilities Regulations* and the NNIECR.

389. Bruce Power also submitted that RD-336, *Accounting and Reporting of Nuclear Material*[86] was implemented at the Bruce NGS to ensure that Bruce Power's safeguards program enabled Canada to meet its safeguards obligations in relation to Bruce Power's licensed activities.

390. CNSC staff confirmed the information provided by Bruce Power, noting that Bruce Power adequately prepared for IAEA physical inventory verification during the current licence period and supported IAEA equipment and maintenance activities at the Bruce NGS to ensure effective implementation of safeguards measures.

391. Based on the above information, the Commission is satisfied that Bruce Power has provided and will continue to provide adequate measures in the areas of safeguards and non-proliferation at the Bruce NGS that are necessary for maintaining national security and measures necessary for implementing international agreements to which Canada has agreed.

3.16 Packaging and Transport

392. The Commission examined Bruce Power's packaging and transport program at the Bruce NGS. 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, 2015*[87] (PTNSR, 2015) and Transport Canada's *Transportation of Dangerous Goods Regulations*[88] (TDG Regulations) for all shipments. During the current licence period, CNSC staff rated Bruce Power's performance in this SCA as "satisfactory."

393. Bruce Power provided the Commission with information on the Bruce NGS packaging and transport activities, noting that they were carried out in accordance with the PTNSR, 2015 and that Bruce Power was a registered user of Type B packages, packages designed to transport material with the highest levels of radioactivity.

394. CNSC staff confirmed the information provided by Bruce Power, explaining that packaging and transport at Bruce NGS met the requirements of the PTNSR, 2015 and the TDG Regulations. CNSC staff reported on minor packaging and transport related

[86] CNSC Regulatory Document RD-336, *Accounting and Reporting of Nuclear Material*, 2010.
[87] SOR/2015-145.
[88] SOR/2001-286.

events and a non-compliance during the current licence period, noting that there was no significant impact on the health or safety of persons or the environment as a result of the reported events and that the non-compliance was satisfactorily addressed by Bruce Power.

395. Upon request for comment from the Commission on the logistics for cross-border transport of radioactive material, the Bruce Power representative explained that all intermediate and high-level radioactive wastes from the Bruce NGS were staying onsite while low-level radioactive wastes were segregated and transported to the United States for incineration. The Bruce Power representative further explained that the ashes from the low-level radioactive wastes were returned to the Bruce site. The Bruce representative added that the shipments were done through a third-party provider who was required to meet CNSC regulatory requirements, and that the incineration facility was under licence by the US NRC.

396. Based on the information presented on the record for this hearing, the Commission is satisfied that Bruce Power is meeting, and will continue to meet, regulatory requirements regarding packaging and transport.

3.17 Aboriginal Engagement and Public Information

3.17.1 Participant Funding Program

397. The Commission assessed the information provided by CNSC staff regarding public engagement in the licensing process as enhanced by the CNSC's Participant Funding Program (PFP). CNSC staff submitted that, in September 2017, up to $100,000 in funding to participate in this licensing process was made available to Indigenous groups, members of the public and other stakeholders to review Bruce Power's licence renewal application and associated documents, and to provide the Commission with value-added information through topic-specific interventions.

398. A Funding Review Committee (FRC), independent of the CNSC, recommended that eight applicants be provided with up to $76,500 in participant funding. These applicants were required, by virtue of being in receipt of participant funding, to submit a written intervention and make an oral presentation at Part 2 of the public hearing commenting on Bruce Power's licence renewal application. As such, $76,503 in participant funding was awarded to the following recipients:

- Mr. Eugene Bourgeois
- Dr. Richard Manzon
- Métis Nation of Ontario (MNO)
- Dr. Antone L. Brooks
- Dr. T.C. Tai and Dr. Chris Thome

- Women in Nuclear (WiN)
- Canadian Environmental Law Association (CELA)
- Northwatch

399. Based on the information submitted for this hearing, the Commission is satisfied that Indigenous groups, members of the public and other stakeholders were encouraged to participate in this licence renewal process and could apply for PFP.

3.17.2 Aboriginal Engagement

400. The common law duty to consult with Aboriginal peoples applies when the Crown contemplates action that may adversely affect established or potential Aboriginal and/or treaty rights. The CNSC, as an agent of the Crown and as Canada's nuclear regulator, recognizes and understands the importance of reconciliation, building relationships and engaging 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 and/or treaty rights pursuant to section 35 of the *Constitution Act, 1982*.[89]

401. The Commission examined the information submitted by Bruce Power regarding its ongoing engagement with Indigenous groups near the Bruce NGS site. Bruce Power provided the Commission with details on the ongoing engagement activities and noted that Bruce Power carried out engagement activities on any regulatory approvals as defined in the REGDOC-3.2.2, *Aboriginal Engagement*.[90] Bruce Power also noted that it received a gold certification from the Canadian Council for Aboriginal Business (CCAB) for excellence in Progressive Aboriginal Relations.

