Pickering NGS Periodic Safety Review 2-B (PSR2-B)

Enclosed:

1. Pickering NGS: Periodic Safety Review 2-B (PSR2-B) Global Assessment Report (GAR)
2. Pickering NGS: Periodic Safety Review 2-B (PSR2-B) Integrated Implementation Plan (IIP)

Pickering NGS Periodic Safety Review 2-B (PSR2-B): Global Assessment Report

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ONTARIO POWER GENERATION **OPG PROPRIETARY**
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ACCEPTED	X
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REVISE AND RESUBMIT	

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Revision Summary

Rev	Date	Author	Comments
R00	26-Jan-2023	J. Cheng	Initial Issue.
R01	12-Apr-2023	J. Cheng	Revised to incorporate OPG review comments.
R02	28-Apr-2023	J. Cheng	Revised to incorporate additional OPG review comments.

EXECUTIVE SUMMARY

Pickering Nuclear Generating Station (NGS) underwent a Periodic Safety Review (PSR), referred to as "PSR2", which included the assessment of the Review Tasks and modern Laws, Regulations, Codes and Standards (LRCSs) in the PSR2 Assessment Basis [1]. The reviews conducted under PSR2 assessed a period of extended operation to the end of 2028, with the understanding that an extension of the commercial operation of certain units beyond 2024 would be possible if supported by a reassessment of the impact of such extended operation on the time-dependent elements of PSR2 on the design and licensing basis that demonstrates acceptability. The requirements for this reassessment are specified in Licence Condition 15.1 of the PNGS Licence Conditions Handbook (LCH).

This Global Assessment Report (GAR) amendment presents the results of the reassessment, completed in support of the extended commercial operation of only Pickering 5-8 beyond 2024 to the end of the year 2026, with Pickering 1,4 shutting down in 2024. This assessment is referred to as "PSR2-B".

This PSR2-B review of Pickering NGS meets the elements of CNSC REGDOC-2.3.3 [2] and CSA N290.18-17, "Periodic Safety Review for Nuclear Power Plants" [3], using guidance from IAEA SSG-25, "Periodic Safety Review for Nuclear Power Plants" [4].

The Global Assessment for PSR2 [5] demonstrated that the Pickering NGS design, condition, operation, processes and management system provides assurance of continued safe operation of the plant during the extended operating period to the end of 2028, with the commercial operation to the end of 2024. All Resolution Actions identified by the PSR2 Global Assessment [5] have been completed as part of the Integrated Implementation Plan (IIP) and closure accepted by the CNSC as of June 30, 2021 [6]. With completion of the Resolution Actions, OPG satisfied the commitments made under the licence for the PSR2.

This assessment is a companion to the PSR2 Global Assessment, and the two assessments constitute the Global Assessment to support extended operation to the end of 2026. This report reassesses the time-dependent elements in PSR2 GAR and the new or revised requirements since PSR2 to confirm the validity of the PSR2 conclusions for the additional two years of operation, and to identify any additional actions required beyond those that have already been achieved in the Pickering PSR2 Integrated Implementation Plan (IIP) [7]. The assessment in the PSR2-B GI Gap Assessment Report [8] that identifies the gaps for consideration in the Pickering PSR2-B Global Assessment includes a review of the Pickering PSR2 Global Issues (GIs) requiring "Reassessment Beyond 2024" in the PSR2 GAR [5], a review of open regulatory actions, and an assessment of D-PSR gaps for applicability to PNGS. By including the results from the D-PSR, the PSR2-B assessment takes into account safety significant changes in requirements since the PSR2 was completed and effectiveness issues related to programs and practices common to the OPG nuclear fleet.

The PSR2-B Global Assessment identified 41 PSR2-B Gaps mapped into 14 existing PSR2 Global Issues and two new Global Issues (GI-52 and GI-53). Twenty-two (22) gaps were identified from the reassessment of PSR2 Global Issues impacted by PNGS Operation beyond 2024, one gap was identified from the review of open regulatory actions, and 18 gaps were identified from the assessment of D-PSR Gaps for applicability to PNGS. The issues identified consist primarily of gaps related to completion of fitness for service assessments for Major Components and

other Structures, Systems and Components (SSCs), safety analysis to address the aging of SSCs for the extended period, and gaps against requirements in modern LRCSs. Thirteen Resolution Statements have been proposed and ranked for resolution under the IIP. Six new Acceptable Deviations have been identified and eleven gaps are resolved as requiring No Further Action.

The issues identified in the PSR2-B Global Assessment that are of higher significance pertain to preparing fitness for service assessments of the Major Components.

Aging Management reviews performed in support of PSR2 confirmed that the condition of SSCs is well understood, and that plant safety and reliability are maintained through a set of systematic and planned surveillance, testing, inspection, and maintenance activities using best industry practices and Operating Experience (OPEX). Fitness for service of Major Components is demonstrated and re-assessed on an on-going basis through planned inspections and maintenance, and assessment of inspection results in accordance with applicable CSA Standards using well established programmatic controls.

Resolution Statements have been proposed to demonstrate fitness for service of Major Components for the extended operating period up to the end of 2026. In addition, the aging management strategy for non-Containment safety-related structures will be reviewed to confirm its validity, given the extended operation of Pickering 5-8 to the end of 2026. Required follow-up actions will be managed under the existing Major Components and Integrated Aging Management Programs. OPG is also committed to updating the safety analysis of events most impacted by aging to support Pickering 5-8 extended operation.

The assessment of newly identified Acceptable Deviations confirmed there is no impact on the conclusions of the Global Assessment, either individually or in aggregate.

Furthermore, the assessment confirms that the Global Issues identified by PSR2-B do not invalidate the conclusions of the assessment in the PSR2 GAR, and the defence-in-depth will be further strengthened with the implementation of the proposed Resolution Plans.

This Global Assessment concludes that the current plant design, condition, operation, processes and management system will ensure continued safe operation of Pickering 5-8 for an additional two years of operation beyond 2024. Resolution of PSR2-B gaps will be addressed under the IIP.

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1.0 INTRODUCTION

1.1 Purpose

OPG is assessing the extension of commercial operation of Pickering 5-8 to the end of the year 2026 and requires a supporting safety assessment for this extended operation. Therefore, this amendment to the Pickering Nuclear Generating Station (PNGS) Periodic Safety Review 2 (referred to as "PSR2") reassesses the time-dependent elements of PSR2, to confirm the validity of the PSR2 bases for an additional two years of commercial operation and identify any additional actions required to support the extended operation period. This assessment is referred to as "PSR2-B".

The objective of the PSR2-B Global Assessment is to provide an overall assessment of the safety of the plant, and to assess the acceptability of Pickering NGS for continued operation over the extended period, and to identify the necessary improvements beyond that which has already been achieved or committed (e.g., in the Pickering PSR2 Integrated Implementation Plan (IIP)).

As PSR2-B is an amendment to PSR2, it builds on the review Basis of PSR2 [1]. As such, PSR2-B is forward-looking, confirming that the conditions of Pickering NGS Structures, Systems and Components (SSCs) support an additional two years of operation since the previous assessments.

In addition, PSR2-B evaluates the results from the recent Darlington NGS PSR (referred to as "D-PSR") to assess the applicability of site-specific and programmatic gaps (where programs and practices are common to the OPG nuclear fleet) and their incremental impact on PSR2. As a result, this re-assessment builds on the results from PSR2 assessment and the D-PSR.

1.2 Background

PNGS underwent PSR2 from 2016 to 2018, in support of operation extension to 2024. OPG was granted a 10-year Power Reactor Operating Licence (PROL) for PNGS for the period of August 31, 2018, to August 31, 2028.

PSR2 was conducted as a subsequent PSR, building on the review basis of earlier OPG PSR work and other associated assessments (termed as "PSR1"), consisting of:

- The Pickering B Integrated Safety Review (ISR), completed in 2009 and performed in support of refurbishment and continued operation (for another 30 years) of the Pickering 5-8 units;
- Pickering 1,4 integrated safety assessments performed during the Pickering A Return to Service work (circa 2000), in support of approval to restart the Pickering 1,4 units; and

- The Darlington ISR (D-ISR), completed in 2011 with a "code refresh review" performed in December 2013, in support of refurbishment and continued operation of the Darlington.

The Safety Factor reviews conducted under PSR2 assessed a period of extended operation to the end of 2028. In conducting the PSR2 Global Assessment, the development of Resolution Plans considered whether the resolution activities would be different for a scenario with operation to 2024 (the nominal planning basis for the units), or for operation beyond 2024. In cases where detailed resolution activities were only identified to address commercial operations to 2024, the Global Issue (GI) Resolution Plan was identified as requiring "Reassessment Beyond 2024". The GI Resolution Plans not requiring reassessment for beyond 2024 were evaluated for the period of extended operation of Pickering NGS units to the end of 2028, and therefore, are not time-sensitive to the proposed extension to the end of 2026. The results of the PSR2 assessments were documented in the PSR2 Global Assessment Report (GAR) [5] and actioned in the PSR2 Integrated Implementation Plan (IIP) [7].

Hence, PSR2 fully assessed the safe operation of PNGS to 2024, with the understanding that an extension of the commercial operation of certain units beyond 2024 would be possible if supported by a reassessment of the impact of such extended operation on the licensing basis and continued plant safety.

The requirements for this reassessment are specified in the PNGS Licence Conditions Handbook (LCH), LCH-PR-48.00/2028 R005, for Licence Condition 15.1 [9], as follows:

> *As detailed in CMD 22-H107 Record of Decision (E-doc 6923859), for any of the Pickering units to operate beyond December 31, 2024, the licensee shall perform and complete by or before June 30, 2023, a reassessment of the continued validity of the PSR results and, as a minimum, shall:*
>
> *a. Reassess the results of the global assessment included in the PSR Global Assessment Report (GAR);*
>
> *b. Include new or revised requirements, expectations and practices that became available since the freeze-date of the PSR stated in P-REP-03680-0001, Pickering NGS Periodic Safety Review 2 (PSR2) Basis Document;*
>
> *c. For any newly identified findings, utilize the consolidation, prioritization and ranking methods employed in performing the PSR global assessment to formulate new global issues and resolutions plans;*
>
> *d. Evaluate the continued validity of conclusions reached in PSR; and*
>
> *e. Revise the IIP by incorporation the results of the reassessment as new or modified IIP actions, and submit the revised IIP for CNSC acceptance.*

The elements of PSR2-B consist of the following three phases:

(i) An assessment to identify additional gaps for consideration in the Pickering PSR2 Global Assessment, including a review of the Pickering PSR2 GIs to evaluate the impact of commercial operations beyond 2024, a review of open regulatory actions, and an assessment of Darlington NGS D-PSR gaps and Enhancement Opportunities (EOs) for applicability to PNGS.

This phase is complete, and the results are documented in the GI Gap Assessment Report [8].

(ii) An amendment to the Pickering PSR2 Global Assessment (this report) to assess the acceptability of Pickering 5-8 for continued operation over the extended period, and to identify the necessary improvements.

(iii) A revision of the Pickering PSR2 IIP to reflect the results of the PSR2-B GAR.

The PSR2-B Re-Assessment Strategy is documented in Reference [10] and defines the scope and methodology for conducting the Pickering PSR2-B.

Evaluation of the transition period of the PNGS units after commercial operation, which includes defueling and dewatering, permanent shutdown for safe storage and surveillance, will be addressed outside of the scope of the PSR and therefore, is not explicitly addressed in this report. Furthermore, OPG will continue to implement programs and processes to support continued operations of Pickering 5-8 and common systems to the end of 2026. This includes, but is not limited to, on-going maintenance and surveillance activities of SSCs required for Pickering 5-8 operations in accordance with OPG Aging Management (AM) governance.

2.0 OVERVIEW OF THE PSR2-B GLOBAL ASSESSMENT PROCESS

The major input to the PSR2-B Global Assessment is the GI Gap Assessment in [8], which includes the following reviews:

- Reassessment of existing PSR2 Global Issues flagged for "Reassessment Beyond 2024" to identify impacts due to the extension of PNGS commercial operation to the end of 2026.
- Review of open PNGS licensing issues as of September 2022 to determine whether new issues are addressed by existing Global Issues.
- Review of gaps and EOs from the D-PSR to determine applicability to PNGS and identify new Global Issues for PNGS where applicable.

The PSR2-B Global Assessment consists of the following elements:

1. Development of Global Issues by integrating and consolidating the Gaps identified in the GI Gap Assessment Report [8]. Note, a preliminary consolidation of Gaps into GIs has already been completed in [8].
2. Prioritization of Global Issues.
3. Development of proposed Resolution Plans with consideration of safety benefits, practicability, and the interfaces between the Gaps and Global Issues.
4. Ranking of Global Issues Resolution Statements.
5. The aggregate impact of Acceptable Deviations and an assessment of Defence-in-Depth.
6. Assessment of overall acceptability of extending the commercial operation of Pickering 5-8 beyond 2024 to the end of 2026.

For items 5 and 6 above, the PSR2 GAR [5] conclusions serve as the basis for this assessment.

Each of the above steps is described in more detail in Section 3.0 of this report, and the results are presented in Section 4.0 through to Section 12.0.

3.0 PSR2-B GLOBAL ASSESSMENT METHODOLOGY

The methodology for the conduct of assessments and the associated framework of the Global Assessment is described in the PSR2 GAR [5]. The PSR2 Global Assessment Framework, described in detail in Section 5 and Appendix C of the PSR2 GAR, is the basis for assessing the relative importance of addressing GIs in terms of aspects such as their safety significance and impact of their resolution. The same methodology and the framework are used to assess the new and revised Global Issues in PSR2-B.

The subsections below describe the steps of the overall methodology used for performing the Global Assessment for PSR2-B.

3.1 Development of Global Issues

The first step in the Global Assessment methodology is the review and accumulation of the Gaps identified and consolidating them into Global Issues.

The following information for each Gap is collected:

- Origin of Gap (i.e., PSR2 Resolution Statement, PSR2 IIP Action, D-PSR Gap, Open PNGS Regulatory Action Item)
- Gap identification number and title
- Associated modern Laws, Regulations, Codes and Standards (if applicable)
- Description of the Gap

The newly identified PSR2-B gaps are then grouped into the existing PSR2 Global Issues or into new PSR2-B Global Issues according to their topical similarities.

3.2 Prioritization of Global Issues

The Global Issues developed in Section 3.1 are prioritized with respect to nuclear safety into one of four categories, based on their Safety Significance Level as described in Section 3.3.3 of the PSR2 Basis Document [1], and shown in Table 1 below.

Table 1: Safety Significance Level versus Impact on Nuclear Safety

Safety Significance Level	Impact on Nuclear Safety
1	High
2	Medium
3	Low
4	Very Low

The basis for prioritization of each Global Issue is provided in Appendices E and F of the PSR2 Basis Document [1], and comprises Deterministic and Probabilistic considerations.

The Deterministic considerations are:

- Defence-in-Depth (E1)
- Safety Significance Level (E2)

Using the guidelines provided in Appendix E of the PSR2 Basis Document [1], a Safety Significance Level of 1, 2, 3 or 4 is assigned to each Deterministic consideration based on whether the Global Issue has a high, medium, low or very low impact on nuclear safety for the consideration being evaluated. A Safety Significance Level of 1, 2, 3 or 4 is then assigned to the overall Deterministic consideration based on the most safety significant result. For Deterministic considerations that are not relevant to the Global Issue, the prioritization is recorded as "N/A" or "Not Applicable".

There are 7 Probabilistic considerations, as follows:

- Reactor Safety Core Damage Frequency (F1)
- Reactor Safety Defence-in-Depth (F2)
- Public Radiation Safety (F3)
- Plant Operability (F4)
- Occupational Radiation Safety (F5)
- Emergency Preparedness (F6)
- Environment (F7)

Using the guidelines provided in Appendix F of the PSR2 Basis Document [1], a Safety Significance Level of 1, 2, 3 or 4 is assigned to each Probabilistic consideration based on whether the Global Issue has a high, medium, low or very low impact on nuclear safety for the consideration being evaluated. A Safety Significance Level of 1, 2, 3 or 4 is then assigned to the overall Probabilistic consideration based on the most safety significant result. For Probabilistic considerations that are not relevant to the Global Issue, the prioritization is recorded as "N/A" or "Not Applicable".

The overall Safety Significance Level for the Global Issue is then assigned based on the Safety Significance Level of whichever overall consideration, Deterministic or Probabilistic, has the highest nuclear safety impact.

The results of the prioritization of the Global Issues, including the Safety Significance Level assigned to each Global Issue and the accompanying rationale, are provided in Section 4 of each Global Issue Table in Appendix B.

The outcome of the Global Issue Safety Significance Level assessment is documented in Section 4 of each Global Issue summary in Appendix B of this report. A Safety Significance Level between 1 and 4, or N/A, is assigned for each of the considerations in Appendix E and Appendix F of the PSR2 Basis Document [1]. N/A means that the Global Issue has no impact on the particular consideration, so the corresponding table in the PSR2 Basis Document is not applicable for the purposes of assessing the Safety Significance Level. The overall Safety Significance Level for each Global Issue corresponds to the highest impact on nuclear safety (smallest Safety Significance Level number) of the individual considerations.

The results of the prioritization of PSR2-B Global Issues are presented in Section 6.0 of this report.

3.3 Development of Resolution Plans

Proposed Resolution Plans for Global Issues are formulated with consideration of interfaces between the various Gaps to ensure that the proposed Resolution Plans complement each other. Proposed Resolution Plans are developed for all Global Issues and consider safety benefits and practicability. Insights from available site Probabilistic Safety Assessments may be used in evaluating the benefit/practicality of potential options, where appropriate.

Proposed Resolution Plans may include proposed Resolution Statements which are actions defined to address a Gap. Proposed Resolution Statements are primarily proposed for Global Issues that have been prioritized with a Safety Significance Level of 1 or 2 (i.e., high or medium impact on nuclear safety), and for Global Issues with Safety Significance Level 3 if a practicable solution is readily evident.

Consistent with Section 3.3.3 of the PSR2 Basis Document [1], Resolution Statements are not proposed for all PSR2 Gaps. Gaps with Safety Significance Level 4 (i.e., very low impact on nuclear safety) are generally assessed as Acceptable Deviations. Gaps with Safety Significance Level 3 (i.e., low impact on nuclear safety) for which a practicable solution is not readily evident are also assessed as Acceptable Deviations. Acceptable Deviations are not tracked beyond the Global Assessment phase of PSR2 [1]. However, the impacts of Acceptable Deviations are considered in the Defence-in-Depth Assessment to determine the aggregate impact on the defence-in-depth capability of the plant.

The proposed Global Issue Resolution Plans for each Global Issue are documented in Appendix B – Global Issues and Proposed Resolution Plans. These consist of the following statement types:

- Resolution Statements (RS): An activity is defined to address the Gap(s).
- No Further Action (NFA): Work is already completed or is underway outside of PSR2 to address the related Gap(s), or information has been found to obviate the Gap(s).

- Acceptable Deviation (AD): The Gap(s) have been assessed to have a Very Low Safety Significance Level, or are Low Safety Significance Level items and a practicable resolution is not readily evident.

- Cross Reference (XRF): An action that addresses the Gap(s) is covered by another Resolution Statement.

The naming convention for the Resolution Plans consist of the GI # followed by the acronym for the Resolution Plan type and then the sequential number for each Resolution Plan of that type for a given GI. The numbering of the Resolution Plans for PSR2-B continues from the numbering sequence in the PSR2 GAR [5]. Examples of Resolution Plan identifiers and their explanations are provided in Table 2 below.

Table 2: Resolution Plan Identification

Resolution Plan Identifier	Global Issue Number	Resolution Plan Type	Sequential #	Description
GI-1-RS5	GI-1	-RS	5	The PSR2 GAR [5] identified four (4) Resolution Statements for GI-1. As a result, the first Resolution Statement identified in PSR2-B for GI-1 is numbered GI-1-RS5.
GI-1-AD1	GI-1	-AD	1	The PSR2 GAR [5] did not identify any Acceptable Deviations for GI-1. As a result, the first AD identified in PSR2-B for GI-1 is numbered GI-1-AD1.

To facilitate binning of potential work, proposed Resolution Plans are categorized as one or more of the following types of enhancements:

- Programmatic (changes to governing programs and procedures)

- Engineering (repair/replacement or design changes)

- Analytical (engineering analysis, deterministic safety analysis, probabilistic safety assessment or hazard analysis)

The categorization is identified in Section 1 of each Global Issue Table in Appendix B. In some cases, the proposed Resolution Statements entail work in more than one of these categories.

The Global Issues and the Resolution Plans undergo several reviews during the Global Assessment process. These reviews consider factors such as the priority previously determined (Safety Significance Level), the contribution to defence-in-depth and the significance of the source (e.g., the type of document that generated the Gap(s) leading to the Global Issue). The proposed resolutions identified in this report are also presented to OPG Senior Management for their review and acceptance.

