

Bruce A and B 2018 Licence Renewal

Commission Hearing (Part 2)
May 28-31, 2018
CMD 18-H4.C



CNSC Staff Presentation



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Presentation Outline

- Background
 - Purpose of Hearing
 - Periodic Safety Review
 - Refurbishment
- Performance assessments
 - Regulatory focus areas
 - Other matters of regulatory interest
- Licence and Licence Conditions Handbook
- Conclusions and Recommendations



Commission Hearing Bruce Power Licence Renewal (Part 2)
May 28-31, 2018, CMD 18-H4.C

BACKGROUND



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Background

- Part 1 Hearing occurred on March 14, 2018
- Part 1 presentation (CMD 18-H4.A) provided highlights from CMD 18-H4, which provided CNSC staff's conclusions and recommendations on licence renewal
- This presentation (CMD 18-H4.C) provides highlights from supplemental CMD 18-H4.B, which provides updated information since the Part 1 Hearing
- Part 1 information is available on CNSC's website (nuclearsafety.gc.ca):
 - Transcript and all documents
 - Video of Part 1 Hearing



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Purpose of Hearing (1/2)

Consideration of the renewal of Bruce Power's Power Reactor Operating Licence (PROL 18.00/2020)

- Licence application requests 10 year licence period and refurbishment
- Licence application includes a Periodic Safety Review (PSR) performed in accordance with REGDOC-2.3.3 (Periodic Safety Reviews)



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Purpose of Hearing (2/2)

Bruce Power's application requests the Commission to:

- approve operations of Bruce A and B up to a maximum of 300,000 Equivalent Full Power Hour (EFPH)
- accept the scope of the refurbishment project, as identified in the Integrated Implementation Plan (IIP)
- consolidate three existing Class II and Nuclear Substances licences into the Power Reactor Operating Licence:
 - Irradiator facility licence, for instrument calibration
 - Consolidated use of nuclear substances licence, for laboratories and radiation devices
 - Industrial radiography licence, for non-destructive testing



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Periodic Safety Review

- CNSC staff determined that Bruce Power's PSR met the requirements of REGDOC-2.3.3 (Periodic Safety Reviews)
- Bruce Power has systematically reviewed modern standards and practices
- Bruce Power has identified improvements that will be made to Bruce A and B stations

Bruce Power completed a comprehensive assessment to determine enhancements to the plant over the next 10 year period