402. Bruce Power provided the Commission with information about three Indigenous groups that were identified as having a potential interest in the Bruce NGS licence renewal and about the engagement activities that were carried out with the identified groups. Bruce Power reported that these groups included the Métis Nation of Ontario (MNO), the Historic Saugeen Métis (HSM), and the Chippewas of Nawash Unceded First Nation and the Saugeen First Nation, who together formed Saugeen Ojibway Nation (SON). Bruce Power submitted that it had protocol agreements with each of the Indigenous groups to facilitate an active dialogue and that Bruce Power began engaging with the identified Indigenous groups about the upcoming life extension and licence renewal application in late 2015. Bruce Power added that feedback provided from past engagement activities was reviewed to ensure that applicable items of concern would be addressed within the most recent ERA that was carried out for this licence renewal application.

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[89] *Constitution Act, 1982*, Schedule B to the *Canada Act 1982*, 1982, c. 11 (U.K.).
[90] CNSC Regulatory Document REGDOC-3.2.2, *Aboriginal Engagement*, 2016.

403. Bruce Power described in detail to the Commission the current status of the engagement activities conducted with the identified Indigenous groups including the proposed mitigation measures in response to the Indigenous groups' concerns. Bruce Power indicated to the Commission that engagement activities with the MNO related to the MCR and the licence renewal application, that the engagement activities with the HSM related to the licence renewal, the MCR and the licence renewal application and that engagement activities with the SON related to the MCR, the *Fisheries Act* Authorizations[91] and climate change. Bruce Power also provided information on Indigenous employment at the Bruce NGS.

404. CNSC staff provided the Commission with information about the MNO, the HSM and the SON, which were identified as having an interest in the Bruce NGS licence renewal and about the consultation activities that were carried out with the identified groups. CNSC staff explained that the primary concerns raised by local Indigenous groups related to impacts on fish from the operation of the Bruce NGS. Even though CNSC staff found that the operations of the Bruce NGS were not having population level effects on fish in Lake Huron, CNSC staff added that Indigenous groups were engaged in an effort to better understand their concerns and that all of the identified Indigenous groups had been encouraged to participate in the review process and in the public hearing to advise the Commission directly of their concerns in relation to this licence application.

405. CNSC staff submitted that the proposed licence renewal did not propose any changes to the facility's footprint, which is located in a secure fenced-in site that has been in operation for many decades. CNSC staff also submitted that that there are no new activities or changes proposed in the licence renewal application that could reasonably be anticipated to have any novel off-site impacts. While CNSC staff expressed the view that a formal duty to consult was not triggered by licence renewal, CNSC staff submitted that continued communication with interested Indigenous groups was, and would continue to be, a priority for CNSC staff. CNSC staff further submitted that this continued communication would continue to be maintained throughout the proposed licence period to ensure that groups receive all of the information requested and to establish, maintain and enhance relationships with these groups.

406. In its intervention, the SON submitted that it disagreed with CNSC staff's position in respect to the Duty to Consult as it related to the Bruce NGS licence renewal and the MCR project. The SON submitted to the Commission that it was of the opinion that the scope and significance of the MCR project, as well as its potential long-term impacts on the SON's established and asserted Indigenous rights and interests, placed a significant obligation on the Crown, as represented by the Commission, CNSC staff, and other federal Crown agents, to consult with the SON and to understand and accommodate SON's concerns in respect of this licence renewal.

407. In considering the SON's submission Commission enquired about the difference in the duty to consult between Bruce Power's 2006 new build project and the proposed

[91] SI/2014-21, (Paragraph 35(2)(b).

life extension project. CNSC staff responded that there was a difference between the environmental and footprint impacts of refurbishing an existing nuclear power plant and the construction and operation of a new nuclear power plant. CNSC staff explained that the EA for the potential new build project in 2006 considered the project as a brand-new nuclear power plant, which triggered the duty to consult. CNSC staff added that the environmental impacts of continued operation and the MCR project were known and not significantly different than the current operation of the Bruce NGS. The Bruce Power representative confirmed CNSC staff's information and added that in 2006, Bruce Power and the SON, within the context of new build, entered into an engagement agreement to consult with SON on the construction of additional reactors on the site. The Bruce Power representative further mentioned that the engagement was directed toward the refurbishment after the new build project was cancelled.

408. CNSC staff detailed to the Commission CNSC staff's collaboration activities with the SON in regard to the SON's concerns. The activities listed by CNSC staff included the development of a study and analysis program to reduce uncertainties on potential environmental impacts of the Bruce NGS, the participation of the SON in environmental monitoring activities, and the study of available mitigation measures.