3.4 Ranking of Resolution Statements

The purpose of ranking proposed Resolution Statements is to determine the activities that will be most effective in enhancing safety.

All Global Issue Resolution Statements with identified actions are ranked from 1 to N in decreasing importance such that 1 is the most important and N, which is the total number of Resolution Statements, is the least important.

The ranking is determined through the application of a value-tree method for solving multi-attribute decision problems, as described in Section 5.5 and Appendix C of the PSR2 GAR [5]. The ranking of each proposed Resolution Statement is based on the weight and a two-variable utility function that accounts for impact and time attributes. The impact attribute is a measure of how directly or strongly the issue impacts the objective, while the time attribute accounts for how long it would take to implement and realize the associated objective. The two-variable utility function is used to generate a utility matrix, and the time and impact ratings for each proposed Resolution Statement are used together with the utility matrix to obtain a numerical value that represents the utility score for resolving the proposed Resolution Statement. The Ranking Number of the proposed Resolution Statement is then calculated by multiplying its utility score by its weight.

Acceptable Deviations and No Further Action statements do not go through the ranking process; only proposed Resolution Statements with identified actions are ranked.

3.5 Defence-in-Depth Assessment

As part of the PSR2 Global Assessment, a Defence-in-Depth Assessment was performed, and is described in detail in Section 18 of the PSR2 GAR [5]. The following process was used in PSR2 GAR:

1. Establish the applicable Safety Principles for the defence-in-depth review.

2. Define defence-in-depth levels impacted for each applicable Safety Principle in SRS-46.

3. Map each Safety Principle to the relevant PSR2 Safety Factor reviews.

4. Assess the defence-in-depth aspects of each Safety Principle in Pickering NGS design and operation at a high level.

5. Provide an overall summary integrating conclusions from each step above for each level of defence-in-depth. These summaries will include the Strengths and Global Issues that are relevant to each level of defence-in-depth.

For the PSR2-B Global Assessment, a review is performed to confirm that the conclusions of the Defence-in-Depth Assessment in the PSR2 GAR [5] are not impacted by the new Global Issues identified by the re-assessment. For each level of defence, the conclusions from the PSR2 assessment are reviewed to determine the impact of proposed PSR2-B Global Issue Resolution Statements and the completed PSR2 IIP actions. In addition, any newly identified Acceptable Deviations are assessed to determine the aggregate impact on the defence-in-depth capability of the plant.

An overall assessment for each level of defence-in-depth is performed, based on the integration of the following:

- Assessment and the conclusions of the defence-in-depth assessment in PSR2 GAR [5];

- Assessment of the aggregate impact of the Acceptable Deviations on the defence-in-depth capability of the plant; and

- The impact of proposed enhancements resulting from the PSR2-B Resolution Statements.

3.6 Acceptability of Operation Pickering Units 5-8 to the End of 2026

This step assembles the results of the previous steps to assess the overall acceptability of extended Pickering 5-8 operation to the end of 2026 on the basis of a balanced view of all of the findings. The assessment considers the PSR2 Global Assessment conclusions in [5], the improvements implemented since the PSR2 assessment, the proposed enhancements identified, and the Defence-in-Depth Assessment.

4.0 IDENTIFICATION OF PSR2-B GAPS

This section summarizes the results of the GI Gap Assessment Report [8] and lists the gaps identified from each review performed for PSR2-B. The GI Gap Assessment is comprised of three reviews:

1. Reassessment of existing PSR2 Global Issues flagged for "Reassessment Beyond 2024" to identify impacts due to the extension of Pickering NGS commercial operation to the end of 2026.

2. Review of open PNGS licensing issues as of September 2022 to determine whether new issues are addressed by existing GIs.

3. Review of gaps and EOs from the D-PSR determine applicability to Pickering NGS and to identify new GIs for PNGS where applicable.

4.1 Reassessment of PSR2 Global Issues

In conducting the PSR2 Global Assessment, the development of Resolution Plans considered whether the resolution activities would be different for a scenario with operation to 2024 (the nominal planning basis for the units) or for operation beyond 2024. If the proposed Resolution Plan for a particular GI was considered dependent on whether plant operation is assumed to continue beyond 2024, the GI Resolution Plan was flagged as requiring reassessment beyond 2024.

4.1.1 Scope

The PSR2 Global Issues that require reassessment beyond 2024 are listed in Table 17 of the PSR2 GAR [5] and reproduced in Table 3 below.

Table 3: Global Issues Potentially Impacted by PNGS Operation Beyond 2024

Global Issue #	Global Issue Title
GI-1	Fitness for Service for Fuel Channels
GI-2	Fitness for Service for Feeders
GI-3	Fitness for Service for Steam Generators
GI-4	Fitness for Service for Reactor Components and Structures
GI-5	Completeness of Class 1 Piping/Components Service Limits Assessment (Excluding Major Components)
GI-7	Pickering Buried Piping Fitness for the Extended Operating Period

Global Issue #	Global Issue Title
GI-8	Completion / Updating of the Condition Assessments
GI-10	IFB Condition
GI-12	Extending the Environmental Qualification of Equipment[1]
GI-17	FFS of Fiberglass Reinforced Plastic Material for the Extended Operating Period
GI-19	FFS of Containment for the Extended Operating Period
GI-21	FFS of the Deaerator and the Deaerator Storage Tank for the Extended Operating Period
GI-22	COP Actions Related to Aging Management from Safety Factor 4
GI-24	Safety Analysis to Support the Extended Operating Period
GI-29	FFS of the Fuelling Machines and FM Bridge Ball Screws for the Extended Operating Period
GI-31	Deterministic Safety Analysis
GI-32	Implementation of REGDOC-2.4.2 PSA Requirements
GI-33	N285.0-12, General Requirements for Pressure-Retaining Systems and Components in CANDU Nuclear Power Plants
GI-43	Safety-Related Structures (Non-Containment)
GI-49	FFS of PHT Auxiliary Piping Systems, and PHT Valves
GI-51	Fuelling with Pressure Tube Sag

PSR2 Resolution Actions associated with GIs that require further assessment for an extended operation to the end of 2026 are identified as PSR2-B gaps.

[1] Note, the title of GI-12 was "Extending the Environmental Qualification of Equipment" in PSR2. For PSR2-B, the Environmental Qualification Assessments (EQAs) will be reviewed to address the extended operating period, however, the original EQ service life of equipment will not be extended. As a result, the PSR2-B gap is mapped to a new Global Issue.

4.1.2 Results

The PSR2-B gap assessment performed on the existing Global Issues from PSR2 assigned 22 gaps to the completed PSR2 IIP Actions requiring re-assessment for Pickering 5-8 extended operation to the end of 2026, associated with seven PSR2 Global Issues and one new PSR2-B Global Issue. Table 4 lists the 22 PSR2-B Gaps identified in the GI Gap Assessment Report [8], together with the source of each Gap and the associated Global Issue number.

Table 4: PSR2-B Gaps Identified from Reassessment of PSR2 Global Issues

Source of Gap		GI #
PSR2 IIP Action ID	**PSR2 IIP Action Description**	
G01-RS2-06-02.1	Update Pickering NGS Fuel Channel Periodic Inspection Plan (PIP) for Operation to the end of 2024	GI-1
G01-RS3-06-03.1	Submit 2018 Fuel Channel Life Cycle Management Plan (LCMP) Update that includes Pickering NGS U1 and U4 Operation to the end of 2024	GI-1
G01-RS4-06-04.2	Update and Submit 2018 Fuel Channel Life Cycle Management Plan (LCMP) and the Pickering NGS Fuel Channel Readiness Plan in Support of Operation to the end of 2024 (FCRP2024)	GI-1
G01-RS4-06-04.3	Update and Submit 2019 Fuel Channel Life Cycle Management Plan (LCMP) and the Pickering NGS Fuel Channel Readiness Plan in Support of Operation to the end of 2024 (FCRP2024)	GI-1
G01-RS4-06-04.4	Update and Submit 2020 Fuel Channel Life Cycle Management Plan (LCMP) and the Pickering NGS Fuel Channel Readiness Plan in Support of Operation to the end of 2024 (FCRP2024)	GI-1
G02-RS1-06-05.1	Submit 2018 Feeders Life Cycle Management Plan (LCMP) Update that includes Pickering NGS U1 and U4 operations to the end of 2024	GI-2
G03-RS1-06-06.1	Submit 2018 Steam Generators Life Cycle Management Plan (LCMP) update that includes Pickering NGS U1 and U4 operations to the end of 2024	GI-3
G04-RS1-06-07.1	Submit 2018 Reactor Components Life Cycle Management Plan (LCMP) update that includes Pickering NGS U1 and U4 Operation to the end of 2024	GI-4

Source of Gap		GI #
PSR2 IIP Action ID	**PSR2 IIP Action Description**	
G04-RS2-06-08.1	Perform CT-LISS nozzle gap measurements as required on Pickering NGS Unit 6	GI-4
G04-RS2-06-08.2	Perform CT-LISS nozzle gap measurements as required on Pickering NGS Unit 5	GI-4
G08-RS1-06-13.3	Complete Condition Assessments for the piping systems in PSR2 scope to support Pickering NGS commercial operation to the end of 2024	GI-8
G08-RS1-06-13.4	Complete Condition Assessments for commodity groups in PSR2 scope to support Pickering NGS commercial operation to the end of 2024	GI-8
G08-RS1-06-13.5	Complete Condition Assessments for the Irradiated Fuel Bays (IFB) to support Pickering NGS commercial operation to the end of 2024	GI-8
G08-RS1-06-13.6	Complete Condition Assessments for the Deaerators and the Deaerator Storage Tanks to support Pickering NGS commercial operation to the end of 2024	GI-8
G08-RS1-06-13.7	Complete Condition Assessments for the Fueling Machines and FM Ball Screws to support Pickering NGS commercial operation to the end of 2024	GI-8
G08-RS1-06-13.8	Complete Condition Assessments for the Primary Heat Transport auxiliary piping system, Primary Heat Transport pump discharge valves, and boiler inlet and outlet valves to support Pickering NGS commercial operation to the end of 2024	GI-8
G12-RS1-05-17.1	Complete Environmental Qualification Assessments (EQA) to support Pickering NGS extended operations	GI-53
G24-RS1-04-19.5	Update Heat Transport Aging safety analysis models (Pickering 5-8)	GI-24
G24-RS1-04-19.6	Complete Loss of Flow (LOF) Safety Analysis accounting for Heat Transport Aging Methodology (Pickering 5-8)	GI-24
G24-RS1-04-19.7	Complete Small Break Loss of Coolant Accident (SBLOCA) safety analysis accounting for Heat Transport Aging Methodology (Pickering 5-8)	GI-24

Source of Gap		GI #
PSR2 IIP Action ID	**PSR2 IIP Action Description**	
G24-RS1-04-19.8	Complete Neutron Overpower safety analysis accounting for Heat Transport Aging (Pickering 5-8)	GI-24
G43-RS3-06-31.1	Prepare Condition Assessments as appropriate for non-Containment safety-significant civil structures for Pickering NGS extended operation	GI-43

4.2 Regulatory Actions Review

A review of open regulatory commitments, regulatory action items, and regulatory obligations is performed to determine if there are any impacts associated with PNGS extended operation to the end of 2026.

4.2.1 Scope

As outlined in Reference [11], this involved a review of the following for impacts on PSR2-B:

- Commitments previously made to the CNSC in the PNGS LCH R004 [12]; and
- Open Regulatory Management Actions (REGMs), Regulatory Obligations (REGOs) and Regulatory Commitments (REGCs), Management Actions (MGMT) as of September 2022; and
- Open CNSC Action Items and Pickering Designated Licencing Authority Action Tracking Requests as of September 2022.

4.2.2 Results

The results of the Regulatory Action Review are documented in Reference [11], and the assessment of the gaps considered applicable to PSR2-B is documented in Section 5 of the GI Gap Assessment Report [8].

The review identified one open regulatory action as a gap applicable to Pickering NGS extended operation up to the end of 2026.

AR# 28243283: As per the Action Notice PRPD-2017-022-AN2 initiated in the CNSC report titled "Desktop Review Report: Maintenance and Reliability: PRPD-2017-022" in P-CORR-00531-05281 [13], OPG is to provide updates of the corrective actions and evaluation of their effectiveness in reducing the number of repeated component failures and deficiencies, and component unavailability.

Action Request AR# 28243283 documents a REGM action that OPG undertook to provide the CNSC with an update on Action Notice AN2 of CNSC Action Item 2017-48-12365 by May 20, 2022, as outlined in Attachment 2 of P-CORR-00531-22603 [14]. OPG provided an update on AN2 in P-CORR-00531-22913 [15] and undertook REGM AR# 28252308 to provide a further update by May 19, 2023. The only outstanding action pertains to the implementation of loop failure detection for the Emergency Water System (EWS) level indicator (67318-LIA566) for Units 5, 6 and 8.

This gap is associated with the existing Global Issue, GI-20, Governance Implementation/Effectiveness Issues.

4.3 Assessment of D-PSR Gaps

An assessment of the gaps from the reviews conducted as part of the D-PSR is performed to identify potential new gaps applicable to Pickering NGS. The results of this assessment are documented in Section 5 of the GI Gap Assessment Report [8] and summarized below.

4.3.1 Scope

The D-PSR GAR [16] summarizes the findings from the LRCS assessments, Safety Factor Review Task assessments, and effectiveness reviews of OPG programs that were performed under the scope of D-PSR. The scope of D-PSR is detailed in the Darlington NGS PSR Basis Document [17]. The gaps[2] from D-PSR are assessed for applicability to PNGS under the PSR2-B project.

4.3.2 Results

The assessment of the D-PSR Gaps identified 18 gaps applicable to PNGS, associated with seven existing PSR2 Global Issues and one new Global Issue (GI-52). Table 5 lists the D-PSR Gaps assessed as applicable to PNGS together with the source of each Gap and the associated Global Issue number.

[2] The Enhancement Opportunities (EOs) from D-PSR are treated as potential gaps in the context of the PSR2-B Global Assessment process as EOs are not defined in the PSR2 assessment basis.

Table 5: D-PSR Gaps Applicable to Pickering NGS

D-PSR Gap ID	Source of Gap	GI #
SF4-3	Canadian Standards Association (CSA) N285.4-19	GI-1
SF4-6	CSA N285.8-15 Update No. 1 (R2020)	GI-1
SF4-7	CSA N285.8-15 Update No. 1 (R2020)	GI-1
SF4-EO1	REGDOC-2.6.3 (2014)	GI-15
SF11-1	PNERP (2017)	GI-15
SF14-EO1	CSA N288.4-19	GI-15
SF2-7	CSA N285.5-18	GI-16
SF4-11	Review of D-ISR IIP Actions, National Building Code of Canada (NBCC) (2005)	GI-19
SF5-EO1	CSA N288.2-19	GI-31
SF11-EO1	REGDOC-2.3.2 Version 2 (2015)	GI-40
SF2-3	CSA N285.4-19	GI-50
SF2-4	CSA N285.4-19	GI-50
SF2-5	CSA N285.4-19	GI-50
SF2-6	CSA N285.4-19	GI-50
SF4-2	CSA N285.4-19	GI-50
SF4-4	CSA N285.4-19	GI-50
SF1-10	NBCC (2015)	GI-52
SF1-11	National Fire Code of Canada (NFCC) (2015)	GI-52

The D-PSR Gaps assessed as not applicable to PSR2-B are listed in Appendix C of the GI Gap Assessment Report [8].

5.0 PSR2-B GLOBAL ISSUES

The Gaps listed in Section 4.0 are grouped into Global Issues in Appendix B, according to their topical similarities, i.e., based on the related discipline, governing process or relevant modern codes and standards, with consideration of any interfaces, overlaps and similarities among the Gaps.

A total of 16 Global Issues are identified for the Pickering NGS PSR2-B. The 41 Gaps identified in Section 4.0 are mapped into 14 existing PSR2 Global Issues and two new Global Issues (GI-52 and GI-53). Twenty-two (22) gaps were identified from the reassessment of PSR2 Global Issues impacted by PNGS Operation beyond 2024 (Section 4.1.2), one gap was identified from the review of open regulatory actions (Section 4.2.2) and 18 gaps were identified from the assessment of D-PSR Gaps for applicability to PNGS (Section 4.3.2).

The Global Issue Titles are listed in Table 6. Full descriptions and assessment of each Global Issue are provided in Global Issue Tables in Appendix B, under the following section headings within each table:

Section 1 – Global Issue Summary

Section 2 – Associated PSR2-B Gaps

Section 3 – Background Information and Resolution Strategy

Section 4 – Priority Determination

Section 5 – Resolution Plan

Section 6 – Global Issue References

The Safety Significance Level shown for each Global Issue in Table 6 is provided in Section 6.0.

Table 6: PSR2-B Global Issues

Global Issue #	Global Issue Title	Safety Significance Level
GI-1	Fitness for Service for Fuel Channels	1
GI-2	Fitness for Service for Feeders	1
GI-3	Fitness for Service for Steam Generators	1
GI-4	Fitness for Service for Reactor Components and Structures	2
GI-8	Completion / Updating of the Condition Assessments	3

Global Issue #	Global Issue Title	Safety Significance Level
GI-15	Governance Issues	4
GI-16	Concession Related to N285.5-M90	4
GI-19	Fitness for Service of Containment for the Extended Operating Period	4
GI-20	Governance Implementation / Effectiveness Issues	4
GI-24	Safety Analysis to Support the Extended Operating Period	2
GI-31	Deterministic Safety Analysis	4
GI-40	Accident Management	4
GI-43	Safety-Related Structures (Non-Containment) for Nuclear Power Plants	3
GI-50	N285.4 PIP / Documentation Revision	4
GI-52	Fire Protection – NBCC and NFCC	3
GI-53	Reassessment of Qualified Life as Documented in the Environmental Qualification Assessments	3

The PSR2-B Gaps are associated with the existing PSR2 GIs, with the exception of two D-PSR Gaps, which are grouped into a new Global Issue (GI-52) and one PSR2 IIP Action, which is mapped into a new Global Issue (GI-53). These Global Issues are then prioritized with respect to their overall impact on nuclear safety, and Resolution Plans are developed for all Global Issues.

6.0 PRIORITIZATION OF GLOBAL ISSUES

Global Issues are prioritized with respect to their overall impact on enhancing nuclear safety, using the process outlined in Section 3.2.

The results of the prioritization of the Global Issues are shown in Table 6 and summarized below.

Three of the 16 Global Issues are assessed as having a high impact on nuclear safety and is accordingly assigned Safety Significance Level 1. Global Issues GI-1, GI-2, and GI-3 are related to fitness for service for Pickering 5-8 fuel channels, feeders and the steam generators for the extended operating period. The proposed Resolution Statements requiring demonstration of fitness for service for the fuel channels (including the Zr-Nb-Cu and Inconel X-750 Spacers), feeders and steam generators, are considered the most important items in terms of supporting continued safe operation for the extended operation period.

Two Global Issues are assessed as having a medium impact on nuclear safety, and as such are assigned Safety Significance Level 2. These Global Issues are related to fitness for service of reactor components and structures (GI-4), and safety analysis (GI-24) to support the safe operation of Pickering 5-8 for the extended operation period. The proposed Resolution Statement for GI-4 requires demonstration of fitness for service of reactor components and structures. In particular, this includes required activities to update the Calandria Tube-Liquid Injection Shutdown System (CT-LISS) nozzle gap assessments to address the extended operating period. The Gaps associated with GI-24 are related to four closed PSR2 IIP Actions that require updating the Heat Transport System (HTS) thermal hydraulic model and safety analysis of events impacted by aging of the HTS to support extended operation beyond 2024.

Four Global Issues are assessed as having a low impact on nuclear safety and are accordingly prioritized as Safety Significance Level 3. These Global Issues are related to evaluation of the existing design and condition of SSCs important to plant safety for the extended operation or specific requirement elements of modern codes and standards. The justification for considering this as low nuclear safety impact is provided in Section 4 of each Global Issue Table in Appendix B.

Seven Global Issues are assessed as having a very low impact on nuclear safety and are accordingly prioritized as Safety Significance Level 4. Six of these Global Issues are related to OPG governance or specific requirement elements of modern codes and standards or are administrative in nature. The remaining Global Issue is related to fitness for service of steel piles for Containment structures, which has been demonstrated for the entire Pickering site for the extended operation period and is therefore closed. The justification for considering these Global Issues as very low nuclear safety impact is detailed in Section 4 of each Global Issue Table in Appendix B.