Four phases of conducting a PSR

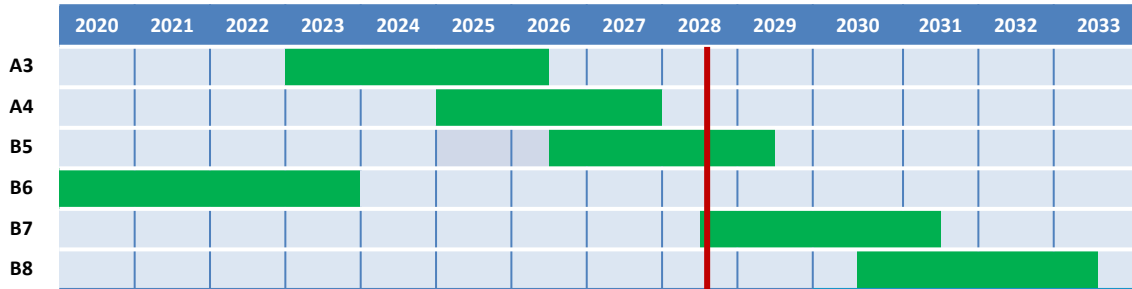




Commission Hearing, May 28-31, 2018
CMD 18-H4.C

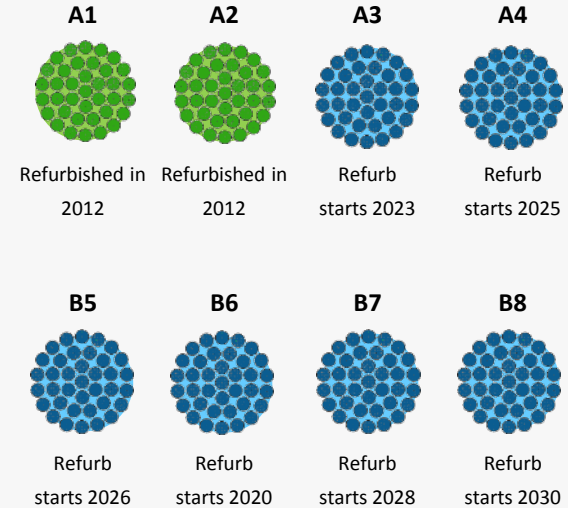
Refurbishment

- Refurbishment would begin in 2020, pending licensing decision by the Commission
- CNSC staff did not identify factors which would limit safe operation
- CNSC staff will maintain oversight of refurbishment activities



Requested licence period

- Planned Refurbishment (Major Component Replacement or MCR)
- Refurbished and returned to service



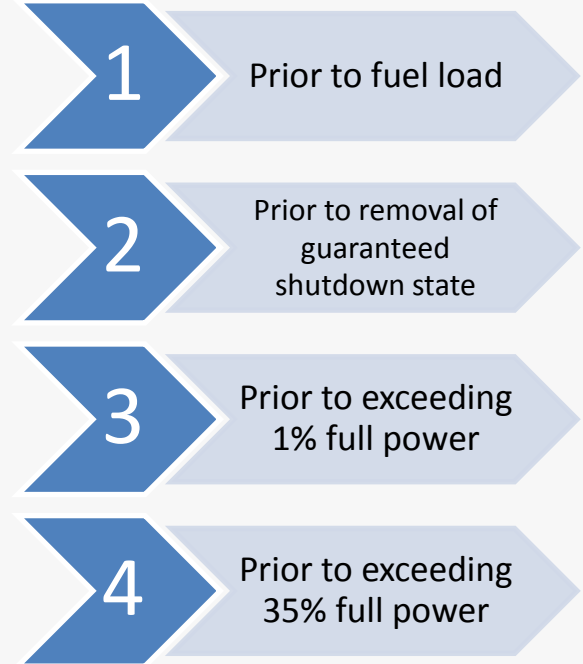


Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Refurbishment Return to Service

- Return to service is achieved through milestones which include 4 regulatory hold points
- Pre-requisite commitments must be met prior to release of hold points
- Recommend the authority to remove hold points be delegated to Executive Vice-President (CNCS)

Regulatory Hold Points





Commission Hearing Bruce Power Licence Renewal (Part 2)
May 28-31, 2018, CMD 18-H4.C

PERFORMANCE ASSESSMENT



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Performance Assessments Compliance Verification Activities

Compliance activities performed

Compliance activities effort	2015	2016	2017
# of REGDOC-3.1.1 Report Reviews	99	96	92
# of Walkdowns	200	195	197
# of Inspections	26	30	35
Person-days of effort at Bruce site	1358 days	1805 days	1716 days
Total Person-days of compliance effort	5127 days	5050 days	4871 days



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Performance Assessments Overall Plant Ratings

FS = Fully Satisfactory
SA = Satisfactory

SAFETY AND CONTROL AREA	2015		2016		2017	
	Bruce		Bruce		Bruce	
	A	B	A	B	A	B
Management System	SA	SA	SA	SA	SA	SA
Human Performance Management	SA	SA	SA	SA	SA	SA
Operating Performance	FS	FS	FS	FS	FS	FS
Safety Analysis	SA	SA	FS	FS	FS	FS
Physical Design	SA	SA	SA	SA	SA	SA
Fitness for Service	SA	SA	SA	SA	SA	SA
Radiation Protection	SA	SA	FS	FS	FS	FS
Conventional Health and Safety	FS	FS	FS	SA	FS	SA
Environmental Protection	SA	SA	SA	SA	SA	SA
Emergency Management and Fire Protection	SA	SA	SA	SA	SA	SA
Waste Management	FS	FS	FS	FS	FS	FS
Security	FS	FS	SA	SA	SA	SA
Safeguards and Non-Proliferation	SA	SA	SA	SA	SA	SA
Packaging and Transport	SA	SA	SA	SA	SA	SA