409. Noting the requested accommodation measures submitted in the intervention from the SON, the Commission invited comments in this regard. CNSC staff explained that the research needed for the disposition of the requested accommodation measures required significant time and added that the ongoing engagement process made progress in this regard as the number of SON's proposed accommodation measures had been greater in the past. The Bruce Power representative gave details about ongoing research focussed on understanding the species present in the Bruce NGS area and the impacts of thermal, radiological or chemical perturbations that was started in 2010 and noted that global warming may impact the result of the studies.

410. The Commission is mindful of its responsibility to uphold the honour of the Crown in respect of its decision-making under the NSCA. While it agrees with and accepts the rationale provided by CNSC staff respecting why authorizing the continued operation of the Bruce NGS will not pose novel adverse impacts to the rights and interests of Indigenous groups, the Commission also finds it to be desirable, and feasible in this matter, to work to accommodate those interests under its NSCA authority and in its ongoing regulatory process. Particularly in respect of the SON, which has articulated in its submission to the Commission the kind of involvement and participation it seeks in the development of monitoring programs for thermal effluent and fish impingement/entrainment, including involvement in crafting a mitigation measures study and the evaluation of its results, the Commission can direct that steps be taken.

411. Therefore the Commission directs CNSC staff to work with the SON to establish a formal arrangement for collaboration in respect of the Bruce NGS operation. Without abdicating regulatory responsibility under the NSCA, the CNSC staff and the Commission wish to have the benefit of both sound scientific principles and SON

knowledge, to inform the development of environmental monitoring programs and regulatory oversight. Bruce Power in the hearing advised the Commission that on three significant items of discussion with the SON – fish impingement/entrainment, thermal impacts and climate change – Bruce Power was looking forward to collaborating with the SON. The Commission sees a good opportunity for collaboration, and encourages Bruce Power to be involved in the formal arrangement that CNSC staff will develop with the SON. This formal arrangement should also incorporate and address the matters addressed at paragraphs 277, 288 and 319 of this record of decision as matters for collaboration.

412. To ensure its oversight of the establishment of this collaboration arrangement and of the development and refinement of the items of discussion and their implementation, the Commission requests that staff periodically update the Commission about its efforts in this regard and progress made in following the Commission's direction. The Commission also directs that staff provide a status update on this matter as part of its annual regulatory oversight reporting, at which there will be an opportunity for public participation, including by the SON as it sees fit.

413. Asked about the incorporation of traditional knowledge and the MNO research outcomes in the CNSC staff processes, CNSC staff responded that there were opportunities to include some of the species that were identified by the MNO in their intervention in the IEMP sampling. CNSC staff added that the information from MNO's proposed monitoring programs could be included in Bruce Power's ERA, noting that CNSC staff encouraged the regional cumulative environmental effects study proposed by MNO. CNSC staff further added that CNSC staff was supporting the MNO in looking at funding traditional knowledge studies.

414. Noting the MOU between Bruce Power and the MNO, the Commission asked about the future collaboration between CNSC staff and MNO and whether an MOU was in place. The MNO representative responded that MNO's preference was to have a specific MOU with CNSC staff to agree on the relationship and the work to come. The Commission encourages the MNO and CNSC staff in the creation of a MOU for their future collaboration.

415. The Commission considered the intervention from the Canadian Council for Aboriginal Business (CCAB) and enquired about Bruce Power's plans to encourage Bruce Power contractors to use Indigenous businesses during the MCR project. The Bruce Power representative provided information about the Indigenous Suppliers Network that Bruce Power created in 2017 and how it encouraged the Bruce Power's suppliers to engage in hiring Indigenous citizens from the area and encourage the Bruce Power's suppliers to secure business from other entities that were aboriginal-owned as part of their supply chain for products coming to Bruce Power. The CCAB representative added that Bruce Power had played a leadership role in working with CCAB and encouraging Bruce Power's suppliers to join the CCAB.

416. Asked for comments about the collaboration opportunities between the HSM, Bruce Power and CNSC staff, the Bruce Power representative confirmed that it held regular meetings with the HSM, stated that the quarterly meetings were very productive and that a draft agenda was always sent out ahead of time allowing for topics of discussions relevant for the quarter. The Bruce Power representative added that HSM's participation and input were helping Bruce Power's continuous process of improvement. The HSM representative informed the Commission that the HSM was satisfied with the collaborative activities it had in place with CNSC staff and Bruce Power, noting that Bruce Power's operations were not inhibiting the rights of HSM members to exercise their traditional harvesting rights. The Commission was satisfied with the information provided on this point and encourages this seemingly successfully collaborative mechanism to continue.

417. Based on the information provided for this hearing, the Commission is satisfied that Aboriginal engagement activities carried out for this licence renewal were adequate and finds that the hearing process provided a means for it to consider Indigenous interest in the renewal. The Commission expresses its appreciation for their participation.

3.17.3 Public Information

418. The Commission assessed Bruce Power's public information and disclosure program (PIDP) for the Bruce NGS. A public information program is a regulatory requirement of the *Class I Nuclear Facilities Regulations* for licence applicants and licensed operators of Class I nuclear facilities.