7.0 DEVELOPMENT OF PROPOSED RESOLUTION PLANS

Proposed Resolution Plans have been developed for all Global Issues following the methodology described in Section 3.3 and are presented in Section 5 of each Global Issue Table in Appendix B. Each Global Issue table includes the following elements relevant to the proposed Resolution Plan:

(i) Background Information and Resolution Strategy are presented in Section 3 of each Global Issue table, with an evaluation of the Global Issue describing the nature of the associated gaps and a summary of the status of any work already underway or completed to address the Global Issue.

(ii) A proposed Global Issue Resolution Plan presented in Section 5 of each Global Issue table and comprised of one or more of the following elements:

- Proposed Resolution Statements (RS): A proposed activity is defined to address the Gap(s).
- No Further Action (NFA): Work is completed or will be done outside of PSR2 to address the related Gap(s), or information has been found to obviate the Gap(s).
- Acceptable Deviation (AD): The deviation in the Gap(s) has been assessed to have a Very Low Safety Significance Level or a Low Safety Significance Level, and a practicable resolution is not readily evident.
- Cross Reference (XRF): An action that addresses the Gap(s) is covered by a proposed Resolution Statement under a different Global Issue.

A proposed Resolution Plan element may address more than one Gap or portions of more than one Gap. A Gap may be addressed by more than one proposed Resolution Plan element.

In developing proposed Resolution Plans for the Global Issues, each Gap identified in Section 4.0 is addressed. In total, 13 proposed Resolution Statements are identified. Eight are related to re-assessment of PSR2 Global Issues, one is related to regulatory action review, and four are related to D-PSR Gaps.

8.0 RANKING OF PROPOSED RESOLUTION STATEMENTS

Proposed Global Issue Resolution Statements presented in Section 5 of the Global Issue Tables in Appendix B are ranked using the methodology and Value Tree summarized in Section 3.4 and detailed in Appendix C of PSR2 GAR [5].

Acceptable Deviations and No Further Action statements do not go through the ranking process; only proposed Resolution Statements are ranked.

The results of ranking the proposed PSR2-B Global Issue Resolution Statements, normalized to 100, are summarized in Table 7 and detailed in B.16.

Table 7: Overall PSR2-B Resolution Statements Ranking Results

Resolution Statement #	Proposed Resolution Statements	Normalized Ranking Value
GI-1-RS6	Demonstrate the continued FFS of fuel channels for Pickering 5-8 for the extended operating period up to the end of 2026. FFS of fuel channels includes demonstration of sufficient margin on the FFS limits of the pressure tubes, calandria tubes and garter springs (annulus spacers) during the continued operational life of the plant.	100
GI-1-RS7	Demonstrate Fitness-for-Service for Zr-Nb-Cu and Inconel X-750 Pickering Units 5 to 8 Spacers for the extended operation to the end of 2026.	100
GI-2-RS2	Demonstrate the continued FFS of feeders for Pickering 5-8 for the extended operating period up to the end of 2026. FFS of feeders includes demonstration that predicted feeder condition, with identified and planned mitigations, is acceptable for the intended operation.	100
GI-3-RS2	Demonstrate the continued FFS of steam generators for Pickering 5-8 for the extended operating period up to the end of 2026. FFS of steam generators includes demonstration that predicted steam generator condition, with identified and planned mitigations, is acceptable for the intended operation.	100

Resolution Statement #	Proposed Resolution Statements	Normalized Ranking Value
GI-4-RS3	Demonstrate the continued FFS of reactor components and structures for Pickering 5-8 for the extended operating period up to the end of 2026. This includes demonstration that predicted reactor components and structures condition, with identified and planned mitigations, is acceptable for the intended operation. This also includes the required inspection activities to update the CT-LISS nozzle gap assessments and identification of mitigation strategies if CT-LISS contact is predicted within the extended operating period.	100
GI-24-RS2	Update the Heat Transport System (HTS) aging safety analysis models and perform the required safety analysis of events most impacted by aging (Small Break Loss of Coolant Accident (SBLOCA), Loss of Flow (LOF) and Neutron Overpower (NOP)) to support extended operation for Pickering 5-8.	72
GI-1-RS5	Update the Fuel Channels Pressure Tubes PIP Plan for Pickering 5-8 (NK30-PIP-31100-00005) to reflect an extended operating period up to the end of 2026.	70
GI-43-RS4	Complete PSR2-B review of the aging management strategy for non-Containment safety-related civil structures. The purpose of the review is to confirm that the associated Aging Management Plan (N-PLAN-01060-10004) and the Periodic Inspection Program remain valid for the extended operation and to determine if any follow-up actions are necessary for extended operation of Pickering 5-8 up to the end of 2026.	46
GI-53-RS1	Re-assess Pickering NGS EQAs to support extended operation of Pickering 5-8 to the end of 2026.	46

Resolution Statement #	Proposed Resolution Statements	Normalized Ranking Value
GI-20-RS1	Complete Regulatory Management action (AR# 28252308) for providing a status update on Action Notice AN2 of CNSC Action Item 2017-48-12365 and continue to provide future status updates until field implementation of Engineering Change (EC) 132846 for 67138-LT566/LIA566 loop failure detection for Emergency Water System (EWS) Reactor Building (RB) Water Level Measurement is complete.	46
GI-52-RS1	Apply NBCC 2015 Part 3 for future construction or modification related to fire protection, occupant safety and accessibility.	27
GI-52-RS2	Update current applicable governance documents to include the new requirements, codes or standards identified in NFCC 2015 and develop strategy for appropriate and practicable design and programmatic changes.	18
GI-1-RS8	Develop and submit an implementation plan for developing inputs to satisfy the methodology in the Non-Mandatory Annex G of CSA N285.8-18, Update #1 to perform uncertainty analyses in probabilistic evaluations where the threshold requirement is met per CSA N285.8.	3

The top five ranked proposed Resolution Statement in Table 7 contribute to meeting the fundamental objective of enhanced confidence in the fitness for service of SSCs (refer to Section 3.4 for the Value Tree fundamental objectives). These proposed Resolution Statements are determined to have the highest normalized ranking value of 100 and are associated with Global Issues related to fitness for service of Major Components, GI-1, GI-2, GI-3, and GI-4. Fitness for service of SSCs is a key issue for OPG and is being managed under the comprehensive programs that OPG has in place, including N-PROG-MA-0026, "Equipment Reliability" [18], N-PROG-MP-0008, "Integrated Aging Management" [19], and N-PROG-MA-0025, "Major Components" [20]. These programs ensure the condition of SSCs important to plant safety is well understood, the level of fitness for service is assessed, and effective actions are taken to maintain good plant condition.

The next highest ranked proposed Resolution Statement in Table 7 contributes to meeting the fundamental objective of enhanced confidence in the safety analyses. This is determined to have a normalized ranking value of 72 and is associated with GI-24, which is related to safety analysis to support the extended commercial operating period. OPG has processes in place to ensure that aging effects associated with the extended operation are accounted for in safety analysis, and the proposed Resolution Statement associated with GI-24 reflects the planned safety analysis to support Pickering NGS extended operation.

A proposed Resolution Statement with a normalized ranking value of 70 is also associated with fitness for service of fuel channels, but is ranked lower as it pertains to the update of the Fuel Channels PIP to reflect the extended operations period. The Fuel Channels PIP Plan demonstrates compliance with applicable CSA N285.4 requirements for periodic inspection of fuel channels whereas the Fuel Channels LCMP integrates the inspection and maintenance requirements, periodic inspection requirements, and regulatory requirements, and outlines the strategies required to manage the effects of aging and assure fitness for service to their station specific target operating life. Therefore, the proposed Resolution Statement for the PIP update is ranked relatively lower.

Three Resolution Statements with a normalized ranking value of 46 are associated with GI-43, which is related to the review of aging management strategy for non-Containment safety-related structures to address the extended operating period, GI-53, which is related to review of Pickering Units 5-8 EQAs to support component service life, and GI-20, which is related to completion of a modification associated with a parameter monitoring of a system important to safety (SIS) for Design Basis Accidents (DBAs).

The proposed Resolution Statements with normalized ranking values 27 and 18 are associated with the current practices that may need to be updated to reflect new requirements from modern codes and standards. The lowest ranking Resolution Statement with a normalized ranking value of 3 is associated with GI-1, related to development and implementation of uncertainty analysis methodology for new requirements in N285.8-15 Update No. 1 (R2020). The ranking is low because the issue is expected to have negligible impact during the PSR period.

The proposed Resolution Statements are inputs to the IIP phase of PSR2-B, and the IIP considers the ranking order shown in Table 7.

9.0 ACCEPTABLE DEVIATIONS IN PSR2

The process for identifying Acceptable Deviations during the development of proposed Resolutions Plans is described in Section 5.4 of the PSR2 GAR [5]. As described in Section 5.6 of the PSR2 GAR, the proposed Resolution Plans were developed by the Global Assessment team with feedback from OPG Subject Matter Experts. In addition, the Global Issues and the proposed Resolution Plans underwent several reviews during the Global Assessment process, which included a third-party Expert Panel review and a review and approval by the OPG's Senior Management Scope Review Board.

In conducting the PSR2 Global Assessment, as Global Issue Resolution Plans were developed, consideration was given as to whether the resolution activities would be different for a scenario with operation to 2024 (the nominal planning basis for the units), or for operation beyond 2024 (i.e., 2028). Therefore, the Acceptable Deviations in these Global Issue Resolution Plans not requiring reassessment for beyond 2024 are not time sensitive.

As part of the PSR2-B assessment, the Acceptable Deviations in PSR2 Global Issues identified as requiring "Reassessment Beyond 2024" listed in Table 3 were reassessed in the GI Gap Assessment Report [8] to confirm that they are not time sensitive. Five PSR2 Acceptable Deviations that required reassessment beyond 2024, i.e., GI-31-AD1, GI-31-AD2, GI-33-AD1, GI-44-AD8 and GI-43-AD1, have been reviewed and assessed not to be time sensitive to extended operation from 2024 to the end of 2026.

Hence, it is concluded that the Acceptable Deviations associated with PSR2 Global Issues are not time sensitive.

10.0 AGGREGATION OF PSR2-B ACCEPTABLE DEVIATIONS

The aggregate impacts of PSR2 Acceptable Deviations were assessed as part of the Defence-in-Depth Assessment (described in Section 17 of the PSR2 GAR [5]). This assessment was performed to determine if the gaps categorized as Acceptable Deviations that were not individually safety significant could become more significant when grouped together. The result of the aggregate impacts of the Acceptable Deviations from PSR1 and PSR2 is presented in Appendix H of the PSR2 GAR [5]. The assessment in the PSR2 GAR concludes that the overall aggregate impact of the Acceptable Deviations is low on all levels of defence-in-depth and has no significant impact on nuclear safety.

The process of identifying Acceptable Deviations and assessing aggregate impacts of Acceptable Deviations PSR2-B is similar to that used in previous OPG ISRs and in PSR2. The aggregate impacts of newly identified Acceptable Deviations in Global Issue Resolution Plans for PSR2-B are assessed for input to the Defence-in-Depth Assessment, as summarized below.

Six additional Acceptable Deviations are identified during the PSR2-B Global Assessment (Appendix B). These are summarized below:

GI-1-AD1: This Acceptable Deviation is related to a gap associated with the new requirement in Clause 7.3.1.2 of N285.8-15 Update No. 1 (R2020) which requires that when probabilistic evaluation of the reactor core is performed, the contributions to the total failure frequency shall account for all of the known and postulated pressure tube degradation mechanisms applicable to the reactor core. While OPG is compliant with this requirement, it is not reflected in the relevant governance. This is a documentation issue only, and therefore, there is no aggregate impact of this Acceptable Deviation on defence-in-depth.

GI-16-AD1 and GI-50-AD1: These Acceptable Deviations, also identified and assessed for their aggregate impact in PSR2, are related to concessions for the Periodic Inspection Plans where components are deemed inaccessible for inspection. The assessments of these concessions in Appendix B have confirmed the alternate means in place for assessing the condition of the SSCs to be adequate and meet the intent of the requirements. Therefore, the aggregate impact on defence-in-depth of these Acceptable Deviations is assessed to be very low.

GI-15-AD3, GI-31-AD3 and GI-50-AD2: These Acceptable Deviations, two of which (GI-31-AD3 and GI-50-AD2) are similar to those identified in PSR2, are related to new and revised requirements from modern codes and standards. The assessments in Appendix B have confirmed practices at OPG meet the intent of the requirements, however the requirements are not explicitly reflected in the OPG governance. These are documentation issues, and therefore, there is no aggregate impact of these Acceptable Deviations on defence-in-depth.

The assessment of PSR2-B Acceptable Deviations confirms there is no impact on the conclusion of the PSR2 Global Assessment, either individually or in aggregate.

11.0 ASSESSMENT OF DEFENCE-IN-DEPTH

Defence-in-Depth is a comprehensive approach to safety to ensure with high confidence that the public and the environment are protected from any hazards posed operation of a nuclear power plant. The general objective of Defence-in-Depth is to ensure that a single equipment or human failure at one level of the five levels of defence, and even a combination of failures at one level of defence would not jeopardize the integrity of subsequent levels.

The PSR2 assessment of defence-in-depth and its conclusions in PSR2 GAR [5] serve as the basis for the PSR2-B review. The approach taken in the assessment in PSR2 is based on the Defence-in-Depth requirements identified in CNSC REGDOC-2.3.3 [2], with specific assessment guidance provided by the IAEA Safety Report Series No. 46, "Assessment of Defence in Depth for Nuclear Power Plants" [21]. The approach analyzes the five independent levels of defence. All levels of defence-in-depth rely on multiple barriers of protection to prevent or limit equipment failures or human errors

and mitigate the consequences should these failures or errors occur. The intent of the review was to confirm that for each of the five levels of defence, barriers are not unnecessarily challenged, and if they are, they do not all fail.

A detailed review of provisions for each level of defence and the defence-in-depth assessment is presented in Section 18 of the PSR2 GAR [5]. The PSR2 GAR used the critical elements of IAEA SRS-46 [21], the safety principles, in conjunction with other information generated in PSR2, to execute a Defence-in-Depth Assessment. Section 18.2 of the PSR2 GAR [5] describes the OPG management system and how it supports defence-in-depth, the plant design features (including significant safety improvements that have been made since the start of operation of Pickering NGS Units 1,4 and 5-8) and the processes that support sustaining and enhancing defence-in-depth. This established the baseline plant, processes and management system for the Pickering NGS Defence-in-Depth Assessment. The assessment for each level of defence-in-depth in PSR2 GAR was based on integration of the following:

- The conclusions from the assessment of the related safety principles (Appendix D of the PSR2 GAR).
- Consideration of Strengths identified in PSR2 and how they support the baseline plant meeting the requirements of defence-in-depth (Appendix E of the PSR2 GAR).
- The positive impact of proposed enhancements to defence-in-depth resulting from the proposed Resolution Statements (Appendix F of the PSR2 GAR).
- Assessment of the aggregate impact of the Acceptable Deviations on the defence-in-depth capability of the plant (Appendix G and Appendix H of the PSR2 GAR).

The adequacy of the provisions for defence-in-depth was confirmed in PSR2 GAR [5] by demonstrating that the Pickering NGS design and operation are aligned with the specific safety principles covered in IAEA SRS-46 [21], and taking into account the Strengths and the PSR2 proposed Resolution Plans identified in the PSR2 GAR [5], including the impact of Acceptable Deviations. Finally, an overall summary provided in the PSR2 GAR confirmed that Pickering NGS fulfills the safety requirements of defence-in-depth.

Overall, the defence-in-depth assessment in the PSR2 GAR [5] confirmed that Pickering NGS design and operation have adequate and effective barriers in all applicable levels of defence-in-depth and that significant improvements have been implemented since the plant was put into service. The comprehensiveness of the PSR2 assessment was assured by assessing each of the safety principles, supported by multiple and overlapping provisions for each level of defence-in-depth.

For PSR2-B, the defence-in-depth assessment includes consideration and confirmation that the conclusions of the assessment in PSR2 are not impacted by the Global Issues identified in PSR2-B. The PSR2-B assessment considers the following elements:

- The key physical improvements, analytical evaluations and programmatic enhancements that have been completed since PSR2, and how these improvements and enhancements supports the baseline plant meeting the requirements of defence-in-depth.
- The positive impact on defence-in-depth of the enhancements associated with the proposed Resolution Plans for PSR2-B (Table 8).
- Confirmation that the PSR2-B Acceptable Deviations do not have a significant adverse effect on defence-in-depth, either individually or when aggregated.

All IIP Actions to address the Resolution Actions identified in PSR2 GAR have been completed [6].

Table 8: Proposed Global Issue Resolution Statements

Resolution Statement #	Resolution Statements	Defence-in-Depth Level
GI-1-RS5	Update the Fuel Channels Pressure Tubes PIP Plan for Pickering 5-8 (NK30-PIP-31100-00005) to reflect an extended operating period up to the end of 2026.	1, 2, 3
GI-1-RS6	Demonstrate the continued FFS of fuel channels for Pickering 5-8 for the extended operating period up to the end of 2026. FFS of fuel channels includes demonstration of sufficient margin on the FFS limits of the pressure tubes, calandria tubes and garter springs (annulus spacers) during the continued operational life of the plant.	1, 2, 3
GI-1-RS7	Demonstrate Fitness-for-Service for Zr-Nb-Cu and Inconel X-750 Pickering Units 5 to 8 Spacers for the extended operation to the end of 2026.	1, 2, 3
GI-1-RS8	Develop and submit an implementation plan for developing inputs to satisfy the methodology in the Non-Mandatory Annex G of CSA N285.8-18, Update #1 to perform uncertainty analyses in probabilistic evaluations where the threshold requirement is met per CSA N285.8.	1, 2, 3

Resolution Statement #	Resolution Statements	Defence-in-Depth Level
GI-2-RS2	Demonstrate the continued FFS of feeders for Pickering 5-8 for the extended operating period up to the end of 2026. FFS of feeders includes demonstration that predicted feeder condition, with identified and planned mitigations, is acceptable for the intended operation.	1, 2, 3
GI-3-RS2	Demonstrate the continued FFS of steam generators for Pickering 5-8 for the extended operating period up to the end of 2026. FFS of steam generators includes demonstration that predicted steam generator condition, with identified and planned mitigations, is acceptable for the intended operation.	1, 2, 3
GI-4-RS3	Demonstrate the continued FFS of reactor components and structures for Pickering 5-8 for the extended operating period up to the end of 2026. This includes demonstration that predicted reactor components and structures condition, with identified and planned mitigations, is acceptable for the intended operation. This also includes the required inspection activities to update the CT-LISS nozzle gap assessments and identification of mitigation strategies if CT-LISS contact is predicted within the extended operating period.	1, 2, 3
GI-20-RS1	Complete Regulatory Management action (AR# 28252308) for providing a status update on Action Notice AN2 of CNSC Action Item 2017-48-12365 and continue to provide future status updates until field implementation of Engineering Change (EC) 132846 for 67138 LT566/LIA566 loop failure detection for EWS RB Water Level Measurement is complete.	3
GI-24-RS2	Update the Heat Transport System (HTS) aging safety analysis models and perform the required safety analysis of events most impacted by aging (Small Break Loss of Coolant Accident (SBLOCA), Loss of Flow (LOF) and Neutron Overpower (NOP)) to support extended operation for Pickering 5-8.	2, 3

Resolution Statement #	Resolution Statements	Defence-in-Depth Level
GI-43-RS4	Complete PSR2-B review of the aging management strategy for non-Containment safety-related civil structures. The purpose of the review is to confirm that the associated Aging Management Plan (N-PLAN-01060-10004) and the Periodic Inspection Program remain valid for the extended operation and to determine if any follow-up actions are necessary for extended operation of Pickering 5-8 up to the end of 2026.	1, 2, 3
GI-52-RS1	Apply NBCC 2015 Part 3 for future construction or modification related to fire protection, occupant safety and accessibility.	2, 3
GI-52-RS2	Update current applicable governance documents to include the new requirements, codes or standards identified in NFCC 2015 and develop strategy for appropriate and practicable design and programmatic changes.	2, 3
GI-53-RS1	Re-assess Pickering NGS EQAs to support extended operation of Pickering 5-8 to the end of 2026.	3

11.1 Level 1 – Prevention of Abnormal Operation and Failures

The aim of the first level of defence is to prevent deviations from normal operation and failures. The first level of defence requires high quality in the design and construction of the plant with barriers to prevent the occurrence of abnormal operating conditions. This is particularly important for the physical barriers surrounding the radioactive material in the Fuel.

Safe, conservative operation of the plant by qualified staff and a continued focus on preventive maintenance provides assurance of reliable functionality of plant equipment under normal operation and therefore prevents process upsets and failures.

