Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

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ORIGINAL/ORIGINAL

CMD: 20-H110

Date signed/Signé le : 27-11-2020

Issue Required Approval(s) for

Request for Commission approval to modify the Pickering Nuclear Generating Station Integrated Implementation Plan

Ontario Power Generation Inc.

Pickering Nuclear Generating Station

Hearing in writing based solely on written submissions

Scheduled for:

December 2020

Submitted by:

CNSC Staff

Délivrer l'approbation requise pour

Demande d'autorisation de la Commission pour modifier le plan intégré de mise en œuvre de la centrale nucléaire de Pickering

Ontario Power Generation Inc.

Centrale Nucléaire de Pickering

Audience par écrit fondée uniquement sur des mémoires

Prévue pour :

Décembre 2020

Soumise par :

Le personnel de la CCSN

e-Doc 6398369 (WORD)
e-Doc 6432017 (PDF)

Canada

Summary

This CMD pertains to a request for a decision regarding:

- a request by Ontario Power Generation (OPG) for Commission approval to amend the Pickering integrated implementation plan by removing resolution action G25-RS1-04-20
- OPG's request for Commission approval to amend the Pickering integrated implementation plan by extending the deadline for resolution action G04-RS2-06-08
- Request for Commission approval to amend the Pickering integrated implementation plan by extending and modifying resolution action G01-RS1-06-01

The following actions are requested of the Commission:

- Consider CNSC staff's recommendation to render a decision on OPG's requests and on CNSC staff's request.

The following items are attached:

- N/A

Résumé

Le présent CMD concerne une demande de décision au sujet de :

- La demande d'Ontario Power Generation (OPG) visant à obtenir l'autorisation de la Commission pour modifier le plan intégré de mise en œuvre de Pickering en retirant la mesure de résolution G25-RS1-04-20.
- La demande d'OPG afin d'obtenir l'autorisation de la Commission pour modifier le plan intégré de mise en œuvre de Pickering en reportant l'échéance associée à la mesure de résolution G04-RS2-06-08.
- La demande d'obtenir l'autorisation de la Commission pour réviser le plan intégré de mise en œuvre de Pickering en prolongeant et en modifiant la mesure de résolution G01-RS1-06-01.

La Commission pourrait considérer prendre les mesures suivantes :

- Examiner la recommandation du personnel de la CCSN afin de rendre une décision concernant les demandes d'OPG et la demande du personnel de la CCSN.

Les pièces suivantes sont jointes :

- S.O.

Signed/Signé le

27 November 2020

Viktorov, Alexandre

Digitally signed by Viktorov, Alexandre
DN: C=CA, O=GC, OU=CNSC-CCSN, CN="Viktorov, Alexandre"
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Alexandre Viktorov, PhD

Director General / Directorate of Power Reactor Regulation

Directeur général / Direction de la réglementation des centrales nucléaires

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EXECUTIVE SUMMARY

Ontario Power Generation (OPG) has requested to modify the Pickering Nuclear Generating Station (NGS) Integrated Implementation Plan (IIP). The Commission's approval is required to make any changes to the IIP, as it forms part of the licensing basis for the Pickering NGS. OPG has requested the removal of resolution action G25-RS1-04-20 from the IIP and an extension of the deadline for resolution action G04-RS2-06-08. Furthermore, the Commission's approval is also being sought to extend the deadlines and propose changes to two IIP actions under resolution action G01-RS1-06-01.

IIP action G25-RS1-04-20.1, *Re-categorization of the large-break loss-of-coolant accident (LBLOCA)*, aims to track the completion of OPG's analysis to re-categorize the Pickering NGS's CANDU safety issues (CSIs) associated with LBLOCAs from Category 3 to Category 2. OPG has supported an industry initiative that is using a different methodology to address the LBLOCA CSIs. However, more time will be required for the LBLOCA analysis at Pickering NGS than the current deadline allows. CNSC staff have evaluated the licensee's submission and determined that this request does not impact the baseline risk documented in the safety report that was used to support the current licensing basis, and it does not inhibit the capability for safe operation beyond the original IIP commitment deadline of December 31, 2020.