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Performance Assessments Summary for current licensing period

- Bruce Power meets regulatory requirements in all SCAs
- Radiation doses are well below regulatory limits
- Releases of nuclear and hazardous substances are assessed, controlled and monitored
- Licensee programs are effectively implemented and maintained
- Safety enhancements and improvements continued to be made

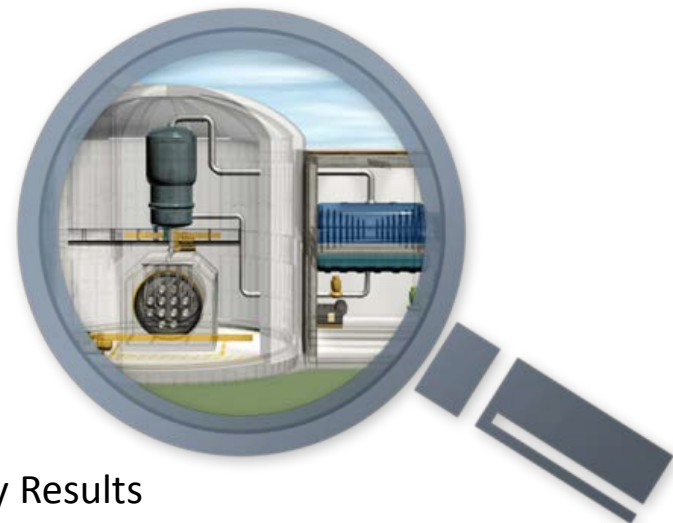
*Environment, health and safety of workers and
the public are protected*



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Regulatory Focus Areas

- All 14 Safety and Control Areas were assessed, including other matters of regulatory interest
- Updates since Part 1 Hearing:
 - Fitness for Duty: Managing Alcohol and Drug Use
 - Probabilistic Safety Analysis: Large Release Frequency Results
 - Environmental Protection
 - Emergency Management: Provincial Nuclear Emergency Response Plan (PNERP)
 - Waste Management
 - *Fisheries Act* Authorization application
 - Fitness for Service: Fracture Toughness of Pressure Tubes





Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Fitness for Duty: Managing Alcohol and Drug Use

- In March 2018, Bruce Power submitted an implementation plan for REGDOC-2.2.4 Vol. II (Fitness for Duty: Managing Alcohol and Drug Use)
 - implement by July 2019 (except for random testing)
 - random testing requirements implemented by December 2019
- CNSC staff are currently reviewing the implementation plan
- Bruce Power to provide update on implementation in Fall 2018

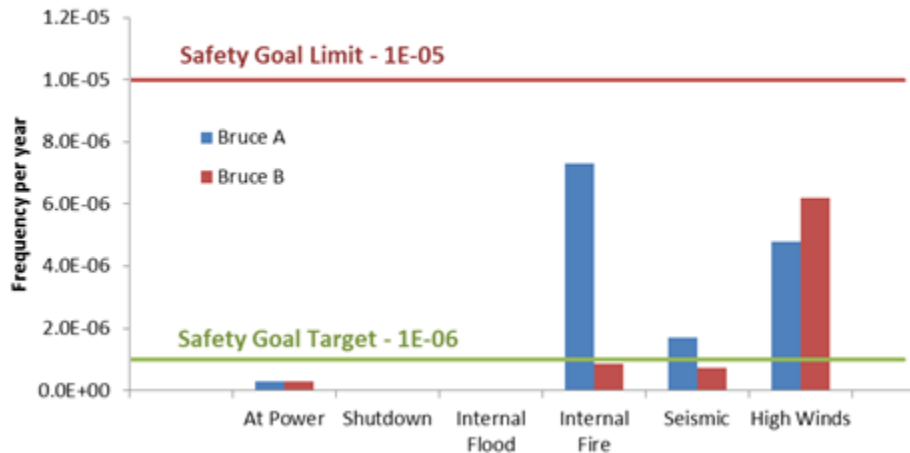
Implementation of Alcohol and Drug use is separate from relicensing and is not an impediment to licence renewal



