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Written submission from the External Advisory Committee

Mémoire du Comité consultatif externe

In the Matter of

À l'égard de

Bruce Power Inc.
Bruce Nuclear Generating Stations A and B

Bruce Power Inc.
Centrales nucléaires de Bruce-A et B

Application to amend the power reactor operating licence for the Bruce Nuclear Generating Stations (NGS) A and B

Demande visant à modifier son permis d'exploitation d'un réacteur de puissance pour les centrales nucléaires de Bruce-A et B

Hearing in writing based on written submissions

Audience par écrit fondée sur des mémoires

April 2023

Avril 2023

Canada

External Advisory Committee (EAC) Review of License Condition Changes

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26th April 2023

On April 19th, CNSC requested an assessment and recommendations from the EAC regarding a licence amendment application from Bruce Power.

The Commission has before it an application from Bruce Power to amend the licence for the Bruce A and B Nuclear Generating Stations. Bruce Power is asking that the Commission remove licence condition LC 15.3, and that the applicable fitness for service requirements for pressure tubes [i.e., compliance verification criteria established in the licence conditions handbook (LCH)] instead be consolidated under licence condition 6.1, Fitness for Service.

The EAC members reviewed ten CMDs provided by the CNSC (they are listed in Section 3 below). The overall assessment of the issue is given in Section 1, and specific recommendations are provided in Section 2. Section 3 provides the essence of each of the CMDs, and raises less significant points and questions for consideration.

1. Overall Assessment

1.1 It is clear that LC 15.3 is no longer relevant as the condition which it requires to be met has already been exceeded in the field. We therefore agree with the CNSC staff CMD and seven of the 9 additional CMDs that this license condition be removed.

1.2 We also agree with the CNSC CMD when it recommends the addition of a new license condition LC 6.2. The unexpected observation of Heq levels well above the former license limit of 120 ppm requires an extraordinary degree of rigor and innovation to establish fitness for service in the affected areas. This is well above the scope of LC 6.1 which requires the licensee to have a program to establish the fitness for service of all the safety-significant components, systems and structures in the plant. (See Recommendation 2.1)

1.3 We also agree with the intention to remove LC 6.2 when the R&D and plant activities such as inspections and surveillance tube retrievals have sufficiently clarified the mechanism and propagation rate of the undesirably elevated Heq that the management of the life cycle of the pressure tubes in the Regions of Interest becomes readily sustainable with current knowledge as in LC 6.1.

1.4 We note that the CNSC CMD Section 2.3 states that Consultation with First Nations is not required for changes in LCs. We do however strongly encourage the CNSC to consider that in a situation as unusual as this high Heq episode and the ways to disposition it, that engagement with the community and First Nations is important. This is not just a routine License Condition revision. Indeed, the Saugeen Ojibway Nation (SON) CMD demonstrates a high level of anxiety and frustration due to

perceived shortcomings in engagement over the Heq issue. If left unresolved, these tensions may lead to a hardening of positions and possibility of serious damage to the relations between the CNSC and the SON. Action is required to prevent this. (See Recommendation 2.2)

1.5 The Bruce Power CMD indicates that technical developments have improved the understanding of Heq behaviour sufficiently to establish fitness for service of the pressure tubes even with Heq levels higher than 120 ppm in the inlet and outlet Regions of Interest. A critical document for the inlet Region of interest is Reference 4 in the Bruce CMD. (See recommendation 2.3). This analysis concludes that the high Heq in the vicinity of the inlet of the pressure tube resides on the outside of the tube. As any flaws will be located on the inside surface, their behaviour would not be affected by the high Heq.

1.6 There is some ambiguous (or at least opaque) wording in some of the CMDs which may leave readers with the wrong impression. The COG CMD (and to some extent the CNSC and Kinectrics CMDs) indicates that "…the documented experimental results that pressure tube fracture toughness will be sufficient for safe operation beyond 120 ppm…". In fact, safe operation under the licence condition in the inlet and outlet regions is based entirely on an absence of flaws in the areas of high Heq, and not on experimental fracture toughness results.

2. Recommendations

2.1 The condition proposed to satisfy the new license condition LC 6.2 is that the R&D required to resolve the issue of Heq levels exceeding 120 ppm be completed. In order to avoid misunderstandings between the licensees and the CNSC, and to maintain transparency in the process for other stakeholders, a table of the required R&D and other activities needs to be assembled and be agreed to by both the licensee(s) and the CNSC.