11.1.1 Level 1 – Assessment

The PSR2 assessment has demonstrated that the plant is designed conservatively using the appropriate design codes and materials, design procedures, equipment qualification, control of component fabrication, plant construction and commissioning. Pickering NGS design and operation aligns with the safety principles related to defence-in-depth Level 1. In addition to the inherent and engineered design features (e.g., Heat Removal Systems, Electrical Power System), the key programmatic Strengths, considered most relevant to Level 1 which support plant design and

physical plant condition, thus allowing for the most effective prevention of failures, are:

- Management, OPEX and Training
- Major Components Program
- Effective Equipment Reliability Program
- Human Factors Engineering Program

These PSR2 Strengths were common to Level 1 and Level 2, and some of the other levels.

The most significant initiatives undertaken and completed since PSR2 that enhance defence-in-depth Level 1 are:

- Demonstration of Fitness-for-Service (FFS) of Major Components (Fuel Channels, Feeders, Steam Generators, and Reactor Components and Structures)
- Completion of Class 1 Piping/Components Service Limits Assessment
- Demonstration of FFS of Containment
- Completion / Updating of Condition Assessments for the piping systems, commodity groups and Safety-Related Civil Structures

The Aging Management reviews performed in support of PSR2 confirmed that the condition of SSCs is well understood, and that plant safety and reliability are maintained through a set of systematic and planned surveillance, testing, inspection, and maintenance activities using best industry practices and Operating Experience (OPEX). Reviews of the existing Condition Assessments for the PSR2 commodity groups (excluding non-Containment civil structures) have reaffirmed these conclusions for the extended operating period to the end of 2026, and required follow-up actions will be managed under the existing Aging Management Program.

Fitness for service of Major Components is demonstrated and re-assessed on an on-going basis through planned inspections and maintenance, and assessment of inspection results in accordance with applicable CSA Standards using well established programmatic controls including N-PROG-MA-0026, "Equipment Reliability" [18], N-PROG-MP-0008, "Integrated Aging Management" [19], and N-PROG-MA-0025, "Major Components" [20]. OPG will not operate a unit when fitness for service has not been demonstrated.

The proposed Resolution Statements to address the PSR2-B Global Issues (Table 8 and Appendix B) are relevant and significant for sustaining and enhancing defence-in-depth Level 1, particularly for the proposed extended operation period. The most significant proposed Resolution Statements relevant to defence-in-depth Level 1 are:

- Fitness for Service for Major Components for extended operation to the end of 2026 [GI-1 to GI-4]
- Review of the aging management strategy for non-Containment safety-related structures for extended operation to the end of 2026 [GI-43]

The objective of these initiatives is to enhance confidence in the fitness-for-service for the SSCs for the extended operation period.

Some PSR2-B gaps are associated with updates of documentation or analysis to address specific modern codes and standards, and in many cases, this work is already in progress. However, these gaps do not identify any weaknesses in Level 1 that require design changes.

As per the assessment in Section 10.0, the aggregate impact of Acceptable Deviations on defence-in-depth is assessed to be very low.

11.1.2 Level 1 - Conclusions

The Defence-in-Depth Assessment in the PSR2 GAR [5] confirmed that effective Level 1 barriers are ensured through the original conservative design supplemented by design improvements implemented since the initial operation, comprehensive programs in place, including strong operating and maintenance programs to ensure continued fitness for service and operation within the design basis, and ongoing continuous improvements based on national and international OPEX and evolving regulatory requirements.

Given the focus and priority placed on equipment reliability to address the findings in the areas of the equipment condition, this level of defence continues to be strong and effective for Pickering NGS.

11.2 Level 2 – Control of Abnormal Operation and Detection of Failures

Defence-in-depth Level 2 concerns the control of abnormal operation and the detection of failures. A strong Level 2 barrier entails control of power, protective systems and other surveillance features.

Level 2 defence-in-depth is achieved by detecting changes from normal operating conditions by the Reactor Regulating System and plant process control systems. The control systems in Pickering NGS maintain the reactor operating conditions within the normal operating range and effectively respond to anticipated transients to avoid the need for safety system action. Reactor control in Pickering NGS has a high degree of immunity to process upsets, measurement failures, etc., due to extensive redundancy

in control devices and process measurements. The ability to maintain control in the presence of partial system failures, combined with high reliability of the Dual Computer Control System, leads to a very high availability of the Reactor Regulating System, which controls reactor power. The Reactor Regulating System prevents or minimizes transients for all but the most serious postulated initiating events.

11.2.1 Level 2 – Assessment

The Defence-in-Depth Assessment in PSR2 confirmed that the provisions and barriers are provided to prevent or to control abnormal process conditions, with an objective to bring the plant back to normal operating conditions. Level 2 design features control abnormal plant operation, incorporating inherent characteristics, with account taken for protection against mechanisms capable of causing further deterioration. SSCs important to plant safety and reliability are continuously monitored, maintained and tested to assure that they operate within their Safe Operating Envelope (SOE) and comply with associated reliability and performance requirements.

In addition to the inherent and engineered design features, the key programmatic Strengths considered most relevant to Level 2 [5], which support plant physical condition thus preventing progression to DBAs, are:

- Management, OPEX and Training
- Major Components Program
- Effective Equipment Reliability Program

The activities completed since PSR2 that are relevant to defence-in-depth Level 2 are FFS and Condition Assessments of SSCs in PSR2 Scope and Safety Analysis in support of extended operation to 2024.

The proposed Resolution Statements to address the PSR2-B Global Issues (Table 8) are relevant and significant for sustaining and enhancing the safety requirements of defence-in-depth Level 2, particularly for the proposed extended operation period.

Several proposed Resolution Statements are common between Levels 1 and 2 of defence-in-depth. The PSR2-B Global Issues associated with the most significant proposed Resolution Statements relevant to Level 2 are:

- Fitness for Service for Major Components for extended operation to the end of 2026 [GI-1 to GI-4]
- Review of the aging management strategy for non-Containment safety-related structures for extended operation to the end of 2026 [GI-43]
- Safety Analysis for extended operation to the end of 2026 [GI-24]

The objective of these initiatives is to enhance confidence in the fitness-for-service for the SSCs and the ability of systems to control transients.

As per the assessment in Section 10.0, the aggregate impact of Acceptable Deviations on defence-in-depth is assessed to be very low.

11.2.2 Level 2 - Conclusions

The assessment of defence-in-depth Level 2 in PSR2 GAR [5] concludes that the provisions in place are mature and robust. This is further enhanced by the completed implementation the PSR2 Resolution Plans related to Level 2 [6].

11.3 Level 3 – Control of Accidents Within the Design Basis

The third level of defence consists of barriers to minimize the consequences of accidents should they occur by providing inherent safety features, fail-safe design, additional equipment and mitigating procedures.

A strong Level 3 barrier is evidenced by the design and the robustness of engineered safety features (e.g., Special Safety Systems, Standby Safety Support Systems) coupled with correspondingly emergency operating procedures. The safety principles review presented in Appendix D of PSR2 GAR [5] identifies several effective barriers and Strengths in Design, Safety Analysis, OPEX, and Management.

11.3.1 Level 3 – Assessment

The PSR2 assessments and the review of safety principles show an effective Level 3 barrier [5]. Adequate and effective provisions for the control of accidents within the design basis are provided at Pickering NGS. Operators have indications and alarms as well as the capability to perform actions from the Main and Secondary Control Areas for this purpose.

In addition to the Strengths identified for Level 1 and Level 2, the Strengths considered most relevant to Level 3 [5], which support the plant design in meeting requirements for DBAs and for preventing progression to Beyond Design Basis Accidents (BDBAs), are the:

- Safe Operating Envelope Program
- Deterministic Safety Analysis
- Probabilistic Safety Assessment
- Environmental Qualification Program

The effectiveness of the Level 3 barriers has been enhanced by the following key initiatives undertaken since PSR2:

- REGDOC-2.4.1, "Deterministic Safety Analysis" [22] Implementation Plan and completion of Safety Report Analysis of Common Mode Events [23][24]
- REGDOC-2.4.2, "Probabilistic Safety Assessment" [25] Implementation Strategy and Updated Probabilistic Safety Assessments (PSA)s [26] [27]

OPG is also updating Large Break Loss of Coolant Accident analysis to support re-categorization of three LBLOCA-related CANDU Safety Issues to a lower category. LBLOCA analysis for Pickering Units 1 and 4 has been completed [28] and similar work for Pickering 5-8 is committed for completion by April 2024 (AR# 28243393).

The PSR2-B Global Issues associated with the most significant proposed Resolution Statements relevant to Level 3 is:

- Safety Analysis to Support Extended Operation [GI-24]

As per the assessment in Section 10.0, the aggregate impact of Acceptable Deviations on defence-in-depth is assessed to be very low.

11.3.2 Level 3 - Conclusions

The Defence-in-Depth Assessment [5] confirms that the Pickering NGS has strong Level 3 barriers due to the high quality of the design that includes extensive mitigating provisions, comprehensive emergency operating procedures, and a robust set of safety analyses. The completed implementation of REGDOC-2.4.1 [22] and REGDOC-2.4.2 [25], and the planned safety analysis updates (GI-24) for the extended operation beyond 2024 further sustain and enhance the safety requirements of Level 3.

11.4 Level 4 - Control of Severe Plant Conditions

Defence-in-depth Level 4 concerns the control of beyond design basis plant conditions and includes the prevention of accident progression and the mitigation of severe consequences resulting from initial accidents. A strong Level 4 barrier is evidenced by strong complementary and BDBA measures coupled with robust accident management strategies.

11.4.1 Level 4 – Assessment

The measures considered at the first three levels ensure maintenance of the structural integrity of the core and limit potential radiation hazards to members of the public. The PSR2 assessments and the review of safety principles show that additional design features and procedural provisions are in place and effective for defence-in-depth Level 4.

The complete implementation of the actions to address the OPEX from the 2011 Fukushima accident and enhancements such as Emergency Mitigating Equipment (EME) and insights from the updated PSAs have significantly strengthened defence-in-depth Level 4. In addition, the implementation of Severe Accident Management Guidance (SAMG) further strengthens the Level 4 barrier.

The implementation of Fukushima Action Items, use of OPEX and Emergency Management were identified as Strengths for Level 4, which support plant design improvements thus allowing for the management and control of BDBA conditions [5]. Also, the management of Equipment Important to Emergency Response (EITER) is identified as a strength for OPG (D-PSR).

The effectiveness of the Level 4 barriers has been enhanced by initiatives undertaken since PSR2, including improvements to SAMG program documentation that were identified as recommendations during a CNSC desktop review.

As per the assessment in Section 10.0, the aggregate impact of Acceptable Deviations on defence-in-depth is assessed to be very low.

11.4.2 Level 4 - Conclusions

The PSR2 assessments and the review of safety principles show that design features and procedural provisions are in place and are effective for defence-in-depth Level 4 [5]. The measures considered at the first three levels ensure maintenance of the structural integrity of the core and limit potential radiation hazards to members of the public. The complete implementation of Fukushima Actions, Phase 2 EME and SAMG has further strengthened defence-in-depth Level 4.

11.5 Level 5 – Mitigation of Radiological Consequences

Defence-in-depth Level 5 concerns the mitigation of radiological consequences of releases of radioactive material; a strong barrier indicates a robust emergency response program.

11.5.1 Level 5 – Assessment

OPG Program N-PROG-RA-0001, "Consolidated Nuclear Emergency Plan" [29] provides a written basis that documents concepts, roles and resources required by OPG Nuclear to implement and maintain its emergency response capability to protect the public, employees and the environment in the event of a nuclear emergency.

Emergency Management is identified as a Strength related to defence-in-depth Level 5 [5]. The program is well established and coordinated both within and external to OPG.

The completion of the Emergency Response Projection enhancements is relevant to sustaining and enhancing the safety requirements of defence-in-depth Level 5. In addition, Pickering has implemented an Automated Source Term Gamma Monitoring System that improves the timely collection and reporting of radiological data inside and outside the plant. This improves the timeliness and reliability of radiological data that is used for emergency dose projections and off-site response.

The PSR2-B review did not identify any gaps associated with Level 5.

As per the assessment in Section 10.0, there are no Acceptable Deviations associated with defence-in-depth Level 5, so there is no impact of Acceptable Deviations on Level 5.

11.5.2 Level 5 - Conclusions

The coordinated emergency response capability of the various response organizations and the implementation of OPEX from the 2011 Fukushima accident support the strength of the Level 5 defence-in-depth provisions [5].

The enhancement to the Emergency Response Projection Software as part of the PSR2 IIP Action (G26-RS1-10-22) [6] has further enhanced the response for defence-in-depth Level 5.

11.6 Defence-in-Depth Assessment Conclusions

The detailed review of provisions for each level of defence presented in Section 18 and Appendix D of PSR2 GAR [5] confirmed that Pickering NGS design and operation have adequate and effective barriers in all applicable levels of defence-in-depth and that significant improvements to barriers have been implemented.

The comprehensiveness of the assessment in PSR2 GAR [5] is assured by assessing each of the safety principles, which are supported by multiple and overlapping provisions for each level of defence-in-depth. Furthermore, each defence-in-depth level is supported by multiple safety principles providing a second layer of overlap of provisions across levels of defence-in-depth. The defence-in-depth has been further strengthened with the implementation of the PSR2 Resolution Plans and completion of associated IIP Actions [6].

The adequacy of these provisions has also been confirmed by the comprehensive PSAs. The Pickering NGS PSAs demonstrate that the overall plant design has a Core Damage Frequency and Large Release Frequency within the OPG risk-based Safety Goals, indicating robustness in the design and reliable equipment that is capable of responding effectively to accident scenarios.

The current D-PSR and PSR2-B has not identified any issues that invalidate these conclusions and the implementation of the proposed PSR2-B Resolution Plans will further enhance the defence-in-depth for extended operation.

12.0 CONCLUSIONS

This amendment to the Global Assessment reassessed the time-dependent elements in PSR2 GAR and the new or revised requirements since PSR2 to confirm the validity of the PSR2 conclusions for two additional years of commercial operation to the end of 2026. Furthermore, by including the results from the D-PSR, the PSR2-B assessment takes into account safety significant changes in requirements since the PSR2 was completed and effectiveness issues related to programs and practices common to the OPG nuclear fleet.

The PSR2-B Global Assessment identified 41 PSR2-B Gaps which are mapped into 14 existing PSR2 Global Issues and two new Global Issues (GI-52 and GI-53). Twenty-two (22) gaps were identified from the reassessment of PSR2 Global Issues impacted by PNGS Operation beyond 2024, one gap was identified from the review of open regulatory actions and 18 gaps were identified from the assessment of D-PSR Gaps for applicability to PNGS. The issues identified consist primarily of gaps related to completion of fitness for service assessments for Major Components and other SSCs, safety analysis to address the aging of SSCs for the extended period, and gaps against requirements in modern LRCSs.

Thirteen Resolution Statements have been proposed and ranked for resolution under the IIP. Eleven gaps are resolved as requiring No Further Action. The assessment of six newly identified Acceptable Deviations confirmed there is no impact on the conclusions of the Global Assessment, either individually or in aggregate.

Furthermore, the assessment confirms that the Global Issues identified by PSR2-B do not invalidate the conclusions of the assessment in the PSR2 GAR, and the defence-in-depth will be further strengthened with the implementation of the proposed Resolution Plans.

This Global Assessment concludes that the current plant design, condition, operation, processes and management system will ensure continued safe operation of Pickering 5-8 for an additional two years of operation beyond 2024. Resolution of PSR2-B gaps will be addressed under the IIP.

13.0 REFERENCES

[1] OPG Report, "Pickering NGS Periodic Safety Review 2 (PSR2) Basis Document", P-REP-03680-00001 R002, June 29, 2016.

[2] CNSC Regulatory Document, "Operating Performance: Periodic Safety Reviews", REGDOC-2.3.3, April 2015.

[3] CSA Standard, "Periodic Safety Review for Nuclear Power Plants", N290.18-17, 2017.

[4] IAEA Specific Safety Guide, "Periodic Safety Review for Nuclear Power Plants", SSG-25, 2013.

[5] OPG Report, "Pickering NGS Global Assessment Report", P-REP-03680-00032 R001, February 8, 2018.

[6] OPG Report, "Pickering Integrated Implementation Plan (IIP) Completion Report", P-REP-03680-00042 R000, July 29, 2021.

[7] OPG Report, "Pickering Periodic Safety Review 2 Integrated Implementation Plan", P-REP-03680-00031 R001, March 1, 2018.

[8] OPG Report, "PSR2-B GI Gap Assessment Report", P-REP-03680-00047 R000, March 29, 2023.

[9] CNSC, "Pickering Nuclear Generating Station, Licence Conditions Handbook", LCH-PR-48.00/2028 R005, February 24, 2023.

[10] OPG Report, "PSR2 Re-Assessment Strategy – B", P-REP-03680-00051 R001, January 12, 2023.

[11] OPG Report, "Pickering PSR2-B – Regulatory Actions Review", P-REP-03680-00050 R000, February 17, 2023.

[12] CNSC, "Pickering Nuclear Generating Station, Licence Conditions Handbook", LCH-PR-48.00/2028 R004, April 27, 2021.

[13] CNSC Letter, "Pickering NGS: CNSC Compliance Verification Activity: Pickering Maintenance and Equipment Reliability – Action Item 2017-48-12365", P-CORR-00531-05281, January 24, 2018.

[14] OPG Letter, "Pickering NGS: Update on Action Notice AN2 CNSC Action Item 2017-48-12365, Pickering Maintenance and Equipment Reliability", P-CORR-00531-22603, May 20, 2021.

[15] OPG Letter, "Pickering NGS: Status Update on Action Notice AN2 of CNSC Action Item 2017-48-12365, Pickering Maintenance and Equipment Reliability PRPD-2017-022", P-CORR-00531-22913, May 19, 2022.

[16] OPG Report, "Darlington NGS Periodic Safety Review (D-PSR): Global Assessment Report", NK38-REP-03680-11938 R000, December 6, 2022.

[17] OPG Report, "Darlington NGS Periodic Safety Review Basis Document", NK38-REP-03680-11844 R002, February 3, 2021.

[18] OPG Program, "Equipment Reliability", N-PROG-MA-0026 R003, June 4, 2019.

[19] OPG Program, "Integrated Aging Management", N-PROG-MP-0008 R008, July 17, 2020.

[20] OPG Program, "Major Components", N-PROG-MA-0025 R003, August 6, 2019.

[21] IAEA Report, "Assessment of Defence in Depth for Nuclear Power Plants", Safety Report Series No. 46, February 2005.

[22] CNSC Regulatory Document, "Deterministic Safety Analysis", REGDOC-2.4.1, May 2014.

[23] OPG Report, "Pickering 1-4 Safety Report: Appendix 13 – Common Cause Events", NA44-REP-03500-00007, November 22, 2017.

[24] OPG Report, "Pickering 5-8 Safety Report: Appendix 12 – Common Cause Events", NK30-REP-03500-10002, November 21, 2017.

[25] CNSC Regulatory Document, "Probabilistic Safety Assessment (PSA) for Nuclear Power Plants", REGDOC-2.4.2, May 2014.

[26] OPG Letter, "Submission of Pickering Probabilistic Safety Assessment (PSA) Reports for REGDOC-2.4.2 Compliance", P-CORR-00531-06168, October 16, 2020.

[27] CNSC Letter, "Pickering NGS – CNSC Staff Review of Pickering Probabilistic Safety Assessment (PSA) Reports for REGDOC-2.4.2 Compliance and Closure of Periodic Safety Review 2 Integrated Implementation Plan (IIP) Action G32-RS1-04-27.1", P-CORR-00531-06276, December 18, 2020.

[28] OPG Letter, "OPG Nuclear – Annual Update to CNSC on Progress of CSI Recategorization", N-CORR-00531-23577, March 28, 2023.

[29] OPG Program, "Consolidated Nuclear Emergency Plan", N-PROG-RA-0001 R020, October 15, 2022.

