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Event Initial Report

Rapport initial d'événement

Bruce Power

Bruce A Unit 3 and Bruce B Unit 6
Hydrogen Equivalent Concentration in
Pressure Tubes Licence Limit
Exceedance

Bruce Power

Dépassement de la limite de la condition
de permis relative à la concentration
d'hydrogène équivalent dans les tubes de
force à la tranche 3 de la centrale de
Bruce-A et à la tranche 6 de la centrale
de Bruce-B

Commission Meeting

Réunion de la Commission

September 29, 2021

Le 29 septembre 2021

EVENT INITIAL REPORT (EIR)

e-Doc 6604836

EIR: Bruce A Unit 3 and Bruce B Unit 6 Hydrogen Equivalent Concentration in Pressure Tubes Licence Limit Exceedance	
Prepared by: Directorate of Power Reactor Regulation, Bruce Regulatory Program Division	
Licensee: Bruce Power	Location: Bruce A Unit 3, Bruce B Unit 6
Date Event was Discovered: 2021-07-05	Have Regulatory Reporting Requirements been met? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Proactive Disclosure: Licensee: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> CNSC: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Overview	
Reporting Criteria: An occurrence or incident that receives substantial media coverage or that has a high public visibility.	
Description: On July 5, 2021, Bruce Power reported that measurements obtained from one Unit 6 pressure tube, selected for examination as part of an industry-supported surveillance program, showed Hydrogen Equivalent Concentration ([Heq]) above the generic predictions and exceeding the Licence Condition 15.3 [Heq] limit of 120 parts per million (ppm – by weight). Bruce Power reported that pressure tube B6S13 has [Heq] measurement of 211 ppm at the burnish mark and 212 ppm at the burnish mark plus 10mm; whereas [Heq] measurements varied from 59 to 98 ppm at the burnish mark plus 20 mm (depending on the circumferential position). The region of higher than expected [Heq] observed in measurements is limited to a region at the top of the pressure tube encompassing 60° of the circumference and extends up to approximately 50 mm inboard of the outlet rolled joint burnish mark in the axial direction. Additional measurements are expected to confirm the dimensions of this region. On July 8, 2021, Bruce Power reported that measurements obtained from one Unit 3 pressure tube selected as part of an outage pressure tube inspection campaign showed [Heq] above the generic predictions and above the Licence Condition 15.3 [Heq] limit of 120 ppm. For the Unit 3 pressure tube (B3F16), Bruce Power indicated a preliminary measurement of 131 ppm [Heq]. The measurement has yet to be confirmed. Both units are shutdown, as such, there is no safety concern arising from the measured elevated [Heq] in their pressure tubes. Unit 6 pressure tubes have all been removed and are being replaced as part of the Major Component Replacement Outage. The Unit 3 pressure tube inspection campaign is being carried out in accordance with the fitness for service requirements and consistent with the verification criteria in CSA standards N285.4 and N285.8. Pressure tubes measure approximately 6 meters in length and 100 mm in diameter. The region of primary concern for fitness for service evaluations is the length of about 5.85 meters between (or inboard of) the end fitting rolled joint burnish marks at each end of the tube, which is subject to tensile stresses due to operational loads. Should the inner diameter surface of the tube have flaws introduced during operation then the tensile stresses could lead to crack initiation and propagation. The regulatory limit for [Heq] of 120 ppm applies to the length of tube between the rolled joint burnish marks and is based upon validity limits of the current pressure tube fracture toughness model. Cause(s): The cause(s) of the [Heq] limit exceedances is/are not known at this time. Further investigation and analysis are being undertaken by Bruce Power to determine the cause of test observations.	
Impact of the Event	
On People: How many workers have been (or may be) affected? <u>none</u> How many members of the public have been (or may be) affected by the event? <u>none</u> How were they affected? There is no impact on people from this discovery	
On the Environment: There is no impact on the environment from this discovery	
Other Implications: High [Heq] reduces the fracture toughness (resistance to fracture) of pressure tubes at temperatures lower than the normal operating temperatures. High [Heq] is of interest at lower pressure tube temperatures, which occur during reactor heat up/cool down. In the unlikely event of a very specific transient (called <i>cold overpressure transient</i>) combined with the presence of a flaw in the high [Heq] area of the pressure tube, a pressure tube rupture could occur.	