- A formal Protocol has been used successfully in prior instances where a fuel channel issue required a significant and complex level of effort by the industry. This approach should be considered for the current circumstance.

2.2. Given the vigorous disagreement of the SON with the level of engagement on this issue, the CNSC must work with the SON to achieve a common view of what is required in terms of engagement on the broad topic of elevated Heq. The current mis-alignment will over time generate alienation and frustration between SON, Bruce Power and CNSC. This requirement should be included in Recommendation 2.1

2.3. The technical document cited in Ref 4 of CMD 23-H103.1 is critical to the issue at the inlet of the pressure tubes. As has been done in previous instances in which complex technical reports were highly risk-significant, an independent review by a

technical expert elsewhere in the industry and totally unaffiliated with this project would provide an important additional level of assurance. In the past, the industry has commissioned the work using an independent technical expert endorsed by the CNSC.

3. Brief Commentary on the Ten CMD Documents

CMD #	From	Essential Message	Questions and Comments
23-H103	CNSC Staff	LC 15.3 is not required as alternate criteria were used to establish FFS.	**Agree**
		LC 6.2 established to provide for enhanced Criteria for FFs of FCs in extended service.	**Agree** **Also agree** with removal of LC 6.2 when R&D and other activities committed by Bruce Power have been completed satisfactorily.
		In 2.3 Indigenous Consultation, CNSC staff assert that no Indigenous consultation is required for the change in LCs.	While Consultation may not be required, the SON (see CMD 103.3) clearly feel that additional engagement *is* required. The CNSC must work with the SON to build meaningful long-term relationships and to engage on the broad topic of elevated Heq. The current misalignment will over time generate alienation and frustration within the SON.
		3.1 Overall Conclusions	**Agree with all three CNSC conclusions.** However, the reporting under the third

			conclusion should be enhanced to address the need for greater communication with stakeholders such as the SON and other local community groups.
		3.2 Overall Recommendations	**Agree with the CNSC recommendations.** But, Q.1: will there be an expectation somewhere to require that the degree of communication with Indigenous and other local community groups be enhanced until the level of engagement/ communication is agreed to by these Stakeholders
		Draft License Conditions Handbook	Page 36 of 38: CNSC staff still considers the Region of Interest to be "…the region encompassing the full circumference of a pressure tube…" Q 2. Does Bruce Power accept the full 360-degree extent of the Region of Interest at the inlet and outlet?
103.1	Bruce Power	Technical developments have improved the understanding of Heq behaviour sufficiently to make the 120 ppm hold point LC15.3 redundant.	The technical basis for the request is in Ref 3,4,5,6 in the Bruce Power CMD. We have not reviewed this material. Retrieval and review of this material was beyond the scope of the one-week timeline provided to the EAC to carry out this assessment. We recommend that for future external advisory entities, a mechanism be put in place to alert the members when relevant new material becomes

			available, to better prepare them for a future meeting. Q3: has the conclusion of the FED analysis been verified on samples from the removed PTs? If not, it may be perilous to base the FFS argument solely on a modelled result. Q.4 If the FED analysis is correct, what will be the effect on the validity of scrape samples on the inside surface of a pressure tube to measure the Heq level in the tube wall.
		The argument for the inlet side seems to hinge largely on Ref 4 . Letter, M. Burton to L. Sigouin, "Bruce A and B: Finite Element Diffusion Analysis of High Hydrogen Level in Rolled Joint Region with Postulated Flaw", June 28, 2022, BP-CORR-00531-02820. The analysis concludes that in inlet RJ regions, the high Heq concentrations are on the outside surface of the pressure tube and don't influence flaws on the inside surface.	
103.2	CNL	CNL has conducted extensive R&D over the years, especially through the Fuel Channel Life Management COG Project.	It is awkward to credit a long-term R&D program when a significant deviation in the behaviour of the field was not predicted. A stronger argument would be all the work done *since* the discovery. Q5. Is there a document somewhere that updates the status of all the planned work that was discussed / promised at previous hearings? What percentage of each of the proposed work activities has been completed?
103.3	Saugeen Ojibway Nation (SON)	Opposes the lifting of LC15.3, based on concern that the R&D which would justify it has not been completed. SON objects to the argument that a PT failure is in the Design Basis and would therefor not impact the public.	Same as Q5 above: have the Utilities done all the things they said they would through all the discussions and hearings. Would such a table listing research topics and status not (at least partially) mollify the concerns of the SON? This is a reasonable question to ask. Restating the SON concerns a bit: Q6: If the risk of a pressure tube failure is fully mitigated by