IIP action G04-RS2-06-08.1, *Perform calandria tube and liquid injection shutdown system (CT-LISS) nozzle gap measurements as required on Pickering NGS Unit 6 and conduct fitness for service (FFS) assessment,* aims to ensure that no CT-LISS nozzle contact is predicted during the extended operating period for Pickering NGS Unit 6. The measurement of CT-LISS nozzle gaps is currently underway as part of the Unit 6 planned outage. OPG is required to submit the FFS assessment 90 days after the outage ends; however, it will not be submitted prior to the original IIP completion date. CNSC staff conclude that a delayed closure of this IIP action does not have any impact on the safety margins due to the continued operation beyond the original IIP commitment deadline of December 31, 2020.

OPG has submitted its request for the closure of IIP resolution action G01-RS1-06-01. However, based on a detailed CNSC staff review, two of the related IIP actions could not be accepted by staff as completed submissions. CNSC staff have requested more information from OPG and more work is required in order to close the resolution action. CNSC staff are satisfied with the interim safety provisions currently in place to preserve the safety margins of the issues captured under IIP resolution action G01-RS1-06-01 for the proposed extended period.

CNSC staff recommend that the Commission approve the requested modifications to the IIP as presented in this Commission member document (CMD).

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1 OVERVIEW

1.1 Background

The Pickering Nuclear Generating Station (NGS) Nuclear Power Reactor Operating Licence (PROL) was renewed in September 2018, for a 10-year period, allowing to continue commercial operations to the end of 2024 with a subsequent transition to safe storage [1].

In support of the licence renewal for the Pickering NGS, Ontario Power Generation (OPG) conducted the second Periodic Safety Review or PSR2, results of which were recorded in the Global Assessment Report (GAR) [2] and actioned in the Integrated Implementation Plan (IIP) [3]. The IIP commits OPG to complete the last IIP actions by December 31, 2020, as stated under Section 15.1 of the Pickering NGS Licence Conditions Handbook (LCH) [4].

The IIP forms part of the licensing basis, and therefore any changes require Commission's approval [5].

1.2 Purpose

The purpose of this Commission Member Document (CMD) is to request Commission's approval to modify the current Pickering NGS IIP [3].

In October 2020, OPG has submitted two requests to the Secretariat, removal of the IIP resolution action G25-RS1-04-20 [6], and to extend IIP resolution action G04-RS2-06-08 [7].

In addition, although OPG has submitted their request for closure of resolution action G01-RS1-06-01 [8], CNSC staff have determined that OPG's supporting technical justification is not complete. Furthermore, CNSC staff have some concerns regarding the following two related IIP actions (G01-RS1-06-01.2 and G01-RS1-06-01.3) and cannot currently accept those actions as completed and closed. Therefore, the Commission is being requested to extend the IIP resolution action G01-RS1-06-01 and to modify the completion criteria to allow completion of these two related IIP actions.

2 MATTERS FOR CONSIDERATION

2.1 CNSC Staff Assessment and Conclusion regarding OPG's Request to Remove Resolution Action G25-RS1-04-20 from the IIP

Resolution action G25-RS1-04-20 contains the following associated IIP action:

- G25-RS1-04-20.1 *Re-categorization of the Large-Break Loss-of-Coolant Accident to Category 2*.

CNSC staff assessed the basis of OPG's request [6] and the accompanying detailed plan [9] that OPG submitted in support of their request for the removal of IIP resolution action G25-RS1-04-20 from the IIP.

The requested removal of this IIP resolution action is not due to intractable technical issues, but is rather a result of the adoption of an alternative analysis approach. OPG's adoption of a new methodology not only requires an extension of the original IIP deadline from 2020 to 2024, but it also results in a modification to the original IIP action description.

CNSC staff have determined that the impact on the safety of Pickering NGS operations, by adopting an alternative analysis approach, is minimal. It has been concluded that this request does not impact the baseline risk documented in the Safety Report that was used to support the current licensing basis and does not inhibit the capability for safe operations beyond the original IIP commitment deadline of December 31, 2020. Consequently, the 4-year delay in the commitment for OPG to submit their analysis is deemed to be acceptable.

A more detailed assessment can be found in Appendix B, Section B.1.

2.2 CNSC Staff Assessment and Conclusion regarding OPG's Request to Extend IIP Resolution Action G04-RS2-06-08

Resolution action G04-RS2-06-08 contains the following associated IIP action:

- G04-RS2-06-08.1 *Perform CT-LISS nozzle gap measurements as required on Pickering NGS Unit 6 and conduct Fitness for Service assessment.*

CNSC staff assessed the basis of OPG's request [7] of a deadline extension to IIP action G04-RS2-06-08.1, from December 31, 2020 to April 23, 2021.