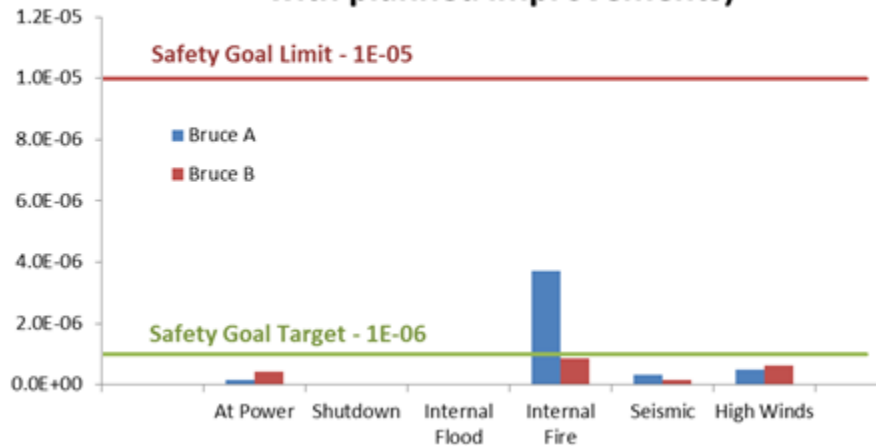
Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Probabilistic Safety Analysis: Large Release Frequency (LRF)

LRF Results for Bruce A and B (2014 PSA)



LRF Results for Bruce A and B (Estimated Data with planned improvements)



Notes:

1. 2014 PSA has been formally submitted and was accepted by CNSC staff.
2. Estimated data with planned improvements showed improved LRF results.



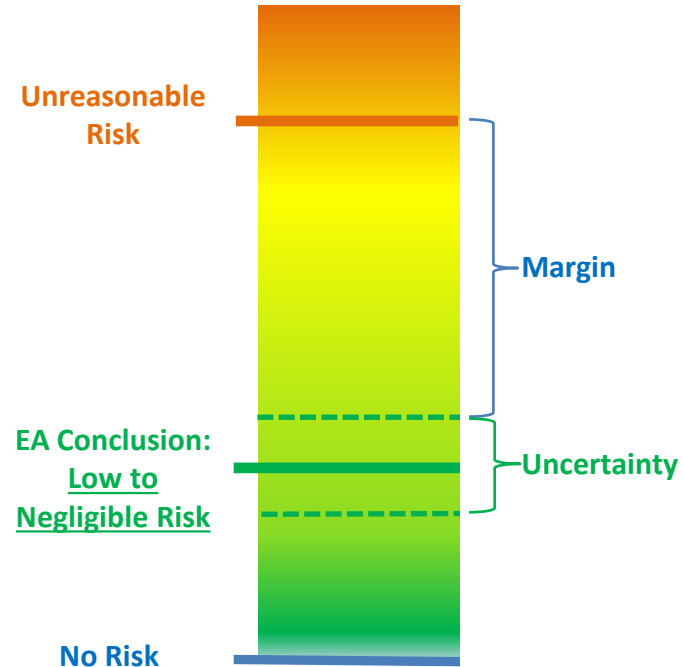
Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Environmental Protection