419. The Commission assessed how Bruce Power's PIDP met the specifications of RD/GD-99.3, *Public Information and Disclosure*.[92] Bruce Power provided the Commission with information regarding its public and stakeholder consultations, communication activities and methods. Bruce Power presented the improvements made to the PIDP since 2014 including enhancements to the corporate website and electronic newsletters. CNSC staff confirmed to the Commission that Bruce Power's PIDP satisfied regulatory requirements.

420. Bruce Power presented to the Commission the results of polls and surveys conducted in 2016 and 2017 to understand the concerns of the local residents. Bruce Power reported that 85% of the local residents supported the Bruce NGS and summarized the community issues by topic.

421. The Commission enquired about the public availability of investigation results after incidents at the Bruce NGS. The Bruce Power representative indicated that event information, including disposition and media questioning, could be found on Bruce Power's website. CNSC staff indicated that it was a requirement for the licensee to post reportable events and to make the information available. CNSC staff added that

[92] CNSC Regulatory/Guidance Document RD/GD-99.3, *Public Information and Disclosure*, 2012.

reportable events were presented to the Commission with the Event Initial Reports and also presented in the ROR.

422. Based on the information presented for this hearing, the Commission is satisfied that Bruce Power's Facility PIDP has communicated and will continue to communicate information to the public about the health, safety and security of persons and the environment and other issues related to the Bruce NGS.

3.17.4 Conclusion on Aboriginal Engagement and Public Information

423. Based on the information presented, the Commission is satisfied that, overall, Bruce Power's PIDP meets regulatory requirements and is effective in keeping Indigenous groups and the public informed of Bruce NGS operations. The Commission acknowledges the good practices already implemented by Bruce Power and encourages its efforts in creating, maintaining and improving its dialogue with the neighbouring communities.

424. The Commission noted the concerns of different intervenors, including CELA, Nuclear Waste Watch and Greenpeace, regarding the absence of possibility for oral intervention from the public for the next 10 years with this renewal. The Commission directs that, at the mid-point of the 10-year licence period and no later than 2023, Bruce Power shall present to the Commission a comprehensive mid-term update on its licensed activities, including the MCR, at the Bruce NGS. This mid-term update will take place during a public Commission meeting in the vicinity of the community that hosts the Bruce NGS and during which Indigenous groups, members of the public and stakeholders will be able to intervene. The Commission notes that, as part of the current practice, it was anticipated that participant funding may be offered for this update. The Commission also notes the opportunity to seek to intervene in the context of the annual ROR as well as at possible hearing to consider amendment to the licence.

425. The Commission is satisfied that meaningful consultation efforts have been made by CNSC staff on behalf of the Commission. The Commission finds that these efforts, together with the valuable discussion in the hearing process, suggestions for collaboration and the good faith efforts to come, in establishing a formal arrangement for that collaboration and continuing the discussion, adequately accommodate the Aboriginal rights and interests at stake with respect to the continued operation of the Bruce NGS.

3.18 Decommissioning Plans and Financial Guarantee

426. The Commission requires that there be operational plans for the decommissioning of the facility, including the long-term management of waste produced during the lifespan of the Bruce NGS. In order to ensure that adequate resources are available for

safe and secure future decommissioning of the Bruce NGS site, the Commission requires that an adequate financial guarantee for realization of the planned activities is put in place and maintained in a form acceptable to the Commission throughout the licence period. The Commission notes that in the case of the Bruce NGS, OPG is responsible for decommissioning and that it is OPG that provides the financial guarantee for the Bruce NGS.

427. CNSC staff assessed OPG's preliminary decommissioning plan (PDP) regarding the Bruce NGS and determined that it met the specifications of CSA N294-09, *Decommissioning of facilities containing nuclear substances*,[93] and G-219, *Decommissioning Planning for Licensed Activities*[94].

428. CNSC staff reported that it had assessed the financial guarantee for the Bruce NGS and was satisfied that it met the guidance set out in G-206, *Financial Guarantees for the Decommissioning of Licensed Activities*[95].

429. In October 2017, the Commission held a public hearing, after which it accepted the updated OPG FG, which included the PDP and FG for the Bruce NGS. On this basis, the Commission concludes that the preliminary decommissioning plan and related financial guarantee for the Bruce NGS are acceptable for the purpose of the current application for licence renewal.

3.19 Cost Recovery

430. The Commission examined Bruce Power's standing under the CNSC *Cost Recovery Fees Regulations*[96] (CRFR) requirements for the Bruce NGS. Paragraph 24(2)(c) of the NSCA requires that a licence application is accompanied by the prescribed fee, as set out by the CRFR and based on the activities to be licensed.