In order to satisfy the closure criteria of IIP action G04-RS2-06-08.1, OPG will complete a design modification [10], as well as acquire new measurement data during the Unit 6 planned maintenance outage, ongoing as of November 2020 (P2061). OPG will perform and submit an updated Fitness-for-Service assessment for Calandria Tube to Liquid Injection Safety System (CT-LISS) nozzle contact for Unit 6, no later than 90 days after the completion of the outage. This assessment will confirm whether the design modification was successful to prevent CT-LISS nozzle contact for Unit 6 until the end of commercial operation.

CNSC staff have evaluated OPG's submission [7] and concluded that a delay in the closure of IIP action G04-RS2-06-08.1 does not have any impact on the assurance of the safe operation of Unit 6, since there is currently no CT-LISS nozzle contact predicted to occur during the requested extension period.

A more detailed assessment can be found in Appendix B, Section B.2.

2.3 CNSC Staff Assessment and Conclusion regarding Resolution Action G01-RS1-06-01 and two related Actions G01-RS1-06-01.2 and G01-RS1-06-01.3

OPG has submitted their request for closure of resolution action G01-RS1-06-01 in December 2019 [8]. However, CNSC staff found OPG's supporting information to be incomplete. Therefore, more time and/or changes to completion criteria are needed for OPG to complete the resolution action G01-RS1-06-01 and the two following related actions:

- IIP action **G01-RS1-06-01.2** *Define Nominal Cooldown Transient for use in Probabilistic Leak-Before-Break (PLBB) Analyses* – CNSC staff have requested further information from OPG [11] and acceptance to close this action is dependent on OPG's response. Therefore, an extension is required for OPG to complete this action.
- IIP action **G01-RS1-06-01.3** *Provide to CNSC documented evidence that validation of PLBB code is complete* – CNSC staff identified a number of gaps in the PLBB code validation [12]. Further, CNSC staff judge there is considerable uncertainty associated with pursuing the resolution of all assessed gaps through analytical or experimental means in the short-term. CNSC staff determined that complementary partial validation of the PLBB code could be achieved by using inspection results and data from rising pressure burst tests. The following two activities would be an alternative means to meet the intent of this IIP action.

  Activity 1: Provide disposition of inspection findings from pressure tubes with higher estimated conditional probability of rupture from PLBB assessments for each of OPG's units.

  Activity 2: Perform probabilistic predictions of pressure tube rupture using the PLBB code for a sample of rising pressure burst tests. The sample burst test results used in this activity must span a range of test temperatures and Hydrogen equivalent concentration values.

OPG staff provided concurrence and confirmation that the information requested for G01-RS1-06-01.2 will be provided by April 23, 2021 and the above activities for G01-RS1-06-01.3 will be completed by the end of February 2021 [13].

CNSC staff conclude that the interim safety provisions currently in place to preserve the safety margins for the requested extension of IIP action G01-RS1-06-01.2 and the requested extension to perform the new proposed activities for IIP action G01-RS1-06-01.3 are satisfactory.

A more detailed assessment can be found in Appendix B, Section B.3.

3 OTHER MATTERS FOR CONSIDERATION

3.1 Environmental Assessment Determination

CNSC staff have determined that the proposed licensing action is administrative. Given there are no potential environmental interactions, no environmental review is required. This EA Determination is based on the information and assumptions provided by the proponent on the proposed project. CNSC staff have determined that the proposed changes to the IIP to be administrative in nature and no further environmental review is required. The proposed activity does not result in any changes to the existing authorized activities; consequently, there are no interactions with the environment associated with these modifications to the IIP.

3.2 Indigenous Consultation Determination

The common law duty to consult with Indigenous peoples applies when the Crown contemplates actions that may adversely affect potential or established Indigenous and/or treaty rights. Given that the request to make changes to the Integrated Implementation Plan is administrative in nature and will not result in changes to the physical footprint of the Pickering site, it is not likely to cause adverse impacts to any Indigenous and/or treaty rights. Therefore, based on the information provided by OPG, CNSC staff have determined that the duty to consult does not arise in relation to the request.

3.3 Participant Funding Program Determination

As the Commission proceeding will be a panel of one hearing in writing with written interventions, it is CNSC staff's determination that no participant funding will be offered. Participant funding is not normally provided for panel of one hearings.