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EIR: Bruce A Unit 3 and Bruce B Unit 6 Hydrogen Equivalent Concentration in Pressure Tubes Licence Limit Exceedance

It is important to note that the design of CANDU reactors considers a pressure tube rupture event as a design basis event. Hence, adequate defence-in-depth provisions are incorporated in the design to ensure safe shutdown of the reactor for the protection of the public and the environment. The defence-in-depth approach to design assures that there are multiple provisions and barriers to prevent an accident and mitigate their consequences, should they occur.

Licensee Actions

Taken or in Progress:

Upon discovery of the elevated [Heq] measurements, Bruce Power completed Technical Operability Evaluations for the operating units (Units 1, 2, 4, 5, 7, and 8). Bruce Power confirmed that Units 1 and 2 are unconditionally operable as their pressure tubes have been replaced and they have not operated long enough to generate elevated [Heq] in the pressure tubes. Bruce Power has also assessed that pressure tubes in Units 4, 5, 7 and 8 are operable along their entire length. Two main conditions are required in order for a pressure tube to rupture: [Heq] above 120 ppm and the presence of a flaw. Since [Heq] cannot be measured during reactor operation, Bruce Power based their conclusion on an assessment of design basis accident conditions, lack of flaws observed in the region of interest, behavior of pressure tubes in the high temperature region, and the concurrence between predictive and measured values outside the region of interest.

In addition to this initial assessment, Bruce Power is performing further evaluations to confirm the conclusion that continued full power operation of these units is safe given adequate fracture toughness has been demonstrated for high [Heq] levels at the high operating temperatures during full operation.

For Unit 3, Bruce Power has performed additional [Heq] scrape inspections on 26 channels. Importantly, Bruce Power reported that flaws were not identified in the channels assessed as part of the outage inspection campaign. However, the [Heq] measurement results from these tubes are not yet available. As the Unit 3 outage inspection campaign is ongoing, a more detailed assessment of inspection results will be submitted to CNSC staff in the coming weeks.

Planned:

Bruce Power will conduct and provide to the CNSC a more detailed assessment of the safe continued operability of Bruce Units 1, 2, 4, 5, 7 and 8. Bruce Power will also assess whether operation of these Units remain within the licensing basis, given the discrepancy between the model predictions and sampling results in Units 3 and 6, and submit results of the assessment to the CNSC. A response has been requested by July 30, 2021.

Commission approval will be required to restart Unit 3.

Other licensees are being directed to assess impact of this discovery on the Canadian NPP fleet through *GNSCR* Section 12(2) requests [1-3]. Responses have been requested by July 30, 2021.

CNSC Actions

Taken or in Progress:

CNSC staff confirmed that Bruce Power has met reporting requirements for these discoveries. CNSC staff have determined that Bruce A Unit 3 and Bruce B Unit 6 were unknowingly operated outside of the licensing basis for a period of time prior to their shutdown.

Based on the review of information provided by Bruce Power to date, CNSC staff concur that this discovery has limited impact on the continued safe operation of Units 1, 2, 4, 5, 7 and 8, given the low likelihood of the flaws in the region of elevated [Heq] and adequate fracture toughness of pressure tubes at high operating temperatures during full power operation. CNSC staff based their conclusion on:

- inspection results from 20 percent of pressure tubes in Units 4, 5, 7 and 8, which did not identify flaws in the region of elevated [Heq] near the outlet burnish mark that would generate cracks,
- the known high fracture toughness of pressure tubes at high operating temperatures,
- the concurrence between predictive and measured values of hydrogen in samples taken along the length of the pressure tube but outside the narrow region of interest (the region of elevated [Heq] makes up about 0.15% of the pressure tube of the pressure tube length and is located at the top of the pressure tube), and
- defence-in-depth design provisions.