431. CNSC staff submitted to the Commission that Bruce Power was in good standing with respect to CRFR requirements for Bruce NGS. Based on Bruce Power's previous performance, CNSC staff determined that there was no concern with payment of future cost recovery fees. CNSC staff added that in the event that the requested consolidation of Class II, nuclear substance and radiation devices licences into the PROL was granted by the Commission, the costs associated with the regulation of those licensed activities would continue to be assessed under "Part 3" of the CRFR.

432. Based on the information submitted by Bruce Power and CNSC staff, the Commission is satisfied that Bruce Power has satisfied the requirements of the CRFR for the purpose of this licence renewal.

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[93] N294-09, *Decommissioning of facilities containing nuclear substances*, CSA Group, 2009; Update 1, 2014.
[94] CNSC Regulatory Guide G-219, *Decommissioning Planning for Licensed Activities*, June 2000.
[95] CNSC Regulatory Guide G-206, *Financial Guarantees for the Decommissioning of Licensed Activities*, June 2000.
[96] SOR/2003-212.

3.20 Nuclear Liability Insurance

433. The Commission notes that Bruce Power is required to maintain nuclear liability insurance for the Bruce NGS. Bruce Power maintained nuclear liability insurance in accordance with the *Nuclear Liability Act*[97] (NLA) during the current licence period until December 31, 2016 and since then, with the *Nuclear Liability and Compensation Act*[98] (NLCA) that came into force on January 1, 2017. CNSC staff reported to the Commission that Natural Resources Canada, the federal department responsible for the administration of the NLCA, had confirmed that Bruce Power had satisfied and should continue to satisfy its obligation under the NLCA during the balance of the current licence period and throughout the licence period. The Commission notes that NRCan has regulatory responsibility and powers, in the event of any non-compliance with the NLCA.

434. Based on the information provided on the record for this hearing, the Commission is satisfied that Bruce Power has satisfied the requirements for the maintenance of nuclear liability insurance under the NLCA. The Commission expects annual updates in the NPP ROR in regard to Bruce Power's compliance with the NLCA.

3.21 Licence Length and Conditions

435. The Commission considered Bruce Power's application for the renewal of the current Bruce Power operating licence for a period of 10 years. CNSC staff recommended the renewal of the licence for a period of 10 years submitting that Bruce Power is qualified to carry on the licensed activities authorized by the licence.

436. In order to provide adequate regulatory oversight of changes that would not alter the licensing basis and do not require a licence amendment nor Commission approval, CNSC staff recommended that the Commission delegate authority for certain approval or consent, as contemplated in licence condition 3.2, to the following CNSC staff:

- Director, Bruce Regulatory Program Division
- Director General, Directorate of Power Reactor Regulation
- Executive Vice-President and Chief Regulatory Operations Officer, Regulatory Operations Branch

With respect to licence condition 15.5, CNSC staff recommend that the Commission delegate the authority to remove regulatory hold points for the return to service of each unit undergoing MCR activities to:

- Executive Vice President and Chief Regulatory Operations Officer, Regulatory Operations Branch.

[97] R.S.C., 1985, c. N-28 (repealed).
[98] S.C. 2015, c. 4, s. 120.

437. The Commission enquired whether the consolidation of Class II, nuclear substance and radiation devices licences into the PROL would have an effect on the amount of oversight by CNSC staff. CNSC staff explained that those licences were issued by a designated officer because of their lower risk nature. CNSC staff added that with these licences in the PROL, CNSC staff oversight might increase as CNSC staff inspectors will now also be involved in compliance verification. The Bruce Power representative noted that the change was mainly administrative in nature and that licences had been consolidated for other licensees.

438. The Commission acknowledges that several intervenors recommended that Bruce Power be issued a licence for a shorter licence period for the Bruce NGS. The Commission considered the information provided by these intervenors and the reasoning for a shorter licence period, including procedural and program maturity, environmental monitoring concerns, and concerns about opportunities for public intervention.

439. Based on the information examined by the Commission during the course of this hearing, the Commission is satisfied that a 10-year licence is appropriate for the Bruce NGS. The Commission is satisfied that a 10-year licence is merited on the basis of Bruce Power's past performance, the synchronization with the 10-year PSR and opportunities for public involvement during the 10-year period through annual ROR and the comprehensive mid-term report by 2023. 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 it can bring any matter to the Commission as required.

440. Pursuant to Licence Condition 15.3, approval by the Commission will be required for Bruce Power to operate with pressure tubes in excess of 120 ppm of [Heq].

4.0 CONCLUSION

441. The Commission has considered the information and submissions of the applicant, CNSC staff and all participants as set out in the material available for reference on the record, as well as the oral and written interventions provided or made by the participants at the hearing.

442. The Commission is satisfied that Bruce Power meets the test set out in subsection 24(4) of the *Nuclear Safety and Control Act*. That is, the Commission is of the opinion that Bruce Power is qualified to carry on the activity that the proposed licence will authorize and that it 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.