Appendix A: Acronyms and Abbreviations

AD	Acceptable Deviation
ADF	Atmospheric Dilution Factor
AM	Aging Management
BDBA	Beyond Design Basis Accident
CA	Condition Assessment
CANDU	Canada Deuterium Uranium
CG	Commodity Group
CNSC	Canadian Nuclear Safety Commission
COG	CANDU Owners Group
CSA	Canadian Standards Association
CT	Calandria Tube
DBA	Design Basis Accident
DCF	Dose Conversion Factor
DCR	Document Change Request
D-ISR	Darlington Integrated Safety Review
EFPD	Equivalent Full Power Days
EFPH	Equivalent Full Power Hours
EITER	Equipment Important to Emergency Response
EME	Emergency Mitigating Equipment
EO	Enhancement Opportunity
EOL	End of Life
EQ	Environmental Qualification
EQA	Environmental Qualification Assessment
EWS	Emergency Water System
FFS	Fitness for Service
FHA	Fire Hazard Assessment
FSSA	Fire Safe Shutdown Analysis
GAR	Global Assessment Report
GI	Global Issue
HTS	Heat Transport System
IAEA	International Atomic Energy Agency

IFB	Irradiated Fuel Bay
IIP	Integrated Implementation Plan
ISR	Integrated Safety Review
LCH	Licence Condition Handbook
LCMP	Life Cycle Management Plan
LISS	Liquid Injection Shutdown System
LOF	Loss of Flow
LRCS	Laws, Regulations, Codes and Standards
NBCC	National Building Code of Canada
NFA	No Further Action
NFCC	National Fire Code of Canada
NFPA	National Fire Protection Association
NGS	Nuclear Generating Station
NOP	Neutron Overpower Protection
OPEX	Operating Experience
OPG	Ontario Power Generation
PBSA	Probabilistic Blister Susceptibility Assessment
PCA	Probabilistic Core Assessment
PHT	Primary Heat Transport
PIP	Periodic Inspection Program
PNERP	Provincial Nuclear Emergency Response Plan
PROL	Power Reactor Operating Licence
PSA	Probabilistic Safety Assessment
PSR	Periodic Safety Review
PSR1	Periodic Safety Review 1
PSR2	Periodic Safety Review 2
PT	Pressure Tube
REGC	Regulatory Commitments
REGM	Regulatory Management Actions
REGO	Regulatory Obligations
RB	Reactor Building
RS	Resolution Statement
SAM	Severe Accident Management

SAMG	Severe Accident Management Guidelines
SBLOCA	Small Break Loss of Coolant Accident
SF	Safety Factor
SFCR	Single Fuel Channel Replacement
SIS	Systems Important to Safety
SOE	Safe Operating Envelope
SSCs	Structures, Systems and Components
TUF	Two Unequal Fluid (Thermal-Hydraulics Computer Program)
XRF	Cross Reference

Appendix B: Global Issues and Proposed Resolution Plans

B.1 GI-1 FITNESS FOR SERVICE FOR FUEL CHANNELS

SECTION 1 – GI-1 GLOBAL ISSUE SUMMARY			
The goal of GI-1, Fitness For Service (FFS) for Fuel Channels, is to ensure that fuel channels remain fit for service for the extended operating period, and to determine the safety significance of changes and actions that would be required for conformance with the new requirements of N285.4-19 and N285.8-15 Update No 1 (R2020). This Global Issue comprises four proposed Resolution Statements and one Acceptable Deviation addressing five PSR2-B Gaps and three D-PSR SF4 Gaps. GI-1 is Safety Significance Level 1 based on deterministic and probabilistic defence-in-depth considerations as well as plant operability considerations. OPG has in place robust FFS programs for fuel channels which provides high confidence of the FFS for these major components and continued safe operation of PNGS. The proposed Resolution Plans will demonstrate the FFS for fuel channels for the extended operation to the end of 2026.			
Safety Significance Level:		Category:	Programmatic, Engineering, Analytical

SECTION 2 – GI-1 ASSOCIATED PSR2-B GAPS	
G01-RS2-06-02.1	The Pickering 5-8 Fuel Channels Periodic Inspection Program (PIP) Plan indicates that the target end of life is 2024, although the inspection schedules in the document present a timescale that extends beyond 2024 and up to 2028. Regardless, as the PIP Plan does not reflect a target end of life up to the end of 2026, this is a PSR2-B gap. ***Source:*** Reassessment of IIP Action G01-RS2-06-02.1 for extended operation ***Associated Resolution:*** GI-1-RS5
G01-RS3-06-03.1, G01-RS4-06-04.2, G01-RS4-06-04.3, G01-RS4-06-04.4	The latest revision of the Fuel Channel Life Cycle Management Plan (LCMP) (2022 update) identifies the fuel channel inspection and maintenance scope and schedule for Pickering 1,4 until the end of 2024 and Pickering 5-8 until the end of 2025. Since the scope and schedule for fuel channel inspection and maintenance activities have not been established and fuel channel FFS has not been demonstrated for Pickering 5-8 extended operation to the end of 2026, this is a PSR2-B gap. ***Source:*** Reassessment of IIP Actions G01-RS3-06-03.1, and G01-RS4-06-04.2 to G01-RS4-06-04.4 for extended operation ***Associated Resolution:*** GI-1-RS6

SECTION 2 – GI-1 ASSOCIATED PSR2-B GAPS	
D-PSR SF4-3	Clauses 12.5.2.1, 12.5.2.2.2, 12.5.4.1.2, 12.5.4.1.3, 12.5.5.2 and 12.5.5.3 in CSA N285.4-19 specify new requirements for material surveillance of fuel channel annulus spacers testing, results evaluation and dispositioning and acceptance standards requirements. While Darlington NGS follows the required spacer material surveillance practices, the Fuel Channel Periodic Inspection Program (PIP) Plans do not include these requirements. ***Source:*** Code Review for CSA N285.4-19, Clauses 12.5.2.1, 12.5.2.2.2, 12.5.4.1.2, 12.5.4.1.3, 12.5.5.2 and 12.5.5.3 ***Associated Resolutions:*** GI-1-RS7
D-PSR SF4-6	There is a Gap associated with the new requirement in Clause 7.1.5 of CSA N285.8-15 Update No. 1 (R2020) which stipulates that uncertainty analysis be performed when the sum of frequency of failure from probabilistic core assessments related to flaws and Pressure Tube-Calandria Tube (PT-CT) contact exceeds one-half of the total allowable failure frequency. The capability to perform uncertainty analysis remains under development by the industry. ***Source:*** Code Review for CSA N285.8-15 Update No. 1 (R2020), Clause 7.1.5 ***Associated Resolution:*** GI-1-RS8
D-PSR SF4-7	There is a gap associated with the new requirement in Clause 7.3.1.2 of N285.8-15 Update No. 1 (R2020) which requires that when probabilistic evaluation of the reactor core is performed, the contributions to the total failure frequency shall account for all of the known and postulated pressure tube degradation mechanisms, applicable to the reactor core. OPG plans to apply the revised maximum acceptable failure frequencies (as provided in Table C.1 of CSA N285.8-15 Update 1) in probabilistic core assessments when the CSA N285.8 Working Groups have defined what constitutes a degradation mechanism, and when a methodology to combine allowable failure frequencies from different degradation mechanisms has been developed and accepted for use. The industry is developing a methodology for acceptance. ***Source:*** Code Review for CSA N285.8-15 Update No. 1 (R2020), Clause 7.3.1.2 ***Associated Resolution:*** GI-1-AD1

SECTION 3 – GI-1 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

This Global Issue contains five PSR2-B Gaps related to FFS of fuel channels for the extended operation period and three D-PSR Gaps related to new requirements in CSA N285.4-19 and CSA N285.8-15 Update No. 1 (R2020).

<u>FFS for Fuel Channels (including CSA N285.4)</u>

The five PSR2-B Gaps relate to fuel channel FFS and required updates to the Pickering 5-8 Fuel Channels PIP Plan [GI-1-1] and LCMP [GI-1-2] to reflect extended operation to the end of 2026. The Fuel Channels PIP Plan demonstrates how OPG is compliant with applicable CSA N285.4 requirements for periodic inspection of fuel channels, in accordance with the Pickering NGS PROL. The inspection schedules in the Pickering 5-8 Fuel

Channels PIP Plan present a timescale that extends beyond 2024 and up to 2028. However, the document still indicates that the target end of life is 2024.

OPG has an extensive program of fuel channel research and development, maintenance, and in-service inspection to manage fuel channel issues to the end of target life. These programs supplement the minimum requirements of the periodic inspection program. The Fuel Channels LCMP integrates the inspection and maintenance requirements, periodic inspection requirements, and regulatory requirements, and outlines the strategies required to manage the effects of aging and assure fitness for service to their station specific target operating life.

FFS assessments are based on the condition of the components throughout the life of the plant, usually as determined from the periodic inspections. The inspection results are assessed according to industry standard guideline documents that set out the permissible assessment methodologies and the mandatory requirements. The results are submitted to the regulator in accordance with the CSA N285.4 and N285.8 Standards' requirements, which indicate when regulatory acceptance is required. The inspection techniques and assessment methodologies continue to improve through the Research and Development (R&D) program supported by OPG.

FFS is demonstrated and re-assessed on an on-going basis through planned inspections and maintenance, and assessment of inspection results in accordance with the requirements of CSA N285.4 and N285.5 Standards, and OPG's Integrated Aging Management Program [GI-1-3] and Major Components Program [GI-1-4], using well established programmatic controls. OPG will not operate a unit when fuel channel FFS has not been demonstrated.

The Fuel Channels LCMP is reviewed and updated annually and submitted to the CNSC for review. The latest revision (2022 update) [GI-1-2] identifies the fuel channel inspection and maintenance scope and schedule for Pickering 1,4 until the end of 2024 and Pickering 5-8 until the end of 2025.

D-PSR Gap SF4-3 deals specifically with Clauses 12.5.2.1, 12.5.2.2.2, 12.5.4.1.2, 12.5.4.1.3, 12.5.5.2 and 12.5.5.3 in CSA N285.4-19, which specify new requirements for spacer material surveillance of fuel channel annulus spacers testing, results evaluation and dispositioning and acceptance standards requirements.

Spacer material surveillance is managed through the Fuel Channel LCMP [GI-1-2] and performed in accordance with Clause 12.5 of the 2014 edition of CSA N285.4.

For Zr-Nb-Cu spacers installed in Pickering Units 5 to 8, an update to the integrity assessment has been completed in N-REP-31160-10015 [GI-1-5] to support target end of life of Pickering units up to 300,000 Equivalent Full Power Hours (EFPH), which is estimated to be beyond 2025. Additional Zr-Nb-Cu ex-service spacers were retrieved from Pickering Unit 5 in the P2251 outage, and will undergo material property testing. An integrity assessment will be performed, as required, to support planned end of life targets.

For Inconel X-750 spacers installed in Pickering Units 1, 4 and some channels in Pickering 6 to 8 units, a plan has been documented for managing the degradation of spacers [GI-1-6]. This plan incorporates activities including R&D, in-service spacer material surveillance, in-service fuel channel inspection, FFS assessment and regulatory interaction. The FFS assessments for the Inconel X-750 spacers in P-CORR-00531-06079 [GI-1-7] concludes that the structural factors on load for Level A normal operating conditions have been satisfied to 300,000 EFPH. However, a validity limit of 250,000 EFPH was placed on the predictions of maximum load carrying capacity for optimized Inconel X-750 spacers in Pickering Units 6-8. Based on additional material surveillance, the FFS assessments for Pickering Units 6-8 were resubmitted in P-CORR-00531-22894 [GI-1-8] which demonstrated that the acceptance criteria for design and normal operating loads are met up to 275,000 EFPH, and extended the validity limit beyond 250,000 EFPH up to 258,000 EFPH. This restriction in operating time is most limiting for Pickering Unit 8 since its tight fitting annulus spacers installed at the initial start of service are expected to reach 258,000 EFPH in ~January 2024.

SECTION 3 – GI-1 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

Pickering Unit 5 now has one channel with Inconel X-750 spacers due to the recent Single Fuel Channel Replacement (SFCR) performed in P2251. In addition, there are non-optimized type Inconel X-750 tight fitting spacers installed in select channels of Pickering Unit 7. FFS assessments for these spacers, which are less susceptible to the effects of degradation, were completed with a FFS validity limit of 300,000 EFPH [GI-1-7].

Unit 8 is expected to reach the validity limit of 258,000 EFPH prior to its current end of life target of 2025. OPG has planned to perform a margin sensitivity assessment to provide additional confidence in available end of life reduced margins [GI-1-8]. The Version 3 load carrying capacity model will be revised based on spacer testing results from Darlington Unit 3 Refurbishment to reduce known conservatism and provide adequate margins against the FFS acceptance criteria. The FFS assessments will be revised in 2023 to support continued spacer FFS beyond 258,000 EFPH.

Aside from the work required to demonstrate FFS for the Unit 8 spacers, the FFS assessments need to demonstrate FFS for all Pickering Units 5-8 for a new end of life target corresponding to operations up to the end of 2026.

<u>CSA N285.8-15</u>

D-PSR Gap SF4-6: Clause 7.1.5 of CSA N285.8-15 Update No. 1 (R2020) requires that uncertainty analysis be performed when the sum of frequency of failure from probabilistic core assessments (PCA) related to flaws and Pressure Tube-Calandria Tube (PT-CT) contact exceeds one-half of the total allowable failure frequency.

Informative Annex G (Uncertainty analysis in probabilistic evaluations) of CSA N285.8-15 Update 1 provides a high-level methodology for performing uncertainty analysis when/as required by Clause 7.1.5. However, as clarified in Attachment 1 of NK30-CORR-00531-08295 [GI-1-9], this Annex does not provide procedures for performing uncertainty analysis and acknowledges that different methodologies and procedures may be required to perform uncertainty analyses in different types of probabilistic evaluations (e.g., Probabilistic Core Assessments (PCAs) for flaws, Probabilistic Blister Susceptibility Assessments (PBSAs) for PT-CT contact). The capability to perform uncertainty analyses is under development via industry effort. As documented in OPG's CSA N285.8-15 Compliance Plan N-REP-31100-10061 R005 [GI-1-10], it intends to comply with the requirements of Clause 7.1.5 in CSA N285.8-15 Update 1 when methodologies to perform the required analyses become available.

Note: N285.8 compliance plan N-REP-31100-10061 R005 [GI-1-10], which addresses OPG's plans for compliance with N285.8-15 Update 1, has been accepted by the CNSC subject to two conditions [GI-1-11]. OPG provided detailed responses [GI-1-12] to address the two conditions. However, based on a review of the information provided, CNSC staff concluded that the conditions should remain [GI-1-13]. In September 2021, OPG provided further technical justification to address the conditions [GI-1-14], however, the CNSC maintained that the conditions will remain [GI-1-15].

D-PSR Gap SF4-7: Clause 7.3.1.2 of N285.8-15 Update No. 1 (R2020) requires that when probabilistic evaluation of the reactor core is performed, the contributions to the total failure frequency shall account for all of the known and postulated pressure tube degradation mechanisms, applicable to the reactor core.

OPG has applied the revised maximum acceptable failure frequencies (as provided in Table C.1 of CSA N285.8-15 Update 1) in probabilistic core assessments for Unit 8 to support its operation up to 248 kEFPH [GI-1-16]. The CNSC has acknowledged and accepted the submission in NK30-CORR-00531-08519 [GI-1-17]. The failure frequencies in Table C.1 of CSA N285.8-15 Update 1 have also been applied in subsequent assessments for Unit 5 [GI-1-18] and Unit 7 [GI-1-19]. However, the new methodology is not reflected in the N285.8 compliance plan N-REP-31100-10061 [GI-1-10].

SECTION 4 – GI-1 PRIORITY DETERMINATION

Safety Significance of Global Issue	Deterministic Considerations			Probabilistic Considerations								Overall Safety Significance Level
	E1 – Defence in Depth	E2 – Safety Significance Level	**Overall Deterministic Considerations**	F1 – Reactor Safety – Core Damage Frequency	F2 – Reactor Safety – Defence In Depth	F3 – Public Radiation Safety	F4 – Plant Operability	F5 – Occupational Radiation Safety	F6 – Emergency Preparedness	F7 – Environment	**Overall Probabilistic Considerations**	
	1	3	**1**	4	1	4	1	N/A	N/A	N/A	**1**	**1**

As discussed in Section 3 of this Global Issue, OPG has an ongoing effective Major Components Program in place to ensure fuel channel fitness for service. In addition, OPG will operate a unit only with fuel channels that are fit for service.

PSR2-B Gaps and D-PSR Gap SF4-3: These gaps have Safety Significance Level 1 for deterministic considerations with respect to Defence in Depth (E1), since addressing it will ensure the effectiveness of the pressure boundary barrier, which is consistent with the definition of Safety Significance Level 1 in Table E1 in the PSR2 Basis Document. Safety Significance Level (E2) is considered N/A, since this Global Issue potentially impacts a physical nuclear safety barrier, whereas E2 primarily relates to issues that impact other objectives or are indirectly related to nuclear safety. Hence, the overall Safety Significance Level of 1 for deterministic considerations is dictated by the E1 categorization.

With respect to probabilistic considerations, the fuel channels represents a safety barrier, the effectiveness of which can potentially be impacted by a postulated initiating event with a frequency of approximately 10^{-2}/y. Consistent with Table F2 in the PSR2 Basis Document, the Safety Significance Level is 1 for Defence-in-Depth (F2). Similarly, the Safety Significance Level with respect to Plant Operability (F4) is 1, since addressing this Global Issue will prevent an extended period of unit shutdown due to FFS issues.

A Safety Significance Level of 4 is assigned for Reactor Safety – Core Damage Frequency (F1). Potential failure of fuel channels is accounted for in the Probabilistic Safety Assessment, and resolution of this gap will ensure that the assumptions in the Probabilistic Safety Assessment regarding fuel channel failure frequency remain valid. Therefore, the change in the Core Damage Frequency will be less than 10^{-7}/y, which corresponds to the fourth row of Table F1 in the PSR2 Basis Document, for which the Safety Significance Level is 4.

With respect to Public Radiation Safety (F3), the radiological consequences of a postulated Fuel Channel failure are already accounted for in the safety analysis and shown to be within regulatory limits. Therefore, this issue will result in no adverse change in Public Radiation Safety (F3), which is the determining factor for the applicability of this consideration, and thus the Safety Significance Level is 4.

The issues associated with these gaps have no direct impact on the other probabilistic considerations, i.e., Occupational Radiation Safety (F5), Emergency Preparedness (F6) and Environment (F7). Therefore, these probabilistic considerations are N/A.

SECTION 4 – GI-1 PRIORITY DETERMINATION
D-PSR Gaps SF4-6 and SF4-7: Regarding deterministic considerations, these gaps pertain to analyses and is not directly related to any physical barriers. Therefore, this Global Issue is not directly applicable to Defence in Depth (E1). Safety Significance Level (E2) is assigned as Level 3 since the issue is not significant by itself (the definition of Safety Significance Level 3 for E2) and OPG will update the compliance plan. Hence, the overall Safety Significance Level of 3 for deterministic considerations is dictated by the E2 categorization. With respect to probabilistic considerations, Safety Significance Level 4 is assigned the Core Damage Frequency (F1) as the resolution of these gaps is not expected to cause a change in Core Damage Frequency. These gaps have no direct impact on the other probabilistic considerations, i.e., Defence in Depth (F2), Public Radiation Safety (F3), Plant Operability (F4), Occupational Radiation Safety (F5), Emergency Preparedness (F6) and Environment (F7). Therefore, these other probabilistic considerations are N/A. In summary, this Global Issue has Safety Significance Level 1 dictated by the FFS issues associated with the PSR2-B Gaps and D-PSR Gap SF4-3.

SECTION 5 – GI-1 RESOLUTION PLAN	
GI-1-RS5	Update the Fuel Channels Pressure Tubes PIP Plan for Pickering 5-8 (NK30-PIP-31100-00005 [GI-1-1]) to reflect an extended operating period up to the end of 2026. (Reassessment of IIP Action G01-RS2-06-02.1)
GI-1-RS6	Demonstrate the continued FFS of fuel channels for Pickering 5-8 for the extended operating period up to the end of 2026. FFS of fuel channels includes demonstration of sufficient margin on the FFS limits of the pressure tubes, calandria tubes and garter springs (annulus spacers) during the continued operational life of the plant. (Reassessment of IIP Actions G01-RS3-06-03.1, and G01-RS4-06-04.2 to G01-RS4-06-04.4)
GI-1-RS7	Demonstrate Fitness-for-Service for Zr-Nb-Cu and Inconel X-750 Pickering Units 5 to 8 Spacers for the extended operation to the end of 2026. (D-PSR SF4-3) OPG is actively progressing this work in support of extended operations at Pickering NGS.
GI-1-RS8	Develop and submit an implementation plan for developing inputs to satisfy the methodology in the Non-Mandatory Annex G of CSA N285.8-18, Update #1 to perform uncertainty analyses in probabilistic evaluations where the threshold requirement is met per CSA N285.8. (D-PSR SF4-6)
GI-1-AD1	OPG has applied the revised maximum acceptable failure frequencies (as provided in Table C.1 of CSA N285.8-15 Update 1) in probabilistic core assessments for Unit 8 in NK30-CORR-00531-08484 [GI-1-16] to support its operation up to 248 kEFPH. The CNSC has acknowledged and accepted the submission in NK30-CORR-00531-08519 [GI-1-17]. The failure frequencies in Table C.1 of CSA N285.8-15 Update 1 have also been applied in subsequent assessments for Unit 5 [GI-1-18] and Unit 7 [GI-1-19]. Therefore, OPG meets the requirements of the revised standard, however the documentation (CSA N285.8 Compliance Plan N-REP-31100-10061 [GI-1-10]) needs updating. This is a documentation issue only, and therefore, it is assessed as an Acceptable Deviation. (D-PSR SF4-7)

SECTION 6 – GI-1 GLOBAL ISSUE REFERENCES

[GI-1-1] OPG Plan, "Pickering Nuclear 5-8 Fuel Channel Pressure Tubes Periodic Inspection Program Plan", NK30-PIP-31100-00005 R000, January 10, 2019.

