



Minutes of the Canadian Nuclear Safety  
Commission (CNSC) Meeting Held on  
January 23, 2018



Minutes of the Canadian Nuclear Safety Commission (CNSC) meeting held Tuesday, January 23, 2018, beginning at 10:33 a.m., in Pembroke, Ottawa, ON.

Present:

M. Binder, President  
Dr. S. McEwan  
Dr. S. Soliman  
Dr. S. Demeter  
Mr. R. Seeley

M. Leblanc, Secretary  
L. Thiele, Senior General Counsel  
C. Moreau, Recording Secretary

CNSC staff advisors were:

P. Elder, G. Frappier, G. McDougall, J. Jin, A. Persaud and H. Khouaja

Other contributors were:

Bruce Power: F. Saunders and G. Newman  
Ontario Power Generation: R. Manley and R. Geofroy  
New Brunswick Power: M. Power

#### Constitution

1. With the notice of meeting CMD 18-M1 having been properly given and a quorum of permanent Commission members being present, the meeting was declared to be properly constituted.
2. Since the meeting of the Commission held December 13-14, 2017, Commission member documents (CMD) 18-M3 and 18-M4 were distributed to members. These documents are further detailed in Appendix A of these minutes.

#### Adoption of the Agenda

3. The agenda, CMD 18-M2, was adopted as presented.

Chair and Secretary

4. The President chaired the meeting of the Commission, assisted by M. Leblanc, Secretary and C. Moreau, Recording Secretary.

Minutes of the CNSC Meeting Held December 13-14, 2017

5. The minutes of the December 13-14, 2017 Commission meeting will be approved at a later date.

STATUS REPORTSStatus Report on Power Reactors

6. With reference to CMD 18-M3, which provides the Status Report on Power Reactors, CNSC staff provided updates on the following:
  - Fuelling for Pickering Nuclear Generating Station (NGS) Units 4 and 7 had returned to full availability.
  - Darlington NGS Unit 1 went into a planned outage on January 20, 2018 to reconnect the service transformer and was in the process of returning to full service.
  - The end-fitting for refurbishment at Darlington NGS Unit 2 removal has been completed. The next important step will be the removal of pressure tubes.

*New Brunswick Power (NB Power) Point Lepreau NGS Severe Winter Storm Monitoring*

7. The Commission sought clarification on how CNSC staff monitored NB Power's safety provisions during severe weather events. CNSC staff responded that the licensees had operational procedures to follow when a severe weather event was approaching and that, in the case of the severe winter storm near the Point Lepreau NGS, CNSC on-site inspectors ensured that NB Power followed its procedures in order to prepare for any effects of the storm and implement any mitigating measures that might be required. CNSC staff added that CNSC inspectors monitored the NGS operations during the event, were in contact with NB Power to discuss the severe weather event and also confirmed after the storm that there were no impacts on the station. The Commission was satisfied with the information provided in this regard.
8. The Commission also asked whether severe weather events requiring station shut down had happened recently. The NB Power representative responded that Point Lepreau NGS had not been required to be shut down due to the grid being unavailable or due to severe weather. The Bruce Power representative responded that

the last time the Bruce NGS was shut down due to an external event was during the power outage in 2003 and the resulting unavailability of the electrical grid.

9. The Commission requested information about the role of the Hanson Stream pump house located near the Point Lepreau NGS. The NB Power representative explained that the Hanson Stream pump house was the freshwater supply for the water treatment plant at the Point Lepreau NGS and added that operational failure of the pump house did not affect reactor safety.

#### *Bruce Power NGS Unit 4 Shutdown for Primary Heat Transport Pump Repair*

10. The Commission asked for information about the circumstances leading to the Bruce NGS Unit 4 shutdown. The Bruce Power representative responded that Unit 4 was shut down to replace a pump seal on the primary heat transport pump as it was discovered that the seal leak rate was increasing. The Bruce Power representative noted that Bruce Power had been tracking the leak rate of the seal and that it was not an unexpected or sudden seal failure.