- Bruce Power has an effective environmental protection program
- CNSC conducted an Environmental Assessment (EA) under NSCA
 - considered current operations and future activities
- Risks to the environment or human health for the continued operation and refurbishment of Bruce A and B are low to negligible
 - Uncertainties do not affect conclusion: there is sufficient margin
- Continue to have discussions with Indigenous groups on environmental risks

Risk to the environment and human health from Bruce A and B is low to negligible

Risk from Bruce A and B is Low to Negligible





Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Independent Environmental Monitoring Program (IEMP)

- CNSC's Independent Environmental Monitoring Program:
 - independent of Bruce Power's environmental monitoring program
 - verifies to ensure no adverse effects around regulated facilities
 - complements ongoing CNSC compliance activities
- Verification is achieved through independent sampling and analysis by the CNSC
- Results confirm that Bruce Power has adequately protected the public and environment around Bruce site



[Independent Environmental Monitoring Program \(IEMP\)](#)



CNSC staff perform independent environmental monitoring around the Bruce site (top).
An air sampler is setup on the shores of Lake Huron (bottom).



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Emergency Management: PNERP Implementation

- In April 2018, the Office of the Fire Marshall and Emergency Management provided update to Commission (CMD 18-M21) on the 2017 Provincial Nuclear Emergency Response Plan (PNERP)
 - Master Plan and Implementing Plan approved
 - Plans available on Ontario Ministry of Community Safety and Correction Services website
- Bruce Power meets all the requirements of the new PNERP: Master Plan and Implementing Plan
- Current plans for Municipalities are effective
 - Incremental improvements will be made by the Municipalities to address Implementing Plan
 - The Province of Ontario will maintain oversight of the Municipalities' incremental improvements

*Bruce Power's Emergency Management and Fire Protection Programs
meet CNSC regulatory requirements*



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Waste Management

- CNSC staff determined that Bruce Power's application is complete and met the requirements of *General Nuclear Safety and Control Regulations*
- On-site and off-site transfer of radioactive waste is adequately managed per regulatory requirements
- Waste resulting from refurbishment activities considered in EA
 - Waste is minimized and volume reduced
 - Western Waste Management Facility (WWMF) has sufficient capacity for interim storage of waste
 - Design of proposed OPG Deep Geological Repository included waste volumes from refurbishment of Bruce units

Bruce Power's Waste Management Program meets regulatory requirements



The removed pressure tubes and calandria tubes (~600 cm in length) will be crushed into 5cm x 5cm coupons and stored in containers at the WWMF.

Source: OPG



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Fisheries Act Authorization

- *Fisheries Act* authorization is separate from CNSC's licence renewal process
- Bruce Power to submit application in May 2018 for CNSC's review prior to submission to Department of Fisheries and Oceans (DFO)
- Next Steps:
 - continued consultation with Indigenous groups
 - Bruce Power application to DFO expected late 2018

*Fisheries Act authorization is separate from relicensing
and is not an impediment to licence renewal*

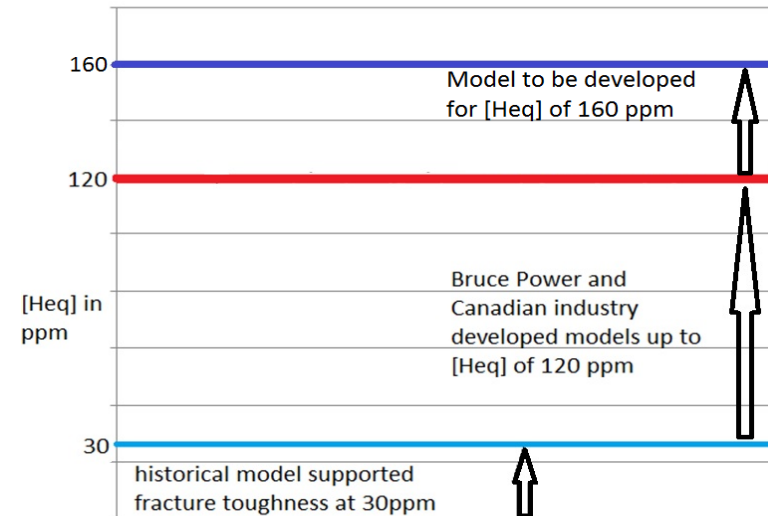


Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Fracture Toughness for Pressure Tubes Model Development