However, additional information is required to assess whether operation of these units remains within the licensing basis.

Two separate requests for information were sent to Bruce Power for Unit 3 [4] and Unit 6 [5], followed by a formal request under *GNSCR* Subsection 12(2) [1].

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EIR: Bruce A Unit 3 and Bruce B Unit 6 Hydrogen Equivalent Concentration in Pressure Tubes Licence Limit Exceedance

Planned: CNSC staff are evaluating:

- whether the measured elevated [Heq] was caused by a new phenomenon specific to these units or their pressure tubes;
- whether the pressure tube inspections previously investigated locations are identical or similar to those sampled in Units 3 and 6;
- the adequacy and validity of the calculations/inputs to the predictive models;
- the need to determine limits/restrictions to minimize the likelihood of transients; and
- the compensatory/regulatory actions.

CNSC staff will assess Bruce Power’s response to the request pursuant to subsection 12(2) of the *GNSCR*, will continue evaluating information as it becomes available, and will update the Commission of any future developments.

Additional reporting to the Commission Members anticipated:

Yes

No

If Yes, provide method of reporting: The response to the request pursuant to subsection 12(2) of the *GNSCR* will be provided to the Commission. Updates to the Commission will be provided by way of memos and/or during future Status Reports on Power Reactors. Bruce Power is required to seek Commission approval to restart Unit 3.

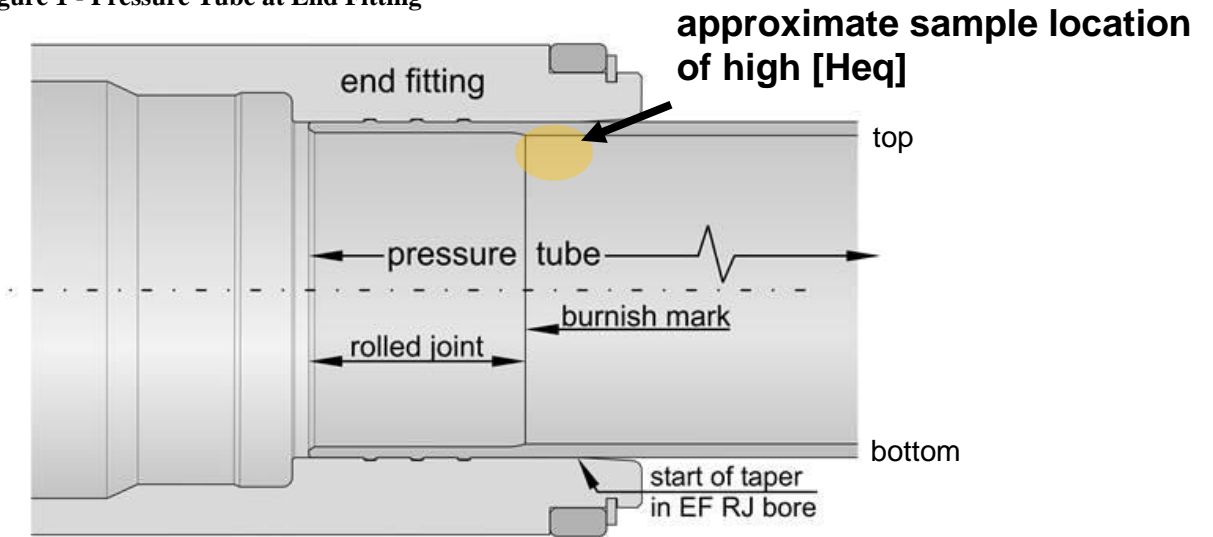
By Name and Title	Signature
<p>A. Viktorov</p> <p>Directorate of Power Reactor Regulation</p>	<div style="text-align: center;">  Recoverable Signature </div> <div style="text-align: center; margin-top: 10px;">  </div> <hr style="width: 60%; margin: 10px auto;"/> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 60%;"> <p>Signed by: Viktorov, Alexandre</p> <p>Director General</p> </div> <div style="width: 35%; text-align: right;"> <p>July 16, 2021</p> <p>Date</p> </div> </div>