3.4 Public Communications Determination

Given that the request to make changes to the Pickering NGS IIP is administrative in nature, CNSC staff do not deem it necessary for the licensee to amend its current public information program. Further, CNSC staff have determined that there will be public communications proceedings which include posting decision-related materials to its website.

4 OVERALL CONCLUSIONS AND RECOMMENDATIONS

4.1 Overall Conclusions

The following are CNSC staff's overall conclusions regarding the OPG and CNSC staff requests:

- **Removal of G25-RS1-04-20 from the IIP** – It has been determined that the impact on the safety of Pickering NGS operations, by adopting an alternative analysis approach, is minimal. CNSC staff have concluded that this request does not impact the baseline risk documented in the Safety

Report that was used to support the current licensing basis and does not inhibit the capability for safe operations beyond the original IIP commitment deadline of December 31, 2020. Consequently, the 4-year delay in the commitment for OPG to submit their analysis is deemed acceptable by CNSC staff.

- **Extension of G04-RS2-06-08** – CNSC staff have evaluated OPG's submission and conclude that a delay in the closure of this IIP resolution action does not have any impact on the assurance of the safe operation of Pickering NGS for the requested extension period.
- **Extension and changes to G01-RS1-06-01 and two related actions G01-RS1-06-01.2 and G01-RS1-06-01.3** – CNSC staff conclude that the interim safety provisions currently in place to preserve the safety margins of the issues captured under resolution action G01-RS1-06-01 for the requested extension period are satisfactory. Impact on the safe operation of Pickering NGS for the requested extension period is judged to be minimal.

In regards to the other matters for consideration, discussed under Section 3, due to the nature of the requests, CNSC staff have determined that there is no need for an environmental review and that the duty to consult does not arise. Also, it is CNSC staff's determination that no participant funding would be offered.

4.2 Overall Recommendations

4.2.1 Removal of G25-RS1-04-20 from the IIP

CNSC staff recommend that the Commission approve OPG's request to remove resolution action G25-RS1-04-20 and the associated IIP action G21-RS1-04-20.1 from the scope of the IIP.

To ensure OPG carries out activities required to re-categorize LBLOCA CSIs to category 2, CNSC staff would initiate a station-specific Action Item which will direct OPG to submit their analysis and request for re-categorization within a required timeframe. It is recommended that the submission deadline be set to April 1, 2024, and the reporting provisions shall remain in line with the directions stated in the RoD [5]. The following text will be added to the Pickering NGS LCH, as a Compliance Verification Criteria (CVC) under Section 4.1 (Management of Safety Issues):

> *OPG is to use a safety analysis methodology, which is acceptable to CNSC staff, to update the Large Break Loss of Coolant Accident (LBLOCA) analysis and re-categorize the LBLOCA CANDU Safety Issues (CSIs) to Category 2. The updated LBLOCA analysis shall be completed and submitted to the CNSC as part of the request to re-categorize LBLOCA CSIs to Category 2 by April 1, 2024.*

Further, the Pickering NGS LCH CVC section 15.1 should be updated to reflect the removal of this action from the Pickering NGS IIP.

4.2.2 Extension of G04-RS2-06-08

Although OPG requested an extension to April 23, 2021, CNSC staff recommend that the date be June 30, 2021, due to the current pandemic situation. CNSC staff recommend that the Commission approves OPG's request to extend the deadline of resolution action G04-RS2-06-08 and the associated IIP action G04-RS2-06-08.1 to June 30, 2021.

In this case, the Pickering NGS LCH, Compliance Verification Criteria section under licence condition 15.1 would be revised to reflect the new timeline.

4.2.3 Extension and modification to G01-RS1-06-01 and two related actions G01-RS1-06-01.2 and G01-RS1-06-01.3

OPG has confirmed that the resolution action G01-RS1-06-01 and the associated IIP actions G01-RS1-06-01.2 and G01-RS1-06-01.3 will be completed by April 23, 2021 and by the end of February 2021 [13], respectively. Due to the current pandemic situation, CNSC staff recommend that the Commission approve the request to extend the deadline to June 30, 2021.

The Pickering NGS LCH Compliance Verification Criteria section under licence condition 15.1 would be revised to reflect the new timeline, as well as the two proposed activities:

Activity 1: Provide disposition of inspection findings from pressure tubes with higher estimated conditional probability of rupture from PLBB assessments for each of OPG's units.