- Bruce Power has requested Commission's approval to operate up to 300,000 Equivalent Full Power Hour (EFPH)
 - current licensed limit is 247,000 EFPH and Hydrogen Equivalent Concentration (HEQ) levels of 120 ppm
 - operation up to 300,000 EFPH may reach HEQ of approximately 150 ppm
- Bruce Power is currently working with Canadian nuclear industry to develop a fracture toughness model of HEQ up to 160 ppm
- CNSC staff is satisfied with the scope and schedule of activities required to update fracture toughness model
- Bruce Power plans to include new models in update to CSA standards

Fracture toughness work performed by Bruce Power





Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Fracture Toughness for Pressure Tubes Predicted HEQ and EFPH

* Inlet and Outlet HEQ as of January 1, 2018. Units 1 and 2 were refurbished in 2012; HEQ for those units are below 70 ppm (inlet) and 100 ppm (outlet).

Unit	Estimated Year to reach HEQ level of 120 ppm	Refurb Outage Year	Estimated EFPH at Refurb	Estimated HEQ ppm at Refurb	Inlet* HEQ, ppm	Outlet* HEQ, ppm
6	Dec 2019	2020	245,000	~121	40	94
3	(will not reach 120)	2023	245,000	~102	50	93
4	(will not reach 120)	2025	255,000	~104	40	90
5	2020	2026	300,000	~151	40	90
7	2022	2028	300,000	~147	40	86
8	2027	2030	300,000	~139	44	63



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Fracture Toughness for Pressure Tubes CNSC Regulatory Oversight (1/3)

- In January 2018, CNSC staff presented in CMD 18-M4 on fuel channel evaluations for Canadian Nuclear Power Plants
 - rigorous regulatory process is applied to ensure fitness-for-service requirements have been met
 - process is applied consistently with ALL licensees
- CNSC staff perform assessments to ensure Structures, Systems and Components (SSCs) required for safe operation continue to meet structural integrity requirements (such as those found in CSA standards)
 - key requirements are provided in CMD 18-H4



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Fracture Toughness for Pressure Tubes CNSC Regulatory Oversight (2/3)

- HEQ of 70 ppm (inlet) and 100 ppm (outlet) defined in CSA standards are not “hard limits”
 - CSA standards allow for operation beyond 70 and 100 ppm limits, subject to fitness-for-service evaluations
 - Bruce Power and the Canadian nuclear industry continue to evaluate the impact of hydrides on pressure tube integrity
 - CNSC staff continue to perform reviews of the findings

CNSC staff applies the same rigour in the evaluation of fitness-for-service of pressure tubes for ALL licensees



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Fracture Toughness for Pressure Tubes CNSC Regulatory Oversight (3/3)

- During Part 1 Hearing, the Commission requested CNSC staff to strengthen the licence condition on fracture toughness model for HEQ in excess of 120 ppm:
 - **Updated:** *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.*
- Compliance verification criteria for the Licence Condition are defined in the Licence Conditions Handbook
- CNSC staff will report to the Commission on status of the pressure tubes through the annual Regulatory Oversight Report (ROR) for Canadian Nuclear Power Generating Sites

Bruce Power will not be allowed to operate beyond 120 ppm HEQ until the fracture toughness models have been accepted by CNSC staff



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Fracture Toughness for Pressure Tubes CNSC staff recommendation