References:

1. CNSC Letter, A. Viktorov to M. Burton, “Bruce A and B: Request pursuant to Subsection 12(2) of the General Nuclear Safety and Control Regulations: Issues Relating to Measurement of Hydrogen Equivalent Concentration in Pressure Tubes”, July 13, 2021, e-Doc 6603948.
2. CNSC Letter, A. Viktorov to S. Gregoris and J. Franke, “Darlington and Pickering NGS: Request pursuant to Subsection 12(2) of the General Nuclear Safety and Control Regulations: Issues Relating to Measurement of Hydrogen Concentration in Pressure Tubes”, July 13, 2021, e-Doc 6603931.
3. CNSC Letter, A. Viktorov to M. Power, “PLNGS: Request pursuant to Subsection 12(2) of the General Nuclear Safety and Control Regulations: Issues Relating to Measurement of Hydrogen Equivalent Concentration in Pressure Tubes”, July 13, 2021, e-Doc 6604246.
4. CNSC Letter, L. Sigouin to M. Burton, “Bruce A: CNSC Review of REGDOC-3.1.1 Event Report B-2021-93819 on A2131 Outage Scrape Campaign Hydrogen Equivalent Concentration Measurements – New Action Item 2021-07-23424”, July 9, 2021, e-Doc 6603183.
5. CNSC Letter, L. Sigouin to M. Burton, “Bruce A and B: CNSC Review of REGDOC-3.1.1 Event Report B-2021-98077 DR on Pressure Tube Surveillance Hydrogen Equivalent Concentration Measurements on Unit Shutdown for Major Component Replacement – New Action Item 2021-07-23406”, July 8, 2021, e-Doc 6600766.

EVENT INITIAL REPORT (EIR)

Figure 1 - Pressure Tube at End Fitting





Directorate of Power Reactor Regulation

July 13, 2021

e-Doc 6603948
File 4.01.03

Mr. Maury Burton
Chief Regulatory Officer
Bruce Power Inc.
P.O. Box 1540, B10-4W
177 Tie Road
Tiverton, Ontario N0G 2T0

Subject: Bruce A and B: Request pursuant to Subsection 12(2) of the *General Nuclear Safety and Control Regulations*: Issues Relating to Measurement of Hydrogen Equivalent Concentration in Pressure Tubes

Dear Mr. Burton:

This letter is a formal request pursuant to subsection 12(2) of the *General Nuclear Safety and Control Regulations*. Based on information, in relation to recent analysis of pressure tube sampling, reported to the Canadian Nuclear Safety Commission (CNSC) by Bruce Power [1, 2], it appears that the currently used models may under-predict the maximum hydrogen equivalent concentration in pressure tubes of CANDU reactors.

In accordance with Licence Condition G.1 of PROL 18.01/2028 and Section G.1 of LCH-PR-18.01/2028-R002, licensed activities shall be conducted in accordance with the licensing basis. In addition, “*for unapproved operation that is not in accordance with the licensing basis, the licensee shall take action as soon as practicable to return to a state consistent with the licensing basis, taking into account the risk significance of the situation.*”

CNSC staff have made recent requests to Bruce Power in relation to the specific reports [3, 4].

Further to these requests, and pursuant to my authority as a person authorized by the Commission for the purposes of subsection 12(2) of the *General Nuclear Safety and Control Regulations*, I request that Bruce Power conduct analysis and review regarding pressure tube fitness for service, and make a report to the Commission, no later than July 30, 2021, in respect of the following actions:

1. Analyze the impact of this information on the demonstration of pressure tube fitness for service;
2. Conduct necessary tests and analysis to verify that operation of all reactors at Bruce Power remains within their licensing basis;

3. Inform CNSC of any other measures taken in response to this information; and
4. Assess the impact of this information on the plan for Unit 3 restart post-A2131 outage.