Activity 2: Perform probabilistic predictions of pressure tube rupture using the PLBB code for a sample of rising pressure bursts tests. The sample burst tests results used in this activity must span a range of test temperatures and Hydrogen equivalent concentration values.

REFERENCES

1. CNSC Document, Power Reactor Operating Licence, "Pickering Nuclear Generating Station Nuclear Power Reactor Operating Licence – PROL 48.00/2028", August 7, 2018, e-Doc 5558765.

2. OPG Letter, R. Lockwood to A. Viktorov, "Pickering NGS – Periodic Safety Review 2 – Submission of Global Assessment Report Revision 1", February 12, 2018, CD# P-CORR-00531-05292, e-Doc 5460376.

3. OPG Letter, R. Lockwood to A. Viktorov, "Pickering NGS Periodic Safety Review 2 – Submission of Integrated Implementation Plan Revision 1", March 1, 2018, CD# P-CORR-00531-05311, e-Doc 5470841.

4. CNSC Document, Licence Conditions Handbook, "Pickering Nuclear Generating Station Nuclear Power Reactor Operating Licence, Licence Conditions Handbook – LCH-PR-48.00/2028-R000", September 1, 2018, e-Doc 5610425.

5. CNSC Document, Record of Decision, "In the Matter of Ontario Power Generation Inc. – Application to Renew the Nuclear Power Reactor Operating Licence for the Pickering Nuclear Generating Station", June 29, 2018, e-Doc 5718117.

6. OPG Letter, J. Franke to M.A. Leblanc, "Pickering NGS: Request for Approval to Amend the Integrated Implementation Plan (IIP) to Remove Resolution Action G25-RS1-04-20", October 6, 2020, CD# P-CORR-00531-06155, e-Doc 6394718.

7. OPG Letter, M.R. Knutson to M. Leblanc, "Pickering NGS: Request for Approval to Amend the Integrated Implementation Plan (IIP) to Extend Resolution Action G04-RS2-06-08", October 28, 2020, CD# P-CORR-00531-06202, e-Doc 6410417.

8. OPG Letter, R. Lockwood to A. Viktorov, "Pickering NGS: Request for Closure of Periodic Safety Review 2 Integrated Implementation Plan Action: G01-RS1-06-01 and Action Item 2014-OPG-4782", December 20, 2019, CD# P-CORR-00531-05884, e-Doc 6077776.

9. OPG Letter, J. Franke to A. Viktorov and J. Burta, "Large Break Loss of Coolant Accident Safety Analysis Margins – OPG's Adoption of Composite Analytical Approach", September 23, 2020, CD# N-CORR-00531-22326, e-Doc 6386157.

10. OPG letter, M.R. Knutson to A. Viktorov, "Pickering NGS Unit 6: Notification of Modification to mitigate CT-LISS Contact", September 3, 2020, CD# NK30-CORR-00531-08090, e-Doc 6373213.

11. CNSC Letter, A. Viktorov and J. Burta to M. Knutson, "Pickering and Darlington NGS – Response to OPG's Use of a Nominal Cooldown Transient for Leak-Before-Break Evaluation", November 6, 2020, e-Doc 5755097.

12. CNSC letter, K. Campbell and J. Burta to M. Knutson, "Pickering and Darlington NGS – Response to OPG's P-LBB Computer Code Validation Report", November 13, 2020, e-Doc 5914156.

13. OPG email, S. Irvine to K. Campbell, "Regarding P-LBB Computer Code Validation Path Forward", November 19, 2020, CD# P-CORR-00531-06227, e-Doc 6426976.

14. OPG letter, R. Lockwood to A. Viktorov, "Pickering Unit 6 – Update on CT-LISS Contact Mitigation Strategy", September 30, 2019, CD# NK30-CORR-00531-07918, e-Doc 6008923.

15. CNSC letter, A. Viktorov to R. Lockwood, "Pickering NGS, Unit 6 – Update on CT-LISS Contact Mitigation Strategy", November 21, 2019, e-Doc 6045979.

16. OPG letter, M. Knutson to A. Viktorov and N. Riendeau, "Closure Request for Action Item 2014-OPG-4782 Condition 3D-1.5", June 15, 2018, CD# N-CORR-00531-19215, e-Doc 5570270.