			the safety systems in the plant, why did OPG and Bruce Power spend >$100M on R&D to prevent such failures from happening. There is a concern expressed by the SON that this was an "argument of last resort" when the data to support the approach of precluding PT failures was not available. This concern **must** be addressed by the CNSC and the Licensees.
		SON wants a new LC on advising SON of elevated Heq discoveries.	This does not seem warranted given that many other stakeholders have similar worries and legitimate expectations to be kept informed. Q7. How do Bruce Power and the CNSC decide whether the information flow to the SON and other stakeholder groups has been adequate?
103.4	Frank Greening	The author raises questions as to the operations of Bruce Power and whether they address CSA N285.8. He states that "CSA Standard N285.8 has recently, (2019), been revised to an Heq of 80 ppm at a pressure tube's inlet and 120 ppm Heq at its outlet" and therefore that Bruce Power is "*in violation of the requirements*" of the CSA.	The EAC disagrees that Bruce Power is in violation of the CSA, since Clause D.13.2.3.1.3 of CSA285.8 specifically allows that in the case where the Heq exceeds these limits, a justification for FFS needs to be made. The EAC believes that is what Bruce Power and the industry are doing, and the question we view is rather, "is the justification for FFS in light of the high Heq, acceptable?".
		Raises the question as to why the amount of Heq is increasing, and questions if that is sufficiently well	The EAC agrees that BP needs to continue to investigate the origin of the increased Heq, and

		understood. In "Final Words" requests that until the root cause of increasing Heq is understood not to accept the proposed amendments to the LC. Raises concerns about the speed with which research is being carried out and information is being transferred to stakeholders. Raises concerns about several aspects of CSA N285.8, statistical reliability and evaluations of several parameters required for the CSA and as to what constitutes an "acceptable model"	whether this arises purely from redistribution or from increased pickup, or both. However, we disagree that the LC amendments should be delayed. The EAC agrees with the importance of information transfer, as illustrated in Q1, Q5, Q6, Q7 above. The EAC does not share the concerns about the CSA N285.8 formulation and approaches.
103.5	CNA	Supports the request based on general arguments.	Nothing really new here, no comments.
103.6	Cdn Nuc Workers	Supports the CNSC assessment of the situation and its recommendations.	Nothing really new here, no comments.
103.7	OPG	Supports Bruce Power request, based in part on: 285.8-15, "Technical requirements for in-service evaluation of zirconium alloy pressure tubes in CANDU reactors" were met for [H]eq up to 120 ppm, and performed a sensitivity assessment up to 200 ppm and show that safety factors are at least 1.0 for all service level transients.	A Safety Factor of 1 means there is no margin. This sensitivity assessment doesn't meet 285.8-15 requirements. , nor does it provide much to support to the discussion of why this situation can be considered acceptable.
103.8	COG	Supports Bruce Power request based in part on: "The Bruce Power request is fully supported by the recent advancements in the understanding of pressure tube behaviour, and the documented experimental results that pressure tube fracture toughness will be sufficient for safe operation beyond 120 ppm in the regions of interest near the pressure tube inlet	The EAC does not consider this paragraph as consistent with the current situation. The FFS of the outlet region near the RJ <u>is based on the absence of flaws at locations of high Heq</u>. For the inlet RJ region, the high Heq is on *OD* of the tube, and will not affect

		and outlet rolled joints"	flaws present on the *ID*. For the outlet RJ region, there are no observed flaws on the inside surface of the Region of Interest. Neither of these non-standard FFS arguments would be needed if in fact there were ` *"results that pressure tube fracture toughness will be sufficient for safe operation beyond 120 ppm …"*. It is because this data **doesn`t** exist that the non-standard FFS cases are required.
103.9	Kinectrics	Supports Bruce Power request based in part on: The licence amendment requested by Bruce Power is supported by the advancements in understanding related to pressure tube behaviour and documented satisfaction that pressure tube fracture toughness will be sufficient for safe operation beyond 120 ppm in the regions of interest near the pressure tube inlet and outlet rolled joints.	The wording of this section is very similar to the COG intervention.

4. Acknowledgment

We want to acknowledge the contribution made by Professor John Luxat to the EAC prior to his resignation for health reasons. We miss his wise counsel and his technical insights. We wish him all the best.