[GI-1-2] OPG Plan, "Fuel Channels Life Cycle Management Plan", N-PLAN-01060-10002 R023, October 12, 2022.

[GI-1-3] OPG Program, "Integrated Aging Management", N-PROG-MP-0008 R008, July 17, 2020.

[GI-1-4] OPG Program, "Major Components", N-PROG-MA-0025 R003, August 6, 2019.

[GI-1-5] OPG Report, "Assessment of Zr-Nb-Cu Spacer Integrity for Pickering Units 5-8 for Operation to 300,000 EFPH", N-REP-31160-10015 R000, November 2019.

[GI-1-6] OPG Memo, "Plan to Manage Degradation of Inconel X-750 Spacers in PNGS", N-CORR-31100-0826309, March 30, 2020.

[GI-1-7] OPG Letter, "Pickering NGS: Inconel X-750 Spacers Fitness For Service", P-CORR-00531-06079, September 2020.

[GI-1-8] OPG Letter, "Pickering NGS – Inconel X-750 Spacer Fitness-for-Service and Submission of the P2181 Spacer Material Surveillance Assessment Report", P-CORR-00531-22894, April 28, 2022.

[GI-1-9] OPG Correspondence, "Pickering NGS – Units 5-8 – OPG Response to CNSC Staff Review of Channel-Specific Probabilistic Assessment Methodology for Pressure Tube to Calandria Tube Contact", NK30-CORR-00531-08295, August 20, 2021.

[GI-1-10] OPG Report, "Compliance Plan for Long-Term Use of CSA N285.8 for In-Service Evaluation of Zirconium Alloy Pressure Tubes", N-REP-31100-10061 R005, July 31, 2020.

[GI-1-11] CNSC Letter, "Pickering and Darlington NGS – Revised CSA N285.8 Compliance Plan", N-CORR-00531-22497, December 15, 2020.

[GI-1-12] OPG Letter, "OPG Response to CNSC's Conditional Assessment of OPG's CSA N285.8 Compliance Plan Revision 5", N-CORR-00531-22611, March 31, 2021.

[GI-1-13] CNSC Letter, "Pickering NGS and Darlington NGS – Follow-up Responses to OPG's CSA N285.8 Compliance Plan Revision 5", N-CORR-00531-22735, June 3, 2021.

[GI-1-14] OPG Letter, "Request For Removal Of Conditions Imposed On OPG's CSA N285.8 Compliance Plan Revision 5", N-CORR-00531-22779, September 16, 2021.

[GI-1-15] CNSC Letter, "Pickering NGS and Darlington NGS – CNSC Staff Response to Request for Removal of Conditions Imposed on OPG's CSA N285.8 Compliance Plan Revision 5", N-CORR-00531-23027, December 10, 2021.

[GI-1-16] OPG Letter, "Pickering NGS: Submission of Revised Core Component Disposition for Unit 8 Pressure Tube to Calandria Tube Contact", NK30-CORR-00531-08484, April 22, 2022.

[GI-1-17] CNSC Letter, "Pickering NGS – CNSC Staff Review of Revised Core Component Disposition for Unit 8 Pressure Tube to Calandria Tube Contact", NK30-CORR-00531-08519, May 10, 2022.

[GI-1-18] OPG Letter, "Submission of Revised Core Component Disposition for Unit 5 Pressure Tube to Calandria Tube Contact", NK30-CORR-00531-08592, November 4, 2022.

[GI-1-19] OPG Letter, "Submission of Revised Component Disposition for Pickering Unit 7 Pressure Tube to Calandria Tube Contact", NK30-CORR-00531-08533, July 14, 2022.

B.2 GI-2 FITNESS FOR SERVICE FOR FEEDERS

SECTION 1 – GI-2 GLOBAL ISSUE SUMMARY

The goal of GI-2, Fitness For Service (FFS) for Feeders, is to ensure that feeders remain fit for service for the extended operating period. This Global Issue comprises one proposed Resolution Statements addressing one PSR2-B Gap.

GI-2 is Safety Significance Level 1 based on deterministic and probabilistic defence-in-depth considerations as well as plant operability considerations.

OPG's Integrated Aging Management Program, N-PROG-MP-0008 [GI-2-1], is supported by the Major Components Program, N-PROG-MA-0025 [GI-2-2], and provides the systematic governance process to ensure ongoing feeder FFS. Life Cycle Management Plans (LCMPs) developed under this governance are in place. The Feeders LCMP [GI-2-3] currently covers the period to the end of 2024 for Pickering 1,4 and to the end of 2025 for Pickering 5-8.

The proposed Resolution Plan primarily comprises activities to ensure that feeders will remain fit for service for the extended operating period. Completion of the proposed Resolution Plan will support and strengthen Level 1 defence-in-depth for the extended operating period.

Safety Significance Level:	1	Category:	Programmatic, Engineering, Analytical

SECTION 2 – GI-2 ASSOCIATED PSR2-B GAPS

G02-RS1-06-05.1	The current Feeders LCMP (2022 update) assesses the feeder monitoring / inspection scope and schedule to the end of 2024 for Pickering 1,4, and to December 2025 for Pickering 5-8. Since the scope and schedule for feeder inspection and maintenance activities has not been established and feeder FFS has not been demonstrated for Pickering 5-8 extended operation to the end of 2026, this is a PSR2-B gap. ***Source:*** Reassessment of IIP Action G02-RS1-06-05.1 for extended operation ***Associated Resolution:*** GI-2-RS2

SECTION 3 – GI-2 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

This Global Issue contains one PSR2-B Gap related to FFS of feeders for the extended operation period.

In a process similar to that described in GI-1, OPG has well established programmatic controls to demonstrate FFS for feeders. FFS is demonstrated and re-assessed on an on-going basis through planned inspections and maintenance, and assessment of inspection results in accordance with the requirements of the CSA N285.4 Standard, and the Integrated Aging Management Program [GI-2-1] and Major Components Program [GI-2-2], using well established programmatic controls.

SECTION 3 – GI-2 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

The LCMP documents the strategies and actions planned to facilitate demonstrate of FFS of the feeders throughout the planned operating period. It is prepared based on planned End-of-Operations dates (calendar dates), which are then converted to EFPH values, factoring in outage dates, and anticipated forced loss rates. Each unit is unique in its End-of-Operation EFPH or its component end-of-life date. The Feeders LCMP is reviewed and updated annually and submitted to the CNSC for review. The latest revision (2022 update) [GI-2-3] identifies the feeder inspection and maintenance scope and schedule for Pickering 1,4 until the end of 2024 and Pickering 5-8 until the end of 2025.

SECTION 4 – GI-2 PRIORITY DETERMINATION

Safety Significance of Global Issue	**Deterministic Considerations**			**Probabilistic Considerations**								**Overall Safety Significance Level**
	E1 – Defence in Depth	E2 – Safety Significance Level	**Overall Deterministic Considerations**	F1 – Reactor Safety – Core Damage Frequency	F2 – Reactor Safety – Defence In Depth	F3 – Public Radiation Safety	F4 – Plant Operability	F5 – Occupational Radiation Safety	F6 – Emergency Preparedness	F7 – Environment	**Overall Probabilistic Considerations**	
	1	N/A	**1**	4	1	4	1	N/A	N/A	N/A	**1**	**1**

Addressing this Global Issue assures the ongoing feeders FFS for the operational life of the station. The feeders are part of the Heat Transport System pressure boundary and, as such, assurance of FFS is important for the safe operation of the plant. As discussed in Section 3 of this Global Issue, OPG has an ongoing effective Major Components Program in place to ensure feeders FFS. In addition, OPG will operate a unit only with feeders that are fit for service.

Nevertheless, this Global Issue has Safety Significance Level 1 for deterministic considerations with respect to Defence in Depth (E1), since addressing it will ensure the effectiveness of the pressure boundary barrier, which is consistent with the definition of Safety Significance Level 1 in Table E1 in the PSR2 Basis document. Safety Significance Level (E2) is considered not applicable, since this Global Issue potentially impacts a physical nuclear safety barrier, whereas E2 primarily relates to issues that impact other objectives or are indirectly related to nuclear safety. Hence, the overall Safety Significance Level of 1 for deterministic considerations is dictated by the E1 categorization.

With respect to probabilistic considerations, the feeders represent a safety barrier, the effectiveness of which can potentially be impacted by a postulated initiating event of frequency of approximately 10^{-2}/y. Consistent with Table F2 in the PSR2 Basis Document, the Safety Significance Level is 1 for Defence in Depth (F2). Similarly, the Safety Significance Level with respect to Plant Operability (F4) is 1, since addressing this Global Issue will prevent an extended period of plant shutdown due to FFS issues.

SECTION 4 – GI-2 PRIORITY DETERMINATION

A Safety Significance Level of 4 is assigned for Reactor Safety – Core Damage Frequency (F1). Potential failure of feeders is accounted for in the Probabilistic Safety Assessment, and resolution of this Global Issue will ensure that the assumptions in the Probabilistic Safety Assessment regarding feeder failure frequency remain valid. Therefore, the change in the Core Damage Frequency will be less than 10^{-7}/y, which corresponds to the fourth row of Table F1 in the PSR2 Basis Document, for which the Safety Significance Level is 4.

With respect to Public Radiation Safety (F3), the radiological consequences of a postulated Feeder failure are already accounted for in the safety analysis and are within regulatory limits. Therefore, this Global Issue will result in no adverse change in Public Radiation Safety (F3), which is the determining factor for the applicability of this consideration, and thus the Safety Significance Level is 4. This Global Issue has no direct impact on the other probabilistic factors, i.e., Occupational Radiation Safety (F5), Emergency Preparedness (F6) and Environment (F7). Therefore, these probabilistic considerations are not applicable.

In summary, both deterministic and probabilistic considerations dictate that this Global Issue has Safety Significance Level 1. As noted, OPG's existing programs address this issue on an ongoing basis to ensure FFS of the feeders for the operational life of the station.

SECTION 5 – GI-2 RESOLUTION PLAN

GI-2-RS2	Demonstrate the continued FFS of feeders for Pickering 5-8 for the extended operating period up to the end of 2026. FFS of feeders includes demonstration that predicted feeder condition, with identified and planned mitigations, is acceptable for the intended operation. (Reassessment of IIP Action G02-RS1-06-05.1)

SECTION 6 – GI-2 GLOBAL ISSUE REFERENCES

[GI-2-1] OPG Program, "Integrated Aging Management", N-PROG-MP-0008 R008, July 17, 2020.
[GI-2-2] OPG Program, "Major Components", N-PROG-MA-0025 R003, August 6, 2019.
[GI-2-3] OPG Plan, "Feeders Life Cycle Management Plan", N-PLAN-01060-10001 R024, October 2022.

B.3 GI-3 FITNESS FOR SERVICE FOR STEAM GENERATORS

SECTION 1 – GI-3 GLOBAL ISSUE SUMMARY

The goal of GI-3, Fitness for Service for Steam Generators, is to ensure that Steam Generators remain fit for service for the extended operating period. This Global Issue comprises one proposed Resolution Statement addressing one PSR2-B Gap.

GI-3 is Safety Significance Level 1 based on deterministic and probabilistic defence-in-depth considerations as well as plant operability considerations.

OPG's Integrated Aging Management Program, N-PROG-MP-0008 [GI-3-1], is supported by the Major Components Program, N-PROG-MA-0025 [GI-3-2], and provides the systematic governance process to ensure ongoing steam generator FFS. Life Cycle Management Plans (LCMPs) developed under this governance are in place. The Steam Generators LCMP [GI-3-3] currently covers the period to the end of 2024 for Pickering 1,4 and to the end of 2025 for Pickering 5-8.

The proposed Resolution Plan primarily comprises activities to ensure that steam generators will remain fit for service for the extended operating period to the end of 2026. Completion of the proposed Resolution Plan will support and strengthen Level 1 defence in depth for the extended operating period.

Safety Significance Level:	1	Category:	Programmatic, Engineering, Analytical

SECTION 2 – GI-3 ASSOCIATED PSR2-B GAPS

G03-RS1-06-06.1	The latest Steam Generators LCMP assesses steam generator monitoring / inspection scope and schedule to the end of 2024 for Pickering 1,4, and to December 31, 2025 for Pickering 5-8. Since the scope and schedule for steam generator inspection and maintenance activities have not been established and steam generator FFS has not been demonstrated for Pickering 5-8 extended operation to the end of 2026, this is a PSR2-B gap. ***Source:*** Reassessment of IIP Action G03-RS1-06-06.1 for extended operation ***Associated Resolution:*** GI-3-RS2

SECTION 3 – GI-3 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

This Global Issue contains one PSR2-B Gap related to FFS of the steam generators.

In a process similar to that described in GI-1, OPG has well established programmatic controls to demonstrate FFS for steam generators. FFS is demonstrated and re-assessed on an on-going basis through planned inspections and maintenance, and assessment of inspection results in accordance with the requirements of the CSA N285.4 Standard, and the Integrated Aging Management Program [GI-3-1] and Major Components Program [GI-3-2], using well established programmatic controls.

SECTION 3 – GI-3 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

The LCMP documents the strategies and actions planned to facilitate demonstrate of FFS of the steam generators throughout the planned operating period. It is prepared based on planned End-of-Operations dates (calendar dates), which are then converted to EFPH values, factoring in outage dates, and anticipated forced loss rates. Each unit is unique in its End-of-Operation EFPH or its component end-of-life date. The Steam Generators LCMP is reviewed and updated annually and submitted to the CNSC for review. The latest revision (2022 update) [GI-3-3] identifies the steam generator inspection and maintenance scope and schedule for Pickering 1,4 until the end of 2024 and Pickering 5-8 until the end of 2025.

SECTION 4 – GI-3 PRIORITY DETERMINATION

Safety Significance of Global Issue	**Deterministic Considerations**			**Probabilistic Considerations**								**Overall Safety Significance Level**
	E1 – Defence in Depth	E2 – Safety Significance Level	**Overall Deterministic Considerations**	F1 – Reactor Safety – Core Damage Frequency	F2 – Reactor Safety – Defence In Depth	F3 – Public Radiation Safety	F4 – Plant Operability	F5 – Occupational Radiation Safety	F6 – Emergency Preparedness	F7 – Environment	**Overall Probabilistic Considerations**	
	1	N/A	**1**	4	1	4	1	N/A	N/A	N/A	**1**	**1**

Addressing this Global Issue assures the ongoing FFS of steam generators for the operational life of the station. The steam generators are part of the Heat Transport System pressure boundary and, as such, assurance of FFS is important for the safe operation of the plant. As discussed in Section 3 of this Global Issue, OPG has an ongoing effective Major Components Program in place to ensure Steam Generator fitness for service.

Nevertheless, this Global Issue has Safety Significance Level 1 for deterministic considerations with respect to Defence in Depth (E1) since addressing it will ensure the effectiveness of the pressure boundary barrier, which is consistent with the definition of Safety Significance Level 1 in Table E1 in the PSR2 Basis document. Safety Significance Level (E2) is considered not applicable since this Global Issue potentially impacts a physical nuclear safety barrier, whereas E2 primarily relates to issues that impact other objectives or that are indirectly related to nuclear safety. Hence, the overall Safety Significance Level of 1 for deterministic considerations is dictated by the E1 categorization.

With respect to probabilistic considerations, the steam generator tubes represent a safety barrier, the effectiveness of which can be impacted by a postulated initiating event of frequency of approximately 10^{-2}/y. Consistent with Table F2 in the PSR2 Basis Document, the Safety Significance Level is 1 for Defence in Depth (F2). The Safety Significance Level with respect to Plant Operability (F4) is also 1, since addressing this Global Issue prevents an extended period of plant shutdown due to fitness for service issues.

SECTION 4 – GI-3 PRIORITY DETERMINATION

Safety Significance Level 4 is assigned to Core Damage Frequency (F1) since this Global Issue has an insignificant impact on this consideration. With respect to Public Radiation Safety (F3), the radiological consequences of a steam generator tube failure are already accounted for in the safety analysis and are within regulatory limits. Therefore, this Global Issue will result in no adverse change in Public Radiation Safety (F3), which is the determining factor for the applicability of this consideration, and thus the Safety Significance Level is 4. This Global Issue has no direct impact on the other probabilistic factors: Occupational Radiation Safety (F5), Emergency Preparedness (F6) and Environment (F7). Therefore, these probabilistic considerations are not applicable.

SECTION 5 – GI-3 RESOLUTION PLAN

GI-3-RS2	Demonstrate the continued FFS of steam generators for Pickering 5-8 for the extended operating period up to the end of 2026. FFS of steam generators includes demonstration that predicted steam generator condition, with identified and planned mitigations, is acceptable for the intended operation. (Reassessment of IIP Action G03-RS1-06-06.1)

SECTION 6 – GI-3 GLOBAL ISSUE REFERENCES

[GI-3-1] OPG Program, "Integrated Aging Management", N-PROG-MP-0008 R008, July 17, 2020
[GI-3-2] OPG Program, "Major Components", N-PROG-MA-0025 R003, August 6, 2019
[GI-3-3] OPG Plan, "Steam Generators Life Cycle Management Plan", N-PLAN-33110-10009 R013, November 16, 2022.

B.4 GI-4 FITNESS FOR SERVICE FOR REACTOR COMPONENTS AND STRUCTURES

SECTION 1 – GI-4 GLOBAL ISSUE SUMMARY			
The goal of GI-4, Fitness for Service for Reactor Components and Structures, is to ensure that the reactor components and structures remain fit for service for the extended operating period. The major equipment within this category includes the Calandria Vessel, Calandria Tubes, Guide Tubes, Moderator Inlet Piping and Nozzles, Reactivity Control Units, Calandria Relief Ducts, Lattice Tubes and End Fittings, as well as Exposed Carbon Steel Components in the Calandria Vault. This Global Issue comprises one proposed Resolution Statement addressing three PSR2-B Gaps. GI-4 is Safety Significance Level 2 based on deterministic and probabilistic defence-in-depth considerations as well as plant operability considerations. OPG's Integrated Aging Management Program, N-PROG-MP-0008 [GI-4-1], is supported by the Major Components Program, N-PROG-MA-0025 [GI-4-2], and provides the systematic governance process to ensure ongoing FFS for reactor components and structures. Life Cycle Management Plans (LCMPs) developed under this governance are in place. The Reactor Components and Structures LCMP [GI-4-3] currently covers the period to the end of 2024 for Pickering 1,4 and to the end of 2025 for Pickering 5-8. The proposed Resolution Plan includes activities to ensure that reactor components and structures will remain fit for service for the extended operating period to the end of 2026. In addition, the proposed Resolution Plan includes required inspections activities to update assessments of the gap between Liquid Injection Shutdown System nozzles and Calandria Tubes, and implementing mitigation strategies, if required. Completion of the proposed Resolution Plan will support and strengthen Level 1 defence in depth for the extended operating period.			
Safety Significance Level:	2	Category:	Programmatic, Engineering, Analytical

SECTION 2 – GI-4 ASSOCIATED PSR2-B GAPS	
G04-RS1-06-07.1	The latest Reactor Components and Structures LCMP assesses the monitoring/inspection scope and schedule for reactor components and structure up to the end of 2024 for Pickering 1,4, and to December 31, 2025 for Pickering 5-8. Since the scope and schedule for inspection and maintenance activities for reactor components and structures have not been established and FFS has not been demonstrated for Pickering 5-8 extended operation to the end of 2026, this is a PSR2-B gap. ***Source:*** Reassessment of IIP Action G04-RS1-06-07.1 for extended operation ***Associated Resolution:*** GI-4-RS3
G04-RS2-06-08.1, G04-RS2-06-08.2	The Calandria Tube-Liquid Injection Shutdown System (CT-LISS) nozzle gap assessment and required inspection activities in the Reactor Components and Structures LCMP do not address Pickering 5-8 extended operation to the end of 2026. Therefore, this is a PSR2-B gap. ***Source:*** Reassessment of IIP Actions G04-RS2-06-08.1 and G04-RS2-06-08.2 for extended operation ***Associated Resolution:*** GI-4-RS3

SECTION 3 – GI-4 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

This Global Issue contains one PSR2-B Gap related to FFS of reactor components and structures for the extended operating period.

In a process similar to that described in GI-1, OPG has well established programmatic controls to demonstrate FFS for reactor components and structures. FFS is demonstrated and re-assessed on an on-going basis through planned inspections and maintenance, and assessment of inspection results in accordance with the requirements of the CSA N285.4 Standard, and the Integrated Aging Management Program [GI-4-1] and Major Components Program [GI-4-2], using well established programmatic controls.