443. Therefore, the Commission, pursuant to section 24 of the *Nuclear Safety and Control Act*, renews the Nuclear Power Reactor Operating Licence (PROL) for the Bruce Nuclear Generating Stations A and B located on the Municipality of Kincardine, Ontario. The renewed licence, PROL-18.00/2028, is valid from October1, 2018 until September 30, 2028.

444. The Commission includes in the licence the conditions as recommended by CNSC staff in CMDs 18-H4.B. The Commission also delegates authority for the purposes of licence conditions 3.2 and 15.5, as recommended by CNSC staff.

445. The Commission also consolidates into the PROL 18.00/2028 the following licences:

- 13152-3-20.2 – Industrial Radiography
- 13152-1-20.4 – Consolidated Use of Nuclear Substances
- 13152-2-21.1 – Operate a calibration irradiator facility

Therefore, the activities currently authorized by these licences are also authorized by Bruce Power Reactor Operating Licence PROL 18.00/2028. With this decision, the Commission revokes CNSC licences 13152-3-20.2, 13152-1-20.4 and 13152-2-21.1, effective as of the date of this decision.

446. The Commission considers the environmental review that was conducted by CNSC staff to be acceptable and thorough. The Commission is satisfied that an EA under CEAA 2012 was not required for the Bruce NGS licence renewal application and notes that the NSCA provides a strong regulatory framework for environmental protection. Further, the Commission is satisfied that Bruce Power has made, and will continue to make, adequate provision for the protection of the environment and the health of persons throughout the proposed licence period.

447. The Commission notes that CNSC staff can bring any matter to the Commission that merits its attention. The Commission directs CNSC staff to inform the Commission on an annual basis of any changes made to the Licence Conditions Handbook (LCH).

448. With this decision, the Commission directs CNSC staff to report annually on the performance of Bruce Power and the Bruce NGS, as part of the annual *Regulatory Oversight Report for Canadian Nuclear Power Plants* (NPP ROR). CNSC staff shall present this report at a public proceeding of the Commission, where members of the public will be able to participate.

449. The Commission also directs CNSC staff to inform the Commission of updates relating to Bruce Power's fracture toughness model and to report the maximum [Heq] of the pressure tubes at every Commission proceedings as well as in the NPP ROR.

450. The Commission authorizes Bruce Power to operate Bruce A and B NGS up to a maximum of 300,000 EFPH.

451. The Commission directs that, at the mid-point of the 10-year licence period and no later than 2023, Bruce Power shall present to the Commission a comprehensive mid-term update on its licensed activities, including the MCR, at the Bruce NGS. This mid-term update will take place during a public Commission meeting in the vicinity of the community that hosts the Bruce NGS and during which Indigenous groups, members of the public and stakeholders will be able to intervene.

452. The Commission directs CNSC staff to work with the SON to establish a formal arrangement for collaboration in respect of the Bruce NGS operation. The Commission encourages Bruce Power to be involved in the formal arrangement that CNSC staff will develop with the SON. The Commission requests that staff periodically update the Commission about its efforts in this regard and progress made in following the Commission's direction. The Commission also directs that staff provide a status update on this matter as part of its annual regulatory oversight reporting, at which there will be an opportunity for public participation, including by the SON as it sees fit.

453. The Commission encourages Indigenous groups and members of the public to take advantage of all of the opportunities provided by the CNSC for public participation including RORs, Commission meetings on specific issues and Commission hearings.

454. The Commission expects CNSC staff to update the Commission on the status of the MCR at every Commission Meeting as part of the Status Report on Power Reactors and also as part of the annual NPP ROR.

455. The Commission encourages Bruce Power to continue its engagement activities with the public.

456. The Commission requests that all of the information about the anticipated volume of waste that will be produced during the MCR of the six units at the Bruce NGS be made available by the licensee for public review in a single document as soon as feasible.

457. Pursuant to Licence Condition 15.3, approval by the Commission will be required for Bruce Power to operate with pressure tubes in excess of 120 ppm of [Heq].

458. It is the Commission's expectation that future IEMP reports take into due consideration the input from local Indigenous peoples and that they be provided an opportunity to review and comment prior to the IEMP report being finalized.