In addition, I request that Bruce Power complete the following tests and analyses in the longer term (within 6 months of receipt of this letter), and make a report to the Commission:

5. Analysis of the hydrogen uptake model validity, reflecting new information.

Please note that, in accordance with subsection 12(2) of the *General Nuclear Safety and Control Regulations*, Bruce Power is required to file a report with the Commission by July 19, 2021 that contains the following information:

- a) confirmation that the request will or will not be carried out or will be carried out in part;*
- b) any action that Bruce Power has taken to carry out the request or any part of it;*
- c) any reasons why the request or any part of it will not be carried out;*
- d) any proposed alternative means to achieve the objectives of the request; and*
- e) any proposed alternative period within which Bruce Power proposes to carry out the request.*

If you have any questions regarding this matter, please contact Agnes Robert at 613-266-1531 or at agnes.robert@cnsccsn.gc.ca.

A similar letter has been sent to all CANDU reactor licensees that are subject to the requirements of the *Nuclear Safety and Control Act*.

Yours truly,



E-DOCS-#6603948-v
4-Bruce_A_and_B_R

Alex Viktorov, Ph.D.
Director General
Directorate of Power Reactor Regulation

c.c.: R. Jammal, P. Elder, M. Rinker, L. Sigouin, V. Tavasoli, Bruce Site Office (CNSC)
C. Mudrick, J. Scongack, G. Newman (Bruce Power)

References:

1. Bruce Power Email, J. Thompson to L. Sigouin, "REGDOC-3.1.1 B-2021-98077 DR", July 5, 2021, e-Doc [6600317](#).

2. Bruce Power Email, J. Thompson to L. Sigouin, “REGDOC-3.1.1 B-2021-93819”, July 8, 2021, e-Doc [6603256](#).
3. CNSC Letter, L. Sigouin to M. Burton, “Bruce A and B: CNSC Review of REGDOC-3.1.1 Event Report B-2021-98077 DR on Pressure Tube Surveillance Hydrogen Equivalent Concentration Measurements on Unit Shutdown for Major Component Replacement – New Action Item 2021-07-23406”, July 8, 2021, e-Doc [6600766](#).
4. CNSC Letter, L. Sigouin to M. Burton, “Bruce A: CNSC Review of REGDOC-3.1.1 Event Report B-2021-93819 on A2131 Outage Scrape Campaign Hydrogen Equivalent Concentration Measurements – New Action Item 2021-07-23424”, July 9, 2021, e-Doc [6603183](#).



Directorate of Power Reactor Regulation

e-Doc 6603931
File 4.01.03

July 13, 2021

Mr. Steve Gregoris
Senior Vice President, Darlington
Ontario Power Generation Inc.
P.O. Box 4000
Bowmanville, ON L1C 3Z8

Mr. Jon Franke
Senior Vice President, Pickering
Ontario Power Generation Inc.
1675 Montgomery Park Road
Pickering, ON L1V 2R5

Subject: Darlington and Pickering NGS: Request pursuant to Subsection 12(2) of the General Nuclear Safety and Control Regulations: Issues Relating to Measurement of Hydrogen Concentration in Pressure Tubes

Messrs. Gregoris and Franke,

This letter is a formal request made pursuant to subsection 12(2) of the *General Nuclear Safety and Control Regulations*. Based on information reported to the Canadian Nuclear Safety Commission (CNSC) by Bruce Power, in relation to recent analysis of pressure tube sampling, it appears that the currently used models may under-predict the maximum hydrogen equivalent concentration in pressure tubes of CANDU reactors.