The LCMP documents the strategies and actions planned to facilitate demonstrate of FFS of the reactor components and structures throughout the planned operating period. It is prepared based on planned End-of-Operations dates (calendar dates), which are then converted to EFPH values, factoring in outage dates, and anticipated forced loss rates etc. Each unit is unique in its End-of-Operation EFPH or its component end-of-life date. The Reactor Components and Structures LCMP is reviewed and updated annually and submitted to the CNSC for review. The latest revision (2022 update) [GI-4-3] identifies the inspection and maintenance scope and schedule for Pickering 1,4 until the end of 2024 and Pickering 5-8 until the end of 2025.

CSA N285.4-19 Clause 12.2.5.2.5 acceptance criteria require that no contact between fuel channel CTs and calandria vessel internal components/parts (primarily Liquid Injection Shutdown System nozzles) be predicted to exist at the end of the next periodic inspection interval.

The CT-LISS gap measurement inspection program has been defined for Pickering 5-8 through to the end of 2025 in the Reactor Components and Structures LCMP [GI-4-3].

The earliest predicted time for CT-LISS contact for Unit 5 is 291 kEFPH, which is beyond 2025 based on current projections but expected to be prior to the end of 2026.

Prior to the Unit 6 P2061 outage, the predicted time of CT-LISS contact for Unit 6 was 258 kEFPH (2021) [GI-4-4] which is expected to occur prior to the end of the extended operation to end of 2025. De-tensioning of the Unit 6 LISS nozzles via the heavy water bellows was performed during the P2061 planned outage, which resulted in an increase in the CT-LISS gaps and extended the predicted time to CT-LISS contact to 286 kEFPH, which is still before the end of extended operation to end of 2025 [GI-4-5]. OPG has committed to monitor and manage the critical CT-LISS nozzle gap in the next Unit 6 planned maintenance outage (P2361), as per the Reactor Components and Structure LCMP, outside of the PSR2 process [GI-4-5][GI-4-6].

The earliest predicted time of contact for Unit 7 is 387 kEFPH and for Unit 8 is 292 kEFPH which is expected to be beyond 2026 for both units.

Note: EFPH projections to the end of 2026 have not yet been reflected in the Fuel Channels LCMP as discussed in GI-1.

SECTION 4 – GI-4 PRIORITY DETERMINATION

Safety Significance of Global Issue	Deterministic Considerations			Probabilistic Considerations								Overall Safety Significance Level
	E1 – Defence in Depth	E2 – Safety Significance Level	**Overall Deterministic Considerations**	F1 – Reactor Safety – Core Damage Frequency	F2 – Reactor Safety – Defence In Depth	F3 – Public Radiation Safety	F4 – Plant Operability	F5 – Occupational Radiation Safety	F6 – Emergency Preparedness	F7 – Environment	**Overall Probabilistic Considerations**	
	2	N/A	**2**	4	2	4	2	N/A	N/A	N/A	**2**	**2**

Addressing this Global Issue assures the ongoing fitness for service of reactor components and structures for the operational life of the station. Reactor functions can be impacted by the aged conditions of these components and structures and, as such, assurance of FFS is important for the safe operation of the plant. The main concern with respect to the aging of reactor components and structures for Pickering 5-8 is the potential for CT-LISS nozzle contact. As discussed in Section 3 of this Global Issue, OPG has an ongoing effective Major Components Program in place to ensure FFS of the reactor components and structures.

Nevertheless, this Global Issue has Safety Significance Level 2 for deterministic considerations with respect to Defence in Depth (E1) since the potential for fretting damage to the CTs or LISS nozzles or PT/CT sag impacts one or more levels of protection such that the safety function capability to protect the defence barrier is questionable (Table E1 of the PSR2 Basis Document). Safety Significance Level (E2) is considered not applicable since this Global Issue can have a direct impact on nuclear safety, whereas E2 primarily relates to issues without a direct impact on nuclear safety. Hence, the overall Safety Significance Level of 2 for deterministic considerations is dictated by the E1 categorization.

With respect to probabilistic considerations, this Global Issue is assigned Safety Significance Level 2 for Defence in Depth (F2). This is because addressing the issues related to Calandria Tube/Liquid Injection Shutdown System nozzle gap or active aging mechanisms will prevent a potential adverse impact on the reactor Shutdown System, preventing a potential loss in the reliability of this system in mitigating events with frequency of approximately 10^{-2}/y. Similarly, the Safety Significance Level with respect to Plant Operability (F4) is also 2, since an extended period of plant shutdown as a result of fitness for service issues is expected to have low probability (less than 0.1). Safety Significance Level 4 is assigned to Core Damage Frequency (F1) and Public Radiation Safety (F3) since this Global Issue has an insignificant impact on these considerations. This Global Issue has no direct impact on the other probabilistic factors, i.e., Occupational Radiation Safety (F5), Emergency Preparedness (F6) and Environment (F7). Therefore, these probabilistic considerations are not applicable.

In summary, both deterministic and probabilistic considerations dictate that this Global Issue has Safety Significance Level 2. As noted, OPG's existing programs address this issue on an ongoing basis to ensure reactor components and structures fitness for service for the operational life of the station.

SECTION 5 – GI-4 RESOLUTION PLAN	
GI-4-RS3	Demonstrate the continued FFS of reactor components and structures for Pickering 5-8 for the extended operating period up to the end of 2026. This includes demonstration that predicted reactor components and structures condition, with identified and planned mitigations, is acceptable for the intended operation. This also includes the required inspection activities to update the CT-LISS nozzle gap assessments and identification of mitigation strategies if CT-LISS contact is predicted within the extended operating period. (Reassessment of IIP Action G04-RS1-06-07.1, G04-RS2-06-08.1 and G04-RS2-06-08.2)

SECTION 6 – GI-4 GLOBAL ISSUE REFERENCES

[GI-4-1] OPG Program, "Integrated Aging Management", N-PROG-MP-0008 R008, July 17, 2020.

[GI-4-2] OPG Program, "Major Components", N-PROG-MA-0025 R003, August 6, 2019.

[GI-4-3] OPG Plan, "Reactor Components & Structures Life Cycle Management Plan", N-PLAN-01060-10003 R020, October 30, 2022.

[GI-4-4] OPG Letter, "Pickering NGS – 2018 Unit 6 Planned Maintenance Outage – Submission of Calandria Tube to Liquid Injection Shutdown System Nozzle Gap Assessment", NK30-CORR-00531-07658, July 30, 2018.

[GI-4-5] OPG Letter, "Pickering NGS – Submission of Fitness for Service Evaluation of Unit 6 Calandria Tubes in Contact with Liquid Injection Shutdown System Nozzles after De-Tensioning", NK30-CORR-00531-08324, October 19, 2021.

[GI-4-6] OPG Correspondence, "Pickering NGS OPG-CNSC PSR2A Meeting Minutes 12 November 2021", P-CORR-00531-22806, November 22, 2021.

B.5 GI-8 COMPLETION / UPDATING OF THE CONDITION ASSESSMENTS

SECTION 1 – GI-8 GLOBAL ISSUE SUMMARY			
The goal of GI-8, Completion/Updating of the Condition Assessments, is to confirm the validity of the Pickering Condition Assessments (CAs) for the piping systems and Commodity Groups for the extended operation period. This Global Issue comprises of one item requiring No Further Action, addressing six PSR2-B Gaps. GI-8 is Safety Significance Level 3 based on deterministic and probabilistic defence-in-depth considerations. All PSR2 CAs have been completed and documented in P-CORR-01060-0798589 [GI-8-1]. No issues were found that impact nuclear safety. OPG has completed the review of existing CA reports for PSR2-B to confirm that the bases for the CA screening, conclusions, recommendations, rationalization and follow-up actions remain valid for the extended operation period to the end of 2026. Additional follow-up actions that are necessary for Pickering 5-8 operation up to the end of 2026 will be tracked and managed as part of station base processes. The PSR2-B review of the existing CA reports identified additional recommendations to address minor gaps which are being tracked as part of station base processes outside of the PSR. Therefore, no further action is required.			
Safety Significance Level:	3	Category:	Programmatic, Analytical

SECTION 2 – GI-8 ASSOCIATED PSR2-B GAPS	
G08-RS1-06-13.3 to G08-RS1-06-13.8	Closed PSR2 IIP Actions G08-RS1-06-13.3 through G08-RS1-06-13.8 are specific to the completion of CAs for commodity groups in PSR2 scope (including XRF) to support Pickering NGS commercial operation to the end of 2024. These actions are grouped together with a common PSR2-B gap for a review of completed CAs and Screening reports for the purpose to confirm that the bases for the screening, conclusions, recommendations, rationalization and follow-up actions are valid for the extended operation of Pickering Units 5 to 8 to the end of 2026. ***Source:*** Reassessment of IIP Actions G08-RS1-06-13.3 to G08-RS1-06-13.8 for extended operation ***Associated Resolution:*** GI-8-NFA1

SECTION 3 – GI-8 BACKGROUND INFORMATION AND RESOLUTION STRATEGY
The adequacy of the CAs for the critical Pickering Units 1, 4 and 5-8 SSCs has been demonstrated through completion and closure of IIP Actions G08-RS1-06-13.1 through G08-RS1-06-13.8 under PSR2. This Global Issue contains PSR2-B gaps related to the condition of the critical Pickering Units 5-8 SSCs for the extended commercial operating period to the end of 2026. All CAs for the SSCs in scope of PSR2 were completed and documented [GI-8-1] per the Aging Management Process [GI-8-2]. The resulting CA recommendations, actions and dispositions were loaded onto the Condition Assessment Recommendations and Actions Management database and are managed in accordance with P-GUID-01060-10001 [GI-8-3]. The ongoing evaluation of the condition of critical SSCs is accomplished through the regular update of CAs.

SECTION 3 – GI-8 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

In support of the extended commercial operation to the end of 2026, OPG has completed the review of existing CA reports and confirmed that the bases for the CA screening, conclusions, recommendations, rationalization and follow-up actions remain valid for the extension of commercial operation to the end of 2026. The scope of the Aging Management reviews performed for reassessment of IIP Actions under G08-RS1-06-13 is:

1. All Commodity Groups (CGs), excluding piping and Non-Containment Civil Structures, filtered to include CGs with at least one equipment tag from Pickering 058 and supporting 014/018 systems and coding Reactor Safety (RS) 1, 2, or 3. The inclusion of RS1, RS2 and RS3 components provides assurance that Systems Important to Safety (SIS) and Safe Operating Envelope (SOE) systems are considered.
2. For Piping CGs, the scope for PSR2-B is same as that for PSR2 defined in P-REP-01060-00010, "Pickering NGS Passive SSC Assessment Piping Screening Report" [GI-8-4].

CGs that were previously screened out in PSR2 were also excluded for PSR2-B.

The PSR2-B CA Reviews Report [GI-8-5] documents the conclusions of the review of 495 in-scope CA Reports, related documentation, and committed actions, and did not identify any significant concerns related to the aging management practices already in place to extend Pickering 5-8 operations to the end of 2026. The review identified additional recommendations to address minor gaps which are being tracked as part of station base processes outside of the PSR. The SSCs within the four piping CGs were also reviewed for PSR2-B and no further actions were identified as being required. Therefore, no further action is required.

SECTION 4 – GI-8 PRIORITY DETERMINATION

Safety Significance of Global Issue	**Deterministic Considerations**			**Probabilistic Considerations**								**Overall Safety Significance Level**
	E1 – Defence in Depth	E2 – Safety Significance Level	**Overall Deterministic Considerations**	F1 – Reactor Safety – Core Damage Frequency	F2 – Reactor Safety – Defence In Depth	F3 – Public Radiation Safety	F4 – Plant Operability	F5 – Occupational Radiation Safety	F6 – Emergency Preparedness	F7 – Environment	**Overall Probabilistic Considerations**	
	3	N/A	**3**	N/A	3	N/A	4	N/A	N/A	N/A	**3**	**3**

Addressing this Global Issue assures the CAs for various systems and components demonstrates fitness for service and good operating condition for the extended commercial operating period. Safety functions can be impacted by the aged conditions of SSCs important to plant safety and, as such, completion of their CA will identify required actions to ensure the equipment remains in good condition for the extended commercial operating period. As discussed in Section 3 of this Global Issue, OPG has reviewed the completed CAs to confirm that the results of PSR2 assessments remain valid for the extended operation to the end of 2026.

SECTION 4 – GI-8 PRIORITY DETERMINATION

Defence in Depth (E1) is assigned Safety Significance Level 3 on the basis that the issue is related to SSCs are associated with accident prevention and mitigation. Safety Significance Level (E2) is considered not applicable because this Global Issue can have a direct impact on nuclear safety, whereas E2 primarily relates to issues without a direct impact on nuclear safety. Hence, the overall Safety Significance Level of 3 for deterministic considerations is dictated by the E1 categorization.

With respect to probabilistic considerations, this Global Issue is assigned Safety Significance Level 3 with respect to Table F2 in the PSR2 Basis Document. This is because the issue is related to the reliability of SSCs. The Safety Significance Level with respect to Plant Operability (F4) is 4, since it may to lead to some loss of operating margin.

This Global Issue has no impact on the other probabilistic considerations, i.e., to Core Damage Frequency (F1), Public Radiation Safety (F3), Occupational Radiation Safety (F5), Emergency Preparedness (F6) and Environment (F7). Therefore, these considerations are not applicable.

In summary, both deterministic and probabilistic considerations dictate that this Global Issue has Safety Significance Level 3. As noted, OPG's existing programs address this issue on an ongoing basis to ensure the CAs are completed and updated and the SSCs in scope are being monitored through system health reporting performed on their respective systems.

SECTION 5 – GI-8 RESOLUTION PLAN

GI-8-NFA1	OPG has completed the review of existing CA reports for all Commodity Groups in PSR2 (excluding piping and non-Containment civil structures) for PSR2-B in P-REP-01060-00023 [GI-8-5]. The review confirmed that the bases for the CA screening, conclusions, recommendations, rationalization and follow-up actions remain valid for the extended operation of Pickering 5-8 up to the end of 2026. The PSR2-B review of the existing CA reports identified additional recommendations to address minor gaps which are being tracked as part of station base processes outside of the PSR. Therefore, no further action is required. (Reassessment of IIP Actions G08-RS1-06-13.3 to G08-RS1-06-13.8)

SECTION 6 – GI-8 GLOBAL ISSUE REFERENCES

[GI-8-1] OPG Correspondence, "Supporting Documentation for the Completion of G08-RS1-06-13 and G43-RS3-06-31", P-CORR-01060-0798589, November 4, 2019.

[GI-8-2] OPG Procedure, "Aging Management Process", N-PROC-MP-0060 R007, May 3, 2022.

[GI-8-3] Pickering Guideline, "Condition Assessment Recommendations and Actions Management", P-GUID-01060-10001 R001, October 29, 2018.

[GI-8-4] OPG Report, "Pickering NGS Passive SSC Assessment Piping Screening Report", P-REP-01060-00010 R000, June 17, 2019.

[GI-8-5] OPG Report, "Pickering Periodic Safety Review 2-B: Condition Assessment Reviews Report", P-REP-01060-00023 R000, March 15, 2023.

B.6 GI-15 GOVERNANCE ISSUES

SECTION 1 – GI-15 GLOBAL ISSUE SUMMARY			
The goal of GI-15, Governance Issues, is to ensure that Gaps relating to various Governance issues are addressed for the extended operating period. This Global Issue comprises two items requiring No Further Action and one Acceptable Deviation, addressing three D-PSR gaps: one SF4 EO (recommendation to add Emergency Mitigating Equipment (EME) to the Aging Management (AM) program), one SF11 Gap (completion of documentation updates for alignment with the Provincial Nuclear Emergency Response Plan (PNERP)), and one SF14 EO (compliance with the guidance related to recording of measurements in CSA N288.4-19). GI-15 is Safety Significance Level 4 based on deterministic considerations.			
Safety Significance Level:	4	Category:	Programmatic

SECTION 2 – GI-15 ASSOCIATED PSR2-B GAPS	
D-PSR SF4-EO1	Item 3 under the guidance for Clause 4.3 of REGDOC-2.6.3 provides direction that extends beyond the requirements of the clause by indicating that Structures, Systems and Components (SSCs) relied upon for design extension conditions (i.e., response to Beyond Design Basis Accidents) should also be considered in the aging management (AM) program. Although a number of preventive maintenance predefines have been established for the Emergency Mitigating Equipment (EME), the SSCs credited for design extension conditions are not explicitly addressed in the AM program. This is an EO against guidance for the Aging Management Program. ***Source:*** Code Review for REGDOC-2.6.3, Clause 4.3 Guidance ***Associated Resolutions:*** GI-15-AD3
D-PSR SF11-1	OPG has completed a gap assessment of the Emergency Response Program against the new Provincial Nuclear Emergency Response Plan (PNERP). A number of documentation updates have been identified to align with the PNERP (2017), which are being managed by the documentation update process. The incomplete DCRs are 150884, 150885, 151252, 151253 and 151254. Completion of these updates to OPG and Darlington-specific documentation are required for full compliance with the PNERP (2017). ***Source:*** Code Review for PNERP 2017 ***Associated Resolutions:*** GI-15-NFA3

SECTION 2 – GI-15 ASSOCIATED PSR2-B GAPS	
D-PSR SF14-EO1	Clause 8.4.4.2 of CSA N288.4-19 identifies that "the results of all measurements should be recorded and documented as estimated by the analysis system, not as a censored "less than" value, even if the estimate is below the decision threshold, or is negative". However, based on the review of Environmental Monitoring Program (EMP) related reports, including References N-PROC-OP-0025, "Management of the Environmental Monitoring Programs", NK38-MAN-03443-10002, "Darlington Environmental Monitoring Program", N-MAN-03443-10005, "Environmental Monitoring Programs Quality Assurance Manual", and N-GUID-03443-10001, "Service Level Agreement: Provision of Environmental Sample Collection And Analysis For Environment Operations Support", no evidence was found to demonstrate that this guidance has been addressed in OPG programs. Therefore, this is identified as an EO against non-mandatory guidance. ***Source:*** Code Review for CSA N288.4-19, Clause 8.4.4.2 ***Associated Resolutions:*** GI-15-NFA4

SECTION 3 – GI-15 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

This Global Issue consists of one SF4 EO, one SF11 Gap and one SF14 EO.

D-PSR SF4-EO1: The guidance for Clause 4.3 of REGDOC-2.6.3 provides direction that extends beyond the requirements of the clause by indicating that SSCs relied upon for design extension conditions (i.e., response to Beyond Design Basis Accidents) should also be considered in the aging management (AM) program. Although a number of testing and preventive maintenance processes have been established for EME in N-INS-03600-10002, "Beyond Design Basis Emergency Mitigating Equipment Testing and Maintenance Process" [GI-15-1], the SSCs credited for design extension conditions are not explicitly identified/addressed in the Aging Management Program. This is a very low safety significance issue since the EME is already being managed and maintained under a dedicated process outside of the Aging Management Program.

D-PSR Gap SF11-1: OPG completed a gap assessment of the Emergency Response Program against the new Provincial Nuclear Emergency Response Plan (PNERP). This assessment identified several minor documentation updates to align with the PNERP (2017), which are being managed by the documentation update process. The associated DCRs have been approved in Asset Suite. DCRs 150884, 151253, and 151254 have been incorporated into affected documentation applicable to PNGS (e.g., P- and N- documents). The remaining updates in approved DCRs 150885 and 151252 have not been incorporated and are applicable to documents that apply fleetwide.

D-PSR SF14-EO1: SF14-EO1 was created to document that initial reviews as part of the D-PSR process could not identify any evidence to demonstrate that the guidance in Clause 8.4.4.2 of CSA N288.4-19 has been reflected in OPG programs. Subsequent reviews identified information which demonstrates compliance with the intent of this clause. Clause 8.4.4.2 of CSA N288.4-19 identifies that "the results of all measurements should be recorded and documented as estimated by the analysis system, not as a censored "less than" value, even if the estimate is below the decision threshold, or is negative". Section 14.2 of the N-GUID-03443-10001, "Service Level Agreement: Provision of Environmental Sample Collection and Analysis for Environment Operations Support" [GI-15-2], states that, "Results that are measured below the detection limits for the method will be reported as measured, with the understanding that they are subject to a very high relative uncertainty". Therefore, the intent of Clause 8.4.4.2 of N288.4-19 is met and no further action is required.