17. OPG letter, W. S. Woods to A.Viktorov and N. Riendeau, "Submission of Probabilistic Leak-Before-Break Validation Report and Closure of CNSC Condition 3D-1.6 of Action Item 2014-OPG-4782", February 12, 2018, N-CORR-00531-19058, e-Doc 5459972.

A. BASIS FOR THE RECOMMENDATIONS

A.1 Regulatory Basis

The regulatory basis for the recommendations presented in this CMD is as follows:

- *Nuclear Safety and Control Act*, subsection 24 (2).
- Nuclear Power Reactor Operating Licence, Pickering Nuclear Generating Station, PROL 48.01/2028.

B. CNSC STAFF DETAILED ASSESSMENTS AND CONCLUSIONS

B.1 OPG Request to Remove Resolution Action G25-RS1-04-20 from the Scope of the IIP

The IIP action G25-RS1-04-20.1, *Re-categorization of the Large-Break Loss-of-Coolant Accident (LBLOCA)*, aims to track the completion of analyses allowing for the re-categorizing the Pickering NGS CANDU Safety Issues (CSIs) associated with Large-Break Loss-of-Coolant Accident (LBLOCA) from Category 3 to Category 2.

Originally, OPG intended to use a modified Limit of Operating Envelope (LOE) safety analysis methodology to update the LBLOCA analysis and on that basis re-categorize the associated CSIs. Although OPG has continued to make progress with this action, the overall progress was slower than expected. Meanwhile, OPG has also participated in a CANDU industry-wide initiative for addressing LBLOCA CSIs, which proposes a different methodology called the Composite Analytical Approach (CAA). Considering that CNSC staff determined that Bruce Power's concept for implementation of CAA constitutes an acceptable approach for safety analysis of LBLOCA, OPG chose to pursue application of this methodology as a more certain basis for re-categorization of LBLOCA CSIs. Although the Bruce B Integrated LBLOCA Safety Analysis using the CAA, including their LBLOCA analysis plan, are still under review by CNSC staff, OPG is currently in the process of developing detailed analysis plans for implementation of the CAA for their fleet of reactors.

CNSC staff assessed the basis of OPG's request [6] and the accompanying detailed plan [9] that OPG submitted in support of their request for the removal of resolution action G25-RS1-04-20 from the IIP. In developing their recommendations, CNSC staff considered:

1. The basis for the modification of the IIP action;
2. The risk significance associated with the change in the methodology;
3. The risk significance associated with the new timeframe and;
4. The existence of an alternative tracking and implementation process.

The following are the staff assessment and conclusions:

- The requested removal of a commitment from the IIP is not due to intractable technical issues, but is rather a result of the adoption of an alternative analysis approach. The proposed OPG plan for the re-categorization of LBLOCA CSIs is, in general, similar to the approach used by Bruce Power that was accepted by CNSC staff.
- The IIP action G25-RS1-04-20.1 description refers to the use of a modified LOE – and not the CAA - safety analysis methodology to update the LBLOCA analysis and re-categorize LBLOCA CSIs. Thus, adoption

of a new methodology would not only require an extension of the deadline, but also a modification to the action description to remove a reference to the LOE.

- The Commission included licence condition 15.1 in the renewed licence for Pickering NGS and made it clear that any changes to the IIP would constitute a change in the Pickering NGS licensing basis; therefore, requiring authorization from the Commission for any change to the IIP. CNSC staff were directed to implement increased regulatory oversight in respect to OPG's IIP activities and to provide annual updates in this regard during the presentation of the NPP Regulatory Oversight Report (ROR) or through other means.
- Items 227-233 of the relicensing Record of Decision (RoD) [5] summarize the discussion on the management of CANDU safety issues. The Commission directed OPG to continue its work to resolve the Pickering NGS-specific Category 3 CSIs and directed CNSC staff to continue providing annual updates on this progress in the ROR or through other means, as appropriate.
- Considering that CNSC staff determined that Bruce Power's concept for implementation of CAA constitutes an acceptable approach for safety analysis of LBLOCA events, OPG is in the process of adopting and customizing the CAA for the LBLOCA safety analysis of OPG reactors. It has been determined that the impact on the safety of Pickering NGS operations is minimal and is found to be acceptable by CNSC staff.
- According to OPG's plan [9], the implementation of the CAA will be performed for Darlington NGS first. This is primarily due to the CNSC staff expectations for completing re-categorization of the LBLOCA CSIs as a condition for Unit 3 Restart after refurbishment. Moreover, the plans and preparatory activities for Darlington NGS CAA analysis are at a more advanced state than for Pickering NGS. Upon successful CNSC acceptance of the CAA analysis for Darlington NGS, Pickering NGS analysis will follow. In accordance with [9], OPG will submit a detailed analysis plan for Pickering NGS in Q3-2022 for CNSC staff concurrence, with analysis results in Q1-2024 for CNSC staff review.
- The 4-year delay in the commitment for analysis to facilitate the re-categorization of the LBLOCA CSI's is acceptable to CNSC staff. This request does not impact the baseline risk documented in the Safety Report that was used to support the current licensing basis and does not inhibit the capability for safe operations beyond the original IIP commitment deadline of December 31, 2020.
- Accepting OPG's request to remove resolution action G25-RS1-04-20 from the IIP would mean that OPG's commitments to re-categorize LBLOCA CSI would no longer be governed by the licence condition 15.1. To ensure regulatory oversight, CNSC staff have other well-established enforcement