- CNSC staff recommend that the Commission approve operation up to a maximum of 300,000 EFPH and add a new Licence Condition on HEQ in excess on 120 ppm
- Staff recommendation is based on:
 1. Adequate safety margins will always be maintained
 2. Strong knowledge of degradation mechanisms of pressure tubes
 3. Bruce Power has an effective pressure tube inspection and monitoring program
 4. A robust regulatory oversight process is in place for CNSC staff to ensure Bruce Power will meet its commitment



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Aboriginal Consultation and Engagement

- CNSC committed to building long-term relationships with Indigenous groups
- Bruce site lies within traditional Indigenous territory
- Extensive consultation and engagement with the following groups on Bruce Power issues, including the current licence application and refurbishment:
 - Saugeen Ojibway Nation (SON)
 - Métis Nation of Ontario (MNO)
 - Historic Saugeen Métis (HSM)

*CNSC staff will continue its collaboration with all
Indigenous groups*



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Collaboration with Indigenous Groups

- CMD 18-H4.B provides details on SON's concerns and CNSC staff proposed actions:
 - developing a study and analysis program to reduce uncertainties on potential environmental impacts
 - SON participation in environmental monitoring program
 - study of available mitigation measures
 - additional collaboration such as outreach, sharing of CNSC inspection results, meetings with the Crown
- CNSC staff will work with all Indigenous groups on concerns



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

CONCLUSIONS AND RECOMMENDATIONS



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Proposed Licence Period

CNSC staff are recommending a 10 year licence period based on:

- Safety Performance of Bruce Power
- Continuous monitoring and safety reviews through inspections and PSR
- Regular reporting to Commission on status of power reactors
- Annual reporting to the Commission at the ROR public proceedings, with participation from interested parties
- International practice on Nuclear Power Plant licence period:
 - Lifetime Licence Period: Belgium, Czech Republic, France, Germany, Hungary, Japan, Netherlands, South Korea, Sweden, Switzerland, United Kingdom
 - Other Licence Periods: Mexico 30 yrs, Finland 10-20 yrs, Spain 5-10 yrs, USA 40 yrs



Commission Hearing, May 28-31, 2018

CMD 18-H4.C

Conclusions and Recommendations

Overall Conclusions

CNSC staff conclude that as per section 24(4) of the NSCA:

- Bruce Power is qualified to carry on the activities authorized by the licence; and
- In carrying on the licensed activities, Bruce Power has made, and will continue to 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



Commission Hearing, May 28-31, 2018

CMD 18-H4.C

Conclusions and Recommendations

Recommendations (1/3)

CNSC staff recommend that the Commission:

1. Renew the PROL to authorize Bruce Power to continue to operate Bruce A and B for a period of 10 years, pursuant to section 24 of the NSCA
2. Consolidate the three specified licences (Class II and Nuclear Substances) into the PROL
3. Authorize Bruce Power to operate Bruce A and B up to 300,000 EFPH



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Conclusions and Recommendations Recommendations (2/3)

CNSC staff recommend that the Commission:

4. Accept the following licence conditions:

- implement the IIP resulting from the current PSR
- demonstrate that pressure tube fracture toughness will be sufficient for safe operation beyond 120 ppm HEQ
- implement a return to service plan for refurbishment activities
- obtain the approval of the Commission, or consent of a person authorized by the Commission, prior to the removal of established regulatory hold points during return to service
- conduct and implement a PSR prior to next licence renewal application
- direct CNSC staff and Bruce Power to work with Indigenous groups to address their areas of concern



Commission Hearing, May 28-31, 2018
CMD 18-H4.C

Conclusions and Recommendations

Recommendations (3/3)

CNSC staff recommend that the Commission:

5. Authorize the delegation of authority for a “person authorized by the Commission” for return to service following refurbishment
 - Licence Condition 3.2, Restart after a serious process failure
 - Licence Condition 15.5, Removal of regulatory hold points (related to return to service)

Connect With Us



nuclearsafety.gc.ca