In accordance with Licence Condition G.1 of PROL 13.02/2025 and PROL 48.01/2028, and Section G.1 of Licence Condition Handbooks, licensed activities shall be conducted in accordance with the licensing basis. In addition, “*for unapproved operation that is not in accordance with the licensing basis, the licensee shall take action as soon as practicable to return to a state consistent with the licensing basis, taking into account the risk significance of the situation.*”

Pursuant to my authority as a person authorized by the Commission for the purposes of subsection 12(2) of the *General Nuclear Safety and Control Regulations*, I request that Ontario Power Generation (OPG) conduct analysis and review regarding pressure tube fitness for service, and make a report to the Commission, no later than July 30, 2021, in respect of the following actions:

1. Confirm receipt of the information from Bruce Power related to this discovery;
2. Analyze the impact of this information on the demonstration of pressure tube fitness for service;
3. Conduct necessary tests and analysis to verify that operation of all reactors at OPG stations remains within their licensing bases; and
4. Inform CNSC of any other measures taken in response to this information.

In addition, I request that OPG complete the following tests and analyses in the longer term (within 6 months of receipt of this letter), and make a report to the Commission:

5. Analysis of the hydrogen uptake model validity, reflecting new information.

Please note that, in accordance with subsection 12(2) of the *General Nuclear Safety and Control Regulations*, OPG is required to file a report with the Commission by July 19, 2021 that contains the following information:

- a) confirmation that the request will or will not be carried out or will be carried out in part;*
- b) any action that OPG has taken to carry out the request or any part of it;*
- c) any reasons why the request or any part of it will not be carried out;*
- d) any proposed alternative means to achieve the objectives of the request; and*
- e) any proposed alternative period within which OPG proposes to carry out the request.*

If you have any questions regarding this matter, please contact Stephanie Eisan-Kouznetsova at 613-897-0895 or at stephanie.eisan-kouznetsova@cnsccsn.gc.ca or Milan Ducic at milan.ducic@cnsccsn.gc.ca.

A similar letter has been sent to all CANDU reactor licensees that are subject to the requirements of the *Nuclear Safety and Control Act*.

Yours truly,

Alex Viktorov, PhD
Director General
Directorate of Power Reactor Regulation

c.c.: R. Jammal, P. Elder, M. Rinker, J. Burta, K. Campbell, V. Tavasoli, S. Eisan-Kouznetsova, H. Overton, M. Ducic, J. Vecchiarelli, P. Herrera, S. Irvine, S. Kaufman



Directorate of Power Reactor Regulation

July 13, 2021

e-Doc 6604246

File 4.01.03

Mr. Mark Power
Site Vice President
Point Lepreau Nuclear Generating Station
New Brunswick Power
P.O. Box 600
Lepreau, NB E5J 2S6

Subject: PLNGS: Request pursuant to Subsection 12(2) of the *General Nuclear Safety and Control Regulations*: Issues Relating to Measurement of Hydrogen Equivalent Concentration in Pressure Tubes

Dear Mr. Power,

This letter is a formal request made pursuant to subsection 12(2) of the *General Nuclear Safety and Control Regulations*. Based on information reported to the Canadian Nuclear Safety Commission (CNSC) by Bruce Power, in relation to recent analysis of pressure tube sampling, it appears that the currently used models may under-predict the maximum hydrogen equivalent concentration in pressure tubes of CANDU reactors.

In accordance with Licence Condition G.1 of PROL 17.01/2022 and Section G.1 of Licence Condition Handbook LCH-PR-17.00/2022-R001, licensed activities shall be conducted in accordance with the licensing basis. In addition, *“for unapproved operation that is not in accordance with the licensing basis, the licensee shall take action as soon as practicable to return to a state consistent with the licensing basis, taking into account the risk significance of the situation.”*

Pursuant to my authority as a person authorized by the Commission for the purposes of subsection 12(2) of the *General Nuclear Safety and Control Regulations*, I request that New Brunswick Power (NB Power) conduct analysis and review regarding pressure tube fitness for service, and make a report to the Commission, no later than July 30, 2021, in respect of the following actions:

1. Confirm receipt of the information from Bruce Power related to this discovery;
2. Analyze the impact of this information on the demonstration of pressure tube fitness for service;
3. Conduct necessary tests and analysis to verify that operation of the reactor at Point Lepreau Nuclear Generating Station remains within its licensing bases; and
4. Inform CNSC of any other measures taken in response to this information.