#### *Darlington NGS Unit 2 Refurbishment*

11. In relation to the Darlington NGS Unit 2 refurbishment, the Commission sought information on whether the refurbishment was proceeding on schedule. The OPG representative confirmed to the Commission that the overall refurbishment project was on schedule with a planned return to service in 2019.
12. Asked about lessons learned from the November 2017 safety stand down at the Darlington NGS,<sup>1</sup> the OPG representative responded that OPG continued to monitor work practices for any indications of unsafe behaviours. The OPG representative added that the safety stand down was a useful activity to have undertaken to reinforce OPG's desired safety behaviours and that, although full lessons learned were not available, to date the stand down had shown to be successful.

### INFORMATION ITEMS

#### Technical Update on Fuel Channel Fitness-for-Service in Canadian Nuclear Power Plants

13. With reference to CMD 18-M4, CNSC staff presented the Commission with a technical update on fuel channel fitness-for-

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<sup>1</sup> Canadian Nuclear Safety Commission, Minutes of Meeting Held December 13-14, 2017. (In draft, to be approved)

service in Canadian Nuclear Power Plants (NPP). CNSC staff presented a summary of the technical concepts surrounding the fitness-for-service of pressure tubes in CANDU reactors, as well as pressure tube degradation mechanisms due to aging. CNSC staff also summarized the regulatory oversight of pressure tube degradation and CNSC staff's evaluation process of licensee proposals for extended operation of pressure tubes.

14. In regard to the concept of extended operation and the demonstration of safety for certain reactor components, the Commission asked if other countries had a similar approach as Canada. CNSC staff responded that Canadian industry was leading the way with respect to operating time and end-of-life research programs for zirconium pressure tubes and other components for its fleet of CANDU reactors. CNSC staff added that, although several other countries had experience in the use of zirconium alloys as pressure tube material, the value of information sharing with these countries was limited due to significant differences in the nature of the materials used.
15. In reference to the longer NPP licences being issued in the United States (US), the Commission asked about the difference between the US and the Canadian analysis in respect of safety significant NPP components such as pressure tubes. CNSC staff responded that CNSC staff's analysis associated with aging management for the different components and structures at an NPP, including periodic safety reviews, were based on a 10-year cycle. CNSC staff further explained that, with respect to pressure tubes, the key operational parameter considered in aging management was effective full power hours (EFPH) instead of the years that the pressure tubes had been in the reactor.
16. Further on this topic, CNSC staff provided the Commission with some information on the licensing status of US NPPs, noting that no extended operating applications had yet been approved by the Nuclear Regulatory Commission. CNSC staff also explained that the CNSC's regulatory practice for the evaluation of the aging of components, including the pressure tubes, was aligned with international aging management practices. CNSC staff mentioned that the International Atomic Energy Agency's Specific Safety Guide No. SSG-25<sup>2</sup> and REGDOC-2.6.3<sup>3</sup> provided all the specifications that the licensees had to meet to demonstrate that they had a reliable and effective aging management program.

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<sup>2</sup> International Atomic Energy Agency, Specific Safety Guide No. SSG-25, *Periodic Safety Review for Nuclear Power Plants*, Vienna, 2013.

<sup>3</sup> Canadian Nuclear Safety Commission Regulatory Document REGDOC-2.6.3, *Aging Management*, 2014.