mechanisms, such as station-specific Action Items. CNSC staff also have options for explicitly retaining the requirement to re-categorize LBLOCA CSIs in the Pickering NGS licensing basis by modifying the Licence Condition Handbook.

B.2 OPG Request to Extend the Deadline of Resolution Action G04-RS2-06-08

OPG has requested the Commission's approval for an extension to the completion date for IIP resolution action G04-RS2-06-08 [7].

This resolution action requires OPG to: *Perform measurements, as required, of CT-LISS nozzle gaps on Units 5-8 to refine the gap closure rates. Using this new measurement data, update analyses as required, to demonstrate Fitness for Service. Implement mitigation strategies if CT-LISS nozzle contact is predicted within the extended operating period.*

During the normal operation of a reactor, calandria tubes and Liquid Injection Shutdown System (LISS) nozzles sag with time due to aging effects. OPG routinely inspects the gap between the Calandria Tube (CT) and LISS nozzles and predicts the gap-closure rate as part of its Fitness for Service assessment for Units 5-8. During the safety review conducted for Pickering NGS, two units were identified as being at risk for CT-LISS nozzle contact. Therefore, IIP actions G04-RS2-06-08.1 and G04-RS2-06-08.2 were raised for OPG to perform follow-up CT-LISS nozzle gap inspections and to produce a new Fitness for Service assessment for Units 6 and 5, respectively.

During a planned inspection of Unit 6, in 2018, OPG performed CT-LISS gap visual and fuel channel sag measurements, and concluded that the earliest CT-LISS nozzle contact was predicted before the current planned end of commercial operation. OPG similarly performed CT-LISS gap visual and fuel channel sag measurements on Unit 5, in 2019, and predict no CT-LISS nozzle contact prior to the current planned end of commercial operation for the unit.

On September 30, 2019 [14], OPG notified CNSC of its mitigation strategies to increase the actual CT-LISS nozzle gap for Unit 6, thus reducing the risk of contact. CNSC staff subsequently evaluated and concurred with OPG's mitigation strategies [15].

On September 3, 2020, OPG notified CNSC of its plan to proceed with a design change to the LISS, which was consistent with the mitigation strategies submitted earlier. OPG followed normal processes to execute the design change, including obtaining an approved registration from the Technical Standards and Safety Authority (TSSA). The Unit 6 planned maintenance outage commenced on September 5, 2020, with OPG moving forward with its plan to install a compression fixture on the Heavy-Water bellow, to increase the gap between the LISS nozzles and the CT. Measurements of the gap relative to the affected

channel is to follow installation of the compression fixture, and is needed to re-assess and update the gap-closure rate prediction.

On October 28, 2020, OPG requested [7] Commission approval for an extension to resolution action G04-RS2-06-08, from December 31, 2020 to April 23, 2021, siting the timing of the Unit 6 planned maintenance outage. The time is needed for OPG to perform and submit an updated Fitness for Service assessment for CT-LISS nozzle contact for Unit 6.

CNSC staff has reviewed OPG's submission [7] and concluded that the requested extension to resolution action G04-RS2-06-08 has no impact on safety as the current results for the Fitness for Service assessment for Unit 6 does not predict CT-LISS contact until well beyond the requested extension.