In addition, I request that NB Power complete the following tests and analyses in the longer term (within 6 months of receipt of this letter), and make a report to the Commission:

5. Analysis of the hydrogen uptake model validity, reflecting new information.

Please note that, in accordance with subsection 12(2) of the *General Nuclear Safety and Control Regulations*, NB Power is required to file a report with the Commission by July 19, 2021 that contains the following information:

- a) confirmation that the request will or will not be carried out or will be carried out in part;*
- b) any action that NB Power has taken to carry out the request or any part of it;*
- c) any reasons why the request or any part of it will not be carried out;*
- d) any proposed alternative means to achieve the objectives of the request; and*
- e) any proposed alternative period within which NB Power proposes to carry out the request.*

Should you have any questions regarding this matter, please do not hesitate to contact Nathan Kline by email at nathan.kline@canada.ca or at (343) 550-8165.

A similar letter has been sent to all CANDU reactor licensees that are subject to the requirements of the *Nuclear Safety and Control Act*.

Sincerely,

Alex Viktorov, PhD
Director General
Directorate of Power Reactor Regulation

c.c.: A. Gardner, S. Demmons, B. Thorne, N. Reicker, R. Worden (NB Power)
R. Jammal, P. Elder, M. Rinker, A. Bulkan, E. Fortier, V. Tavasoli (CNSC Ottawa)



Directorate of Power Reactor Regulation

July 9, 2021

e-Doc 6603183
File 4.01.02

Mr. Maury Burton
Chief Regulatory Officer
Bruce Power Inc.
P.O. Box 1540, B10-4W
177 Tie Road
Tiverton, Ontario N0G 2T0

Subject: Bruce A: CNSC Review of REGDOC-3.1.1 Event Report B-2021-93819 on A2131 Outage Scrape Campaign Hydrogen Equivalent Concentration Measurements – New Action Item 2021-07-23424

Dear Mr. Burton:

Canadian Nuclear Safety Commission (CNSC) staff have reviewed Bruce Power's "CNSC Event Report" (B-2021-93819) on "A2131 Outage Scrape Campaign Hydrogen Equivalent Concentration Measurements" [1] which was submitted in accordance with REGDOC-3.1.1.

Based on the finding of an elevated hydrogen equivalent concentration [Heq] measurement in the Unit 3 F16 scraped pressure tube, it appears that Unit 3 operated beyond the Licensing Basis in Power Reactor Operating Licence PROL18.01/2028 [2] since Licence Condition 15.3 limits the operation of units containing pressure tubes with a [Heq] exceeding 120 parts per million (ppm).

Therefore, in accordance with PROL18.01/2028 [2] Licence Condition G.2, Bruce Power is requested to provide:

- a. The predicted Heq values for Unit 3 at the time of shutdown for the A2131 planned outage, and
- b. The Heq measurements from the Unit 3 F16 pressure tube.

In addition, this finding shall be included in the assessment and response to request made in [3] to provide assurance that the operating Bruce A and B units (Units 1, 2, 4, 5, 7, and 8) continue to meet the Licensing Basis in PROL18.01/2028 [2] Licence Conditions 6.1 and 15.3.

Finally, the issue of restarting Unit 3 post-A2131 with respect to the requirements of PROL18.01/2028 [2], and specifically Licence Condition 15.3, will be addressed in separate correspondence.

A response is requested within 5 business days of receipt of this letter.

Action Item 2021-07-23424 has been opened to track this matter.

If you have any questions regarding this matter, please do not hesitate to contact Agnes Robert at agnes.robert@cnsccsn.gc.ca.