September 27, 2018

Rumina Velshi
President,
Canadian Nuclear Safety Commission

Date

Appendix A – Intervenors

Oral Interventions	
Northern Ontario School of Medicine, represented by T.C. Tai and C. Thome	18-H4.52 18-H4.52A
McMaster University & the University of Regina Whitefish Research Group, represented by J. Wilson and C. Somers and R. Mazon	18-H4.53
Eugene Bourgeois and Anna Tilman	18-H4.54 18-H4.54A
Historic Saugeen Métis, represented by P. McArthur, G. Govier, C. Hachey and R. Lamont	18-H4.55
Women in Nuclear Canada, represented by T. Primeau and H. Kleb	18-H4.56 18-H4.56A
Métis Nation of Ontario, represented by P. Richardson, B. Bartlett, D. Dusome, P. Couture, L. Duval, G. Garratt, G. Conacher and A. Barty	18-H4.57
The Society of United Professionals, represented by S. Travers, M. Gade and R. Chatoor	18-H4.61 18-H4.61A
Canadian Nuclear Society, represented by D. Gammage, P. Easton and C. Hunt	18-H4.62
Canadian Nuclear Association, represented by J. Barrett	18-H4.63
Lake Huron Fishing Club, represented by M. Hahn	18-H4.64
City of Owen Sound, represented by W. Ritchie and I. Boddy	18-H4.65
Municipality of Kincardine, represented by A. Eadie	18-H4.66
The Corporation of the Township of Huron-Kinloss, represented by M. Twolan	18-H4.67 18-H4.67A
South Bruce Grey Health Centre, represented by P. Rosebush	18-H4.68 18-H4.68A
Canadian Council for Aboriginal Business, represented by P.-E. McNab	18-H4.69
Grey Bruce Health Unit, represented by H. Lynn	18-H4.70
Cameco Corporation, represented by D. Clark and R. Robillard	18-H4.71
Municipality of Brockton, represented by D. Gieruszak	18-H4.72
Kinetrics Inc., represented by J. Mackinnon and J. D'Angelo	18-H4.73
The Organization of Canadian Nuclear Industries, represented by R. Oberth	18-H4.74 18-H4.74A
Aecon Group Inc., represented by J. Sylvester	18-H4.75
County of Bruce, represented by P. Eagleson	18-H4.76
Strategic Policy Economics, represented by M. Brouillette	18-H4.77
Ontario Chamber of Commerce, represented by R. Rossi	18-H4.78
Municipality of South Bruce, represented by R. Buckle	18-H4.79
Grey County, represented by K. Wingrove	18-H4.80
Hatch, represented by A. Jolly	18-H4.81
North American Young Generation in Nuclear, represented by K. Gill and E. Paul	18-H4.82
NA Engineering Associates, represented by E. Saab	18-H4.83 18-H4.83A

County of Huron, represented by C. Watson	18-H4.84
Town of Saugeen Shores, represented by M. Smith and D. Smith	18-H4.85
E.S. Fox Limited, represented by T. Armstrong	18-H4.86 18-H4.86A
SNC-Lavalin Inc., represented by N. Badie	18-H4.88
Nottawasaga Valley Conservation Authority, represented by F. Dobbs	18-H4.89
Nordion, represented by R. Wiens	18-H4.90
BWXT Canada Ltd., represented by J. Lundy	18-H4.91
Toronto Region Board of Trade, represented by J. Parker	18-H4.92
Power Workers' Union, represented by M. Hyatt, L. Alderdice and D. Trumble	18-H4.93 18-H4.93A
Canadian Nuclear Workers' Council, represented by D. Shier, L. Crombeen, K. Smith and D. Trumbull	18-H4.94 18-H4.94A
Provincial Building and Construction Trades Council of Ontario, represented by I. Delov and C. Tiano	18-H4.96
Society of Professional Engineers and Associates, represented by M. Ivanco	18-H4.98
Greenpeace, represented by S.P. Stensil	18-H4.99 18-H4.99A
Nuclear Waste Watch, represented by J. Jackson and T. McClenaghan	18-H4.100
Canadian Environmental Law Association, represented by M. Poremba, K. Blaise and T. McClenaghan	18-H4.101 18-H4.101A 18-H4.102B
Northwatch, represented by B. Lloyd	18-H4.103 18-H4.103.A
CANDU Owners Group Inc., represented by F. Dermarkar	18-H4.105
ATS Automation Tooling Systems Inc., represented by N. Bains	18-H4.106 18-H4.106A
Biidaabinokwe and Waasekom	18-H4.107
Saugeen Valley Conservation Authority, represented by W. Brohman	18-H4.120
Asthma Canada, represented by V. Foran	18-H4.121
The Invasive Phragmites Control Centre, represented by J. Gilbert	18-H4.122
Glenn Sutton	18-H4.123
Ipsos Public Affairs, represented by M. Hrobsky	18-H4.124 18-H4.124A
Sunil Nijhawan	18-H4.144
Saugeen Ojibway Nation, represented by A. Chegahno (Elder Miptoon), G. Nadjiwon, L. Anoquot, K. Ryan and A. Monem	18-H4.146 18-H4.146A
Norm Gurr	18-H4.147
Eastern Georgian Bay Stewardship Council, represented by K. Krievins	18-H4.148