B.3 CNSC Staff Request to Modify Resolution Action G01-RS1-06-01 and two related Action G01-RS1-06-01.2 and G01-RS1-06-01.3

OPG has submitted their request for closure of resolution action G01-RS1-06-01 in December 2019 [8]. This resolution action has four related IIP actions:

- G01-RS1-06-01.1 *Provide Revised OPG CSA N285.8 Compliance Plan*
- G01-RS1-06-01.2 *Define Nominal Cooldown Transient for use in Probabilistic Leak-Before-Break (PLBB) Analyses*
- G01-RS1-06-01.3 *Provide to CNSC documented evidence that validation of PLBB code is complete*
- G01-RS1-06-01.4 *Address the Probabilistic Core Assessment (PCA) Flaw Removal Issue*

Before accepting the request for closure of resolution action G01-RS1-06-01, all the related IIP actions must be completed and accepted as closed. OPG must also fulfill the completion criteria: *Activities to address Action Item 2014-OPG-4782 and 2016-OPG-8975 are complete*.

CNSC staff review of OPG's request [8] found that the supporting information [14, 15] was not fully satisfactory regarding two of the four IIP actions, G01-RS1-06-01.2 and G01-RS1-06-01.3.

IIP action G01-RS1-06-01.2

This action requires OPG to: *Define Nominal Cooldown Transient for use in Probabilistic Leak-Before-Break (PLBB) Analyses*, which is Condition 3D-1.5 of Action Item 2014-OPG-4782.

OPG applies a unique nominal cooldown transient for each station which serves as an input function in computer simulations to define limits to temperature and pressure for predicting pressure tube behavior. The purpose for the actions is to

confirm the nominal cooldown transient is sufficiently conservative in order to increase confidence in OPG's PLBB evaluations.

To address the action, OPG presented an overview of the nominal cooldown transient for use in PLBB evaluation and subsequently followed-up with a letter requesting closure of the action [16]. OPG's approach is intended to bound the cooldown scenarios specified in the station-specific operating manual that an operator is expected to follow in response to an indication of a pressure tube leak during normal operation.

CNSC staff identified an example of a cooldown transient leading to an unplanned outage in 2018 at Pickering where the cooldown rate was slower than the nominal cooldown transient, which has the effect to under-predict the stability of postulated pressure tube flaws in computer simulations of the reactor core.

In order to confirm the nominal cooldown transient is sufficiently bounding for use in PLBB evaluation CNSC staff are recommending to extend resolution action G01-RS1-06-01.2 to allow time for OPG to respond to staff request for supplemental information [11]. OPG staff provided concurrence to provide the requested information by April 23, 2021 [13].

CNSC staff concluded that the requested extension for IIP action G01-RS1-06-01.2 have negligible impact on safety for the extended time period.

IIP action G01-RS1-06-01.3

This action requires OPG to: *Provide to CNSC documented evidence that validation of PLBB code is complete*, which is Condition 3D-1.6 of Action Item 2014-OPG-4782.

The objective for this action is to improve CNSC staff confidence in the results generated by OPG's "P-LBB" computer code, which is capable of performing both deterministic and probabilistic Leak-Before-Break (LBB) evaluations.

On February 12, 2018 OPG submitted [17] a validation report for the "P-LBB" computer code which applied a "bottom-up" approach for validation of constituent sub-models; however, CNSC staff identified a number of gaps in the validation of sub-models in addition to the lack of quantification of parameter correlations. Further, staff judge there is considerable uncertainty associated with pursuing resolution of all assessed gaps through analytical or experimental means in the short-term. CNSC staff determined that complimentary partial validation of the "P-LBB" computer code could be achieved using inspection results and data from rising pressure burst tests used to determine pressure tube fracture toughness. These activities would be an alternative means to meet the intent of Condition 3D-1.6 under Action Item 2014-OPG-4782.

<u>Activity 1</u>: Provide disposition of inspection findings from pressure tubes with higher estimated conditional probability of rupture from PLBB assessments for each of OPG's units.

<u>Activity 2</u>: Perform probabilistic predictions of pressure tube rupture using the PLBB code for a sample of rising pressure bursts tests. The sample burst tests results used in this activity must span a range of test temperatures and Hydrogen equivalent concentration values

OPG staff provided concurrence and confirmation that the above activities could be completed by the end of February 2021 [13].

CNSC staff concluded that the requested extension to perform the new proposed activities for IIP action G01-RS1-06-01.3 have negligible impact on safety for the extended time.