Sincerely,

Luc Sigouin
Regulatory Program Director
Bruce Regulatory Program Division

c.c.: V. Tavasoli, A. Robert, Bruce Site Office

References:

1. Bruce Power Email, J. Thompson to L. Sigouin, "REGDOC-3.1.1 B-2021-93819", July 8, 2021, e-Doc [6603256](#).
2. CNSC Power Reactor Operating Licence PROL18.01/2028 "NUCLEAR POWER REACTOR OPERATING LICENCE BRUCE NUCLEAR GENERATING STATIONS A AND B", October 1, 2018, e-Doc [6113854](#).
3. CNSC Letter, L. Sigouin to M. Burton, "Bruce A and B: CNSC Review of REGDOC-3.1.1 Event Report B-2021-98077 DR on Pressure Tube Surveillance Hydrogen Equivalent Concentration Measurements on Unit Shutdown for Major Component Replacement – New Action Item 2021-07-23406", July 8, 2021, e- Doc [6600766](#).



Directorate of Power Reactor Regulation

July 8, 2021

e-Doc 6600766
File 4.01.02

Mr. Maury Burton
Chief Regulatory Officer
Bruce Power Inc.
P.O. Box 1540, B10-4W
177 Tie Road
Tiverton, Ontario N0G 2T0

Subject: Bruce A and B: CNSC Review of REGDOC-3.1.1 Event Report B-2021-98077 DR on Pressure Tube Surveillance Hydrogen Equivalent Concentration Measurements on Unit Shutdown for Major Component Replacement – New Action Item 2021-07-23406

Dear Mr. Burton:

Canadian Nuclear Safety Commission (CNSC) staff have reviewed Bruce Power's "CNSC Event Report" (B-2021-98077 DR) on "Pressure Tube Surveillance Hydrogen Equivalent Concentration Measurements on Unit Shutdown for Major Component Replacement" [1] which was submitted in accordance with REGDOC-3.1.1.

Based on the finding of an elevated hydrogen equivalent concentration, [Heq] measurement in the Unit 6 S13 surveillance pressure tube, it appears that Unit 6 operated beyond the Licensing Basis in Power Reactor Operating Licence PROL18.01/2028 [2] since Licence Condition 15.3 limits the operation of units containing pressure tubes with a [Heq] exceeding 120 parts per million (ppm).

Therefore, in accordance with PROL18.01/2028 [2] Licence Condition G.2, Bruce Power is requested to provide:

- a. The predicted Heq values for Unit 6 at the time of shutdown for MCR in January 2020, and
- b. The Heq measurements from the Unit 6 S13 surveillance pressure tube.

In addition, as this finding puts into question the predictive modelling for [Heq] in all Bruce A and B units, Bruce Power is requested to provide assurance that the operating Bruce A and B units (Units 1, 2, 4, 5, 7, and 8) continue to meet the Licensing Basis in PROL18.01/2028 [2] Licence Conditions 6.1 and 15.3. (Note: Unit 3 is currently in the planned A2131 outage and will be addressed separately).

A response is requested within 5 days of receipt of this letter. Action Item 2021-07-23406 has been opened to track this matter.

If you have any questions regarding this matter, please do not hesitate to contact Agnes Robert at agnes.robert@cnscccsn.gc.ca.

Sincerely,

Luc Sigouin
Regulatory Program Director
Bruce Regulatory Program Division

c.c.: V. Tavasoli, A. Robert, Bruce Site Office

References:

1. Bruce Power Email, J. Thompson to L. Sigouin, "REGDOC-3.1.1 B-2021-98077 DR", July 5, 2021, e-Doc [6600317](#).
2. CNSC Power Reactor Operating Licence PROL18.01/2028 "NUCLEAR POWER REACTOR OPERATING LICENCE BRUCE NUCLEAR GENERATING STATIONS A AND B", October 1, 2018, e-Doc [6113854](#).
3. CNSC Licence Conditions Handbook LCH-PR-18.01/2028-R002 Bruce Nuclear Generating Stations A and B Nuclear Power Reactor Operating Licence PROL18.01/2028, May 25, 2020, e-Doc [5864086](#).