Written Interventions	Document Number
Big Brothers Big Sisters of Kincardine & District	18-H4.2
Municipality of Morris-Turnberry	18-H4.3
International Association of Heat and Frost Insulators and Allied Workers, Local 95	18-H4.4
International Brotherhood of Electrical Workers, Local 804	18-H4.5
Unity for Autism	18-H4.6
Bluewater District School Board	18-H4.7
Huron Chamber of Commerce – Goderich, Central and North Huron	18-H4.8
Hydro Pensioners of Ontario, Georgian Bay District Pensioners Association, Bruce Sub Group	18-H4.9
Stewardship Grey Bruce Inc.	18-H4.10
Lake Huron Shoreline Tourism Marketing Partners	18-H4.11
Labourers' International Union of North America	18-H4.12
Municipality of Northern Bruce Peninsula	18-H4.13
Painters and Allied Trades of Ontario District Council 46, Locals 1494 / 1590	18-H4.14
World Nuclear Association	18-H4.15
Levitt-Safety	18-H4.16
Westover Treatment Centre	18-H4.17
Carpenters' District Council of Ontario, Local 2222, Goderich	18-H4.18
ASI Group Ltd.	18-H4.19
Municipality of South Huron	18-H4.20
Town of Hanover	18-H4.21
Sheet Metal Workers' International Association, Local Union 473	18-H4.22
Laveer Engineering	18-H4.23
International Brotherhood of Boilermakers	18-H4.24
Larry Miller, MP, Bruce-Grey-Owen Sound	18-H4.25
Bill Walker, MPP, Bruce-Grey-Owen Sound	18-H4.26
Women's House Serving Bruce & Grey	18-H4.27
Special Electronics & Designs Inc.	18-H4.28
JNE Consulting Ltd.	18-H4.29
Framatome Canada Ltd.	18-H4.30
Lakeside Process Controls Ltd.	18-H4.31
Township of Georgian Bluffs	18-H4.32
Sargent & Lundy Canada Company	18-H4.33
Municipality of Arran-Elderslie	18-H4.34
Lisa Thompson, MPP, Huron-Bruce	18-H4.35
International Irradiation Association	18-H4.36
Grey-Bruce Labour Council	18-H4.37
Millwright Regional Council of Ontario	18-H4.38
Town of South Bruce Peninsula	18-H4.39
Cronos Consulting Group	18-H4.40

Canadian Council for Public-Private Partnership	18-H4.41
Ideal Supply Inc.	18-H4.42
Teamsters Local Union No. 879	18-H4.43
Ben Lobb, MP, Huron-Bruce	18-H4.44
Rolls-Royce	18-H4.45
Georgian Bay Forever	18-H4.46
Ontario Power Generation	18-H4.47
Lake Huron Centre for Coastal Conservation	18-H4.48
Huron Shores Hospice	18-H4.49
Penetangore Watershed Group	18-H4.50
Énergie NB Power	18-H4.51
Bruce Peninsula Environment Group	18-H4.58
Source Security Working Group	18-H4.59
Brain Tumour Foundation of Canada	18-H4.60
Council of the Great Lakes Region	18-H4.87
Nuclear Energy Institute	18-H4.95
EnergySolutions Canada	18-H4.97
Green Feet, Ecosystem Services Management	18-H4.102
South Bruce Community & Business Association	18-H4.104
Grey Bruce Sustainability Network	18-H4.108
SauGreen for the Environment Inc.	18-H4.109
Kincardine Cross-Country Ski Club	18-H4.110
Township of Ashfield-Colborne-Wawanosh	18-H4.111
FIRST LEGO League Team 4137	18-H4.112
Wildlife Habitat Council Inc.	18-H4.113
Praxair Inc.	18-H4.114
Easter Seals Ontario	18-H4.115
Bruce County Historical Society	18-H4.116
Habitat for Humanity Grey Bruce	18-H4.117
Plug’n Drive Coalition of Ontario	18-H4.118
Canadian Cancer Society	18-H4.119
Association of Power Producers of Ontario	18-H4.125
Bruce Power Pensioners Association	18-H4.126
Butterfly Gardens of Saugeen Shores	18-H4.127
Kincardine & District Chamber of Commerce	18-H4.128
Saugeen Shores Chamber of Commerce	18-H4.129
EMC Power Canada	18-H4.130
Kincardine and Community Health Care Foundation	18-H4.131
Liv-A-Little Foundation	18-H4.132
Community Living Kincardine & District	18-H4.133
Kinetic Knights Robotics Team 781	18-H4.134
ABRAFLEX 2004 Ltd.	18-H4.135
Saugeen Memorial Hospital Foundation	18-H4.136
Canadian Mental Health Association – Grey Gruce	18-H4.137
John Roberts	18-H4.138

United Way of Bruce Grey	18-H4.139
Canadian Manufacturers & Exporters	18-H4.140
Promation Nuclear Ltd.	18-H4.141
REALTOR® Association of Grey Bruce Owen Sound	18-H4.142
Unified Engineering	18-H4.143
Antone L. Brooks	18-H4.145
Physician Quest	18-H4.149
Canadian Union of Skilled Workers	18-H4.151