17. In regard to pressure tube fitness-for-service assessments, CNSC staff explained that a licensee's periodic inspection program had to meet CSA N285.4,<sup>4</sup> which provided all the specifications for periodic inspection programs in terms of inspections frequency, scope of inspections and inspections methodologies. CNSC staff added that it reviewed periodic inspection reports submitted by licensees, noting that these reports included information about pressure tube health.
18. The Commission requested additional information about the techniques used to inspect pressure tubes. CNSC staff described the two types of pressure tube inspections generally used: periodic inspections whereby pressure tubes remained in the core and testing that involved the removal of pressure tubes. CNSC staff also elaborated on the different parameters that were collected during those inspections and noted that both destructive and non-destructive testing were used.
19. Further on the pressure tube inspection topic, the Commission asked for information about flaw detection rates. The Bruce Power representative explained that not many flaws were detected during inspections and that, if a flaw was discovered, the pressure tube would be replaced. The Bruce Power representative added that, in the case of the discovery of an indication of a possible flaw, an impression of the possible flaw was taken for further evaluation, noting that the number of indications of flaws in a pressure tube was dependent on its operating history.
20. The Commission asked about how many pressure tubes Bruce Power had to replace in the last five years due to the detection of a flaw during an inspection. The Bruce Power representative responded that, at the Bruce NGS, one or two pressure tubes were removed over the last five years to study indications in pressure tubes but noted that pressure tubes were generally removed from a reactor for surveillance purposes and destructive testing. CNSC staff confirmed that it was rare to find flaws that required a pressure tube to be replaced and explained that removing a pressure tube for surveillance and destructive testing was a licensing requirement.
21. The Commission asked about the role of Type II inspections in CNSC staff's assessment of pressure tube integrity. CNSC staff explained that, during Type II inspections, licensees' programs were verified to ensure that the licensees were implementing them appropriately.

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<sup>4</sup> N285.4, *Periodic inspection of CANDU nuclear power plant components*, CSA Group, 2014.

22. CNSC staff explained how that the periodic safety review process is used to confirm the condition of the major components for the next licensing period, adding that the results of the inspections influence models which, in turn, influence the required number of inspections. CNSC staff added that, to operate beyond the original pressure tube design life, the licensees would have to report more frequently on pressure tube health and provide more information regarding aging management activities. CNSC staff also added that CNSC staff reported to the Commission annually on the status of the pressure tubes in the NPP Regulatory Oversight Reports.
23. In relation to end fitting ejection, the Commission asked about whether there were any additional studies carried out or progress made on that issue. CNSC staff responded that the issue of end fitting ejection was studied in the 1990s and that the conclusions from those studies eliminated the need for further analysis of that accident scenario. CNSC staff added that pressure tube failure was analyzed as a design basis accident, that safety systems were designed to handle a single pressure tube failure and that research in this regard has ensured that design basis accidents were mitigated.
24. In relation to the use of the term “hydrogen equivalent concentration” in fitness-for-service assessments, the Commission asked CNSC staff to elaborate further than what was in the briefing material. CNSC staff responded that the interaction of hydrogen or deuterium with the pressure tube was a chemical reaction which resulted in the formation of brittle hydrides when the concentration of hydrogen or deuterium was high enough and that, for this reason, the primary indicator in fitness-for-service assessments was hydrogen equivalent. CNSC staff added that, up to a certain hydrogen equivalent concentration, hydrides would precipitate when the reactor cooled down, and would dissolve back in the metal at the reactor’s operating temperature.
25. The Commission noted that the current area of concern for pressure tube operation was the fracture toughness and asked about CNSC staff’s current understanding of the evaluation of pressure tube integrity. CNSC staff described three aspects of enhanced regulatory scrutiny related to fracture toughness and also the ongoing work within the industry to validate the models. CNSC staff also emphasized that the key focus of future NPP relicensing was going to be on fracture toughness.
26. The Commission congratulated CNSC staff for the presentation, noting that it was very helpful in summarizing and explaining the complex subject of pressure tube fitness-for-service.



Closure of the Public Meeting

27. The public meeting closed at 12:16 on January 23, 2018.

Cheryl Moreau  
Recording Secretary

ML  
Secretary

March 19, 2018  
Date

19-03-2018  
Date



## APPENDIX A

CMD	Date	e-Docs No.
18-M1	21-12-2017	5420037
Notice of Commission Meeting		
18-M2	21-12-2017	5420146
Agenda of the Meeting of the Canadian Nuclear Safety Commission (CNSC) to be held on Tuesday, January 23, 2018		
18-M3	15-01-2018	5435305
Status Report on Power Reactors Submission from CNSC Staff		
18-M4	10-01-2018	5436079
Technical Update on Fuel Channel Fitness for Service in Canadian Nuclear Power Plants Presentation by CNSC Staff		