SECTION 4 – GI-15 PRIORITY DETERMINATION

Safety Significance of Global Issue	Deterministic Considerations			Probabilistic Considerations								Overall Safety Significance Level
	E1 – Defence in Depth	E2 – Safety Significance Level	**Overall Deterministic Considerations**	F1 – Reactor Safety – Core Damage Frequency	F2 – Reactor Safety – Defence In Depth	F3 – Public Radiation Safety	F4 – Plant Operability	F5 – Occupational Radiation Safety	F6 – Emergency Preparedness	F7 – Environment	**Overall Probabilistic Considerations**	
	N/A	4	**4**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	**4**

This Global Issue includes minor issues related to governance documentation updates.

Regarding deterministic considerations, this Global Issue is not associated with a physical barrier, so Defence in Depth (E1) is not applicable. Safety Significance Level (E2) is assigned Safety Significance Level 4 (Very Low) for SF4-EO1 since the EME is being already managed and maintained under a dedicated process [GI-15-1]. Other gaps in this Global Issue have been assessed as No Further Action required.

With respect to probabilistic considerations, this Global Issue has no impact on Core Damage Frequency (F1) or Defence in Depth (F2), Public Radiation Safety (F3), Plant Operability (F4), Occupational Radiation Safety (F5), Emergency Preparedness (F6) or Environment (F7) as the gap (SF4-EO1) is related to OPG governance/programs.

In summary, the overall Safety Significance Level for this Global Issue is 4.

SECTION 5 – GI-15 RESOLUTION PLAN

GI-15-AD3	The guidance for Clause 4.3 of REGDOC-2.6.3 provides a non-mandatory direction that extends beyond the requirements of the clause by indicating that SSCs relied upon for design extension conditions (i.e., response to Beyond Design Basis Accidents) should also be considered in the aging management (AM) program. Testing and preventive maintenance processes have been established for the Emergency Mitigating Equipment (EME) in N-INS-03600-10002, "Beyond Design Basis Emergency Mitigating Equipment Testing and Maintenance Process" [GI-15-1]. This is a very low safety significance documentation/governance issue, and therefore, it is assessed as an Acceptable Deviation. (D-PSR SF4-EO1).

SECTION 5 – GI-15 RESOLUTION PLAN	
GI-15-NFA3	The necessary documentation changes required to ensure the Emergency Response Program is aligned with the 2017 Provincial Nuclear Emergency Response Plan (PNERP) are minor updates which are already flagged under the following approved DCRs: • DCR150884 changes reference for Primary Zone Map to Pickering Nuclear Detailed & Contingency Zones Map; • DCR150885 changes reference to Primary Zone in Appendix C to Detailed Planning Zone; • DCR151253 is to replace "Emissions" with "Release" to align with PNERP (2017); • DCR151252 will revise Appendix E to align with revised Consolidated Nuclear Emergency Plan (CNEP) Appendix A and replace "Nuclear Installation" with "Reactor Facility"; and • DCR151254 will add references to Evacuation Time Estimates in CNEP. DCRs 150884, 151253, and 151254 has been incorporated into affected documentation applicable to PNGS. The remaining work (DCRs 150885 and 151252) is in progress and can be managed outside of PSR2-B. No further action is required in PSR2-B. (D-PSR SF11-1)
GI-15-NFA4	The intent of Clause 8.4.4.2 of CSA N288.4-19 is met by the discussion on reporting of analytical results in Section 14.2 of N-GUID-03443-10001 [GI-15-2]. No further action is required. (D-PSR SF14-EO1)

SECTION 6 – GI-15 GLOBAL ISSUE REFERENCES

[GI-15-1] OPG Instructions, "Beyond Design Basis Emergency Mitigating Equipment Testing and Maintenance Process", N-INS-03600-10002 R000, February 15, 2017.

[GI-15-2] OPG Guideline, "Service Level Agreement: Provision of Environmental Sample Collection And Analysis For Environment Operations Support", N-GUID-03443-10001 R002, December 18, 2015.

B.7 GI-16 CONCESSION RELATED TO N285.5-M90

SECTION 1 – GI-16 GLOBAL ISSUE SUMMARY

The goal of GI-16, Concession Related to N285.5-M90, is to confirm that concessions granted from CNSC for compliance with CSA N285.5, "Periodic Inspection of CANDU Nuclear Power Plant Containment Components" remain valid for Pickering 5-8 operation to the end of 2026. This Global Issue comprises one Acceptable Deviation, addressing one D-PSR Gap related to the concessions granted from the CNSC for compliance with CSA N285.5.

GI-16 is Safety Significance Level 4 based on deterministic defence-in-depth considerations.

Pickering is currently in compliance with CSA N285.5-08 Update No. 1, with the exception of Clauses (including the sub-clauses) 7.1, 7.5, 7.7, 9.2.2, 9.2.5, 9.3.1, 9.3.2, 9.3.3, 9.3.4 and Table 4, for which compliance with CSA N285.5-18 is a requirement under Licence Condition 6.1 in the Pickering Licence Conditions Handbook [GI-16-1].

Note, this gap was also identified in PSR2 and was assessed in the PSR2 GAR. This review has confirmed that the assessment, results and the conclusions of the PSR2 assessment for this issue remain valid for Pickering 5-8 extended operation to the end of 2026.

Safety Significance Level:	4	Category:	Programmatic

SECTION 2 – GI-16 ASSOCIATED PSR2-B GAPS

D-PSR SF2-7	There were a number of concessions granted from the CNSC for compliance with CSA N285.5. These concessions, identified within the compliance matrix table in Appendix F of the PIP Plan, represent gaps against N285.5-18 as they cannot be assured on a continuing basis for the period of D-PSR. ***Source:*** Code Review for CSA N285.5-18 ***Associated Resolutions:*** GI-16-AD1

SECTION 3 – GI-16 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

This Global Issue contains one D-PSR SF2 Gap related to the concessions granted by the CNSC for compliance with N285.5-M90 for Clauses 4.5.1, 8.4.2.1, 8.4.2.2 and 8.6.5, and whether they are affected by Pickering operation beyond 2024. Per Licence Condition 6.1 in the Pickering Licence Conditions Handbook [GI-16-1], Pickering is required to comply with CSA N285.5-08 Update No. 1, with the exception of Clauses 7.1, 7.5, 7.7, 9.2.2, 9.2.5, 9.3.1, 9.3.2, 9.3.3, 9.3.4 and Table 4, for which compliance with CSA N285.5-18 is a licence requirement. The issue of CNSC concessions for N285.5-13 was assessed for PSR2 in P-REP-03680-00004 [GI-16-2] which addressed Clauses 4.5.1, 8.4.2.1, 8.4.2.2, 8.5.2.2, and 8.6.3.

The D-PSR SF2 Gap is related to the following equivalent clauses in N285.5-08 Update No. 1:

a) Clause 4.5.1 for the inspection of components deemed inaccessible states that the design and arrangement of components and piping shall provide for clearance to permit the inspections required by the Standard.

The Pickering PIPs [GI-16-3] [GI-16-4] [GI-16-5] acknowledge that in some instances, items are deemed inaccessible and do not permit the inspections required by the Standard. As per the PIPs, the following measures are in place to manage situations of this nature:

> *Where there is no or limited access for inspection of a selected component, the inspection will be completed to the extent possible and full credit for the inspection will be taken for that inspection interval.*
>
> *Comments on the accessibility and completeness of inspection will be included in the inspection report. Inaccessible or non-existent items will be reported in the inspection report and evaluated for impacts. Program document impacts, if any, will be incorporated in the Program document revision.*

b) Clauses 8.4.2.1 and 8.4.2.2 regarding the areas of components that are subject to visual examination. Clause 8.4.2.1 requires that in conducting visual inspections, "the inspection area shall include all areas of the component that are accessible without dismantling. The removal of insulation patches or access covers shall not be considered as dismantling of equipment." Clause 8.4.2.2 requires that supports be visually inspected, and that the inspection area of a support shall include the whole support.

   The Pickering PIPs [GI-16-3] [GI-16-4] [GI-16-5] describe the concession and alternative measures taken to address these requirements:

   > *In the absence of any visible damage to the removable or fixed insulation adjacent to the support, insulation will not be removed for periodic inspection, except where removal is necessary in order to perform non-visual examinations of attachment welds. Where insulation is not removed, a partial visual inspection of the support will be performed and the penetration of the support through the insulation will be examined for signs of damage/deterioration that could indicate a potential degradation of the support. If such damage/deterioration is observed, the insulation will be removed and the suspect area will be fully inspected.*

   The basis for this concession is that serious degradation of the support would be evident through damage to the insulation due to the relative movement between the components involved.

c) Clause 8.6.3 regarding components that require dismantling for examination requires that "when the inspection of a component would normally necessitate the dismantling of equipment, the required periodic inspection should be performed when the equipment has been dismantled for other reasons, e.g., maintenance. The detachment of access covers or removable insulation shall not be considered as dismantling."

   The compliance matrix in the Pickering PIPs [GI-16-3] [GI-16-4] [GI-16-5] do not take exception to this clause. The D-PSR Gap originated from a concession relating to the removal of insulation, as opposed to dismantling of equipment. The concession related to removal of insulation is discussed above with respect to Clause 8.4.2.1 and 8.4.2.2.

The OPG position with respect to concessions to clauses of N285.5-08 Update No. 1, including the clauses discussed above, is stated in the PIPs as an exception to the requirements with alternative measures provided. The CNSC has agreed to the rationale for the variances to the Standard and has accepted the alternate practices described in the PIPs (P-CORR-00531-04186 [GI-16-6]). The justification for these variances is not impacted by the duration of the extended operations period. OPG intends to continue to identify these clauses as compliance concessions in the PIPs. Pickering inspection history and OPEX have not indicated any adverse condition or raised any concern regarding these concessions. OPG will request continued acceptance by the CNSC of partial compliance to these clauses. Therefore, this issue is assessed as an Acceptable Deviation.

SECTION 4 – GI-16 PRIORITY DETERMINATION

Safety Significance of Global Issue	Deterministic Considerations			Probabilistic Considerations								Overall Safety Significance Level
	E1 – Defence in Depth	E2 – Safety Significance Level	**Overall Deterministic Considerations**	F1 – Reactor Safety – Core Damage Frequency	F2 – Reactor Safety – Defence In Depth	F3 – Public Radiation Safety	F4 – Plant Operability	F5 – Occupational Radiation Safety	F6 – Emergency Preparedness	F7 – Environment	**Overall Probabilistic Considerations**	
	4	N/A	**4**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	**4**

Resolution of this Global Issue will confirm applicability of a previously approved concession related to periodic inspection of Containment components.

Regarding deterministic considerations, Defence in Depth (E1) has Safety Significance Level 4 on the basis that no safety function is impacted by the issue. The Safety Significance Level determined from Table E2 in the PSR2 Basis Document is not applicable. The overall significance level for deterministic considerations is 4.

Regarding probabilistic considerations, this Global Issue has no impact on Core Damage Frequency (F1) or Defence in Depth (F2), nor does it impact Public Radiation Safety (F3), Plant Operability (F4), Occupational Radiation Safety (F5), Emergency Preparedness (F6) or the Environment (F7). Therefore, probabilistic considerations are not applicable.

In summary, the overall Safety Significance Level is 4.

SECTION 5 – GI-16 RESOLUTION PLAN

GI-16-AD1	Concessions to several clauses of CSA N285.5-08 Update No. 1 are identified in the Pickering PIPs for Containment Components (P-PIP-03642.2-00001 [GI-16-3], NA44-PIP-03642.2-00001 [GI-16-4], and NK30-PIP-03642.2-00001 [GI-16-5]) and justification is provided in the appendices of the PIPs. The concessions are for Clauses 4.1(a), 4.5.1, 4.5.2, 5.3(b), 8.4.2.1, 8.4.2.2, and 8.6.1. Alternative measures have been accepted by the CNSC in P-CORR-00531-04186 [GI-16-6], and the rationale for these variances is not impacted by the duration of the extended operations period. OPG intends to continue to identify these clauses as compliance concessions in the PIPs. Pickering inspection history and OPEX have not indicated any adverse condition or raised any concern regarding these concessions. OPG will request continued acceptance by the CNSC of partial compliance to these clauses. As per the very low safety significance (Safety Significance Level 4), this is assessed as an Acceptable Deviation. (D-PSR SF2-7)

SECTION 6 – GI-16 GLOBAL ISSUE REFERENCES

[GI-16-1] CNSC, "Pickering Nuclear Generating Station, Licence Conditions Handbook", LCH-PR-48.00/2028 R005, February 24, 2023.

[GI-16-2] OPG Report, "Pickering NGS Periodic Safety Review 2: Codes and Standard Reviews for Safety Factor 2 (Actual Condition of SSCs), 3 (Equipment Qualification) and 4 (Aging)", P-REP-03680-00004, July 13, 2016.

[GI-16-3] OPG Plan, "Pickering Nuclear Generating Station Periodic Inspection Program for Unit 0 Containment Components", P-PIP-03642.2-00001 R003, July 31, 2012.

[GI-16-4] OPG Plan, "Pickering Nuclear Generating Station 'A' Periodic Inspection Program for Containment Components", NA44-PIP-03642.2-00001 R002, July 31, 2012.

[GI-16-5] OPG Plan, "Pickering Nuclear Generating Station 'B' Periodic Inspection Program for Containment Components", NK30-PIP-03642.2-00001 R003, July 31, 2012.

[GI-16-6] CNSC Letter, "Transition to 2008 Edition of CSA Standard N285.5 Update No. 1 – Periodic Inspection of CANDU Nuclear Power Plant Containment Components Submission of Periodic Inspection Programs", P-CORR-00531-04186, November 14, 2012.

B.8 GI-19 FITNESS FOR SERVICE OF CONTAINMENT FOR THE EXTENDED OPERATING PERIOD

SECTION 1 – GI-19 GLOBAL ISSUE SUMMARY			
The goal of GI-19, FFS of Containment for the Extended Operating Period, is to ensure that the safety-significant civil structures of Containment remain fit for service for the extended operating period. This Global Issue comprises one item assessed as requiring No Further Action, addressing one D-PSR Gap. GI-19 is Safety Significance Level 4 based on deterministic considerations. OPG has completed a steel pile assessment for the entire Pickering site and demonstrated FFS to the end of 2028 [GI-19-1].			
Safety Significance Level:	4	Category:	Analytical

SECTION 2 – GI-19 ASSOCIATED PSR2-B GAPS	
D-PSR SF4-11	A review of open IIP actions associated with National Building Code of Canada (2005) compliance reviews identified an instance where the resolution is not complete. The corresponding IIP Item number and associated tracking number is IIP-OI 058 (AR# 28175343-01). Since this IIP Item has not been closed, this has been identified as a D-PSR gap. ***Source:*** Review of IIP actions from D-ISR ***Associated Resolutions:*** GI-19-NFA2

SECTION 3 – GI-19 BACKGROUND INFORMATION AND RESOLUTION STRATEGY
D-PSR Gap SF4-11 is related to open Darlington NGS IIP actions associated with previous compliance reviews performed against the National Building Code of Canada (2005) where the resolution has progressed but is not complete. This IIP item was raised in response to D-ISR issues related to managing the potential for corrosion of steel foundation piles during the remainder of the station's operating life. Closure of this IIP item requires OPG to complete a comprehensive site-specific assessment which provides thorough information on the potential for pile corrosion at the Darlington site. The need to complete a similar assessment for Pickering NGS was identified as PSR2 Gap COP-25, which was resolved through Resolution Statement G19-RS1-06-18. OPG completed a steel pile assessment for the entire Pickering site and demonstrated FFS to the end of 2028 [GI-19-1]. The assessment concluded that the potential for corrosion has been found to have a negligible impact on the structural integrity of the Pickering NGS Reactor Buildings, Vacuum Building, and Pressure Relief Duct foundation steel H-Piles, to the end of 2028. OPG further demonstrated that the steel H-Piles of the Pickering 5-8 Reactor Buildings, taking into account the conservative estimate of corrosion, will withstand the loading due to a Design Basis Earthquake with an acceptable Factor of Safety [GI-19-2]. As a result, the CNSC accepted closure of the associated PSR2 IIP Action [GI-19-3]. OPG subsequently submitted [GI-19-4] a series of additional assessments to address CNSC questions and further demonstrate FFS to the end of 2028 [GI-19-5] [GI-19-6] [GI-19-7].

SECTION 4 – GI-19 PRIORITY DETERMINATION

Safety Significance of Global Issue	Deterministic Considerations			Probabilistic Considerations								Overall Safety Significance Level
	E1 – Defence in Depth	E2 – Safety Significance Level	**Overall Deterministic Considerations**	F1 – Reactor Safety – Core Damage Frequency	F2 – Reactor Safety – Defence In Depth	F3 – Public Radiation Safety	F4 – Plant Operability	F5 – Occupational Radiation Safety	F6 – Emergency Preparedness	F7 – Environment	**Overall Probabilistic Considerations**	
	4	N/A	**4**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**4**	**4**

This Global Issue comprises one D-PSR Gap related to the demonstration of FFS of steel piles for the operational life of the station.

Regarding deterministic considerations, Defence in Depth (E1) is assigned Safety Significance Level 4 since OPG has demonstrated FFS of the steel piles for the entire Pickering site to the end of 2028, therefore there is no impairment of the Containment barrier (column 1, fourth row of Table E1 in the PSR2 Basis Document). Safety Significance Level (E2) is assessed as not applicable because this Global Issue can have a direct nuclear safety impact, whereas E2 primarily relates to issues without a direct impact on nuclear safety. The overall Safety Significance Level for deterministic considerations is 4.

Since this gap has been resolved for Pickering, there is no adverse condition that needs to be resolved or poses a challenge with respect to probabilistic considerations. Therefore, probabilistic considerations are not applicable.

In summary, the overall Safety Significance Level is 4 based on deterministic considerations.

SECTION 5 – GI-19 RESOLUTION PLAN

GI-19-NFA2	PSR2 Gap COP-25 was resolved through PSR2 IIP Action G19-RS1-06-18. OPG has completed a steel pile assessment for the entire Pickering site and demonstrated FFS to the end of 2028. Therefore, no further action is required. (D-PSR SF4-11)

SECTION 6 – GI-19 GLOBAL ISSUE REFERENCES

[GI-19-1] OPG Memo, "Pickering NGS Steel Pile Assessment", P-CORR-21000-0751858 R002, November 14, 2019.

[GI-19-2] OPG Letter, "Pickering NGS: Response Related to the Integrated Implementation Plan (IIP) Action Item G19-RS1-06-18.1 on Fitness for Service of Foundation H-Piles", P-CORR-00531-05971, February 28, 2020.

[GI-19-3] CNSC Letter, "Pickering NGS – CNSC staff review of Request for Closure of Periodic Safety Review 2 Integrated Implementation Plan Resolution Action: G19-RS1-06-18, Opening of Action Item 2020-48-21744", P-CORR-00531-06193, October 8, 2020.

SECTION 6 – GI-19 GLOBAL ISSUE REFERENCES

[GI-19-4] OPG Correspondence, "Pickering NGS – Fitness for Service of H-Pile Foundations, CNSC Action Item 2020-48-21744", P-CORR-00531-23112, January 30, 2023.

[GI-19-5] OPG Calculation, "Pickering B – Assessment of Safety Factor of RB Foundation H-Pile", NK30-CALC-21000-00004 R001, December 16, 2022.

[GI-19-6] OPG Memorandum, "Assessment of Pile-to-Cap Connection on Reactor Building Foundation of PNGS-B", NK30-CORR-21000-1078182, December 16, 2022.

[GI-19-7] OPG Report, "Nonlinear Dynamic Analysis of PNGS-B Reactor Building Foundation H-Piles", NK30-REP-21000-00007 R000, December 16, 2022.

B.9 GI-20 GOVERNANCE IMPLEMENTATION / EFFECTIVENESS ISSUES

SECTION 1 – GI-20 GLOBAL ISSUE SUMMARY			
The goal of GI-20, Governance Implementation / Effectiveness Issues, is to ensure that Pickering Governance is effectively implemented for the extended operating period. This Global Issue comprises one Resolution Statement addressing one PSR2-B gap resulting from the CNSC desktop review of OPG's Maintenance and Reliability Program at Pickering. GI-20 is Safety Significance Level 4 based on deterministic considerations. The Resolution Plan comprises of status updates on the implementation of Engineering Change (EC) 132846 for 67138-LT566/LIA566 loop failure detection for Emergency Water System (EWS) Reactor Building (RB) Water Level Measurement. OPG is actively progressing this work and has committed to provide the CNSC with an update by May 19, 2023.			
Safety Significance Level:	4	Category:	Programmatic

SECTION 2 – GI-20 ASSOCIATED PSR2-B GAPS	
AR# 28243283	As per the Action Notice PRPD-2017-022-AN2 initiated in the CNSC report titled "Desktop Review Report: Maintenance and Reliability: PRPD-2017-022" in P-CORR-00531-05281, OPG is to provide updates of the corrective actions and evaluation of their effectiveness in reducing the number of component failures and deficiencies, and component unavailability. ***Source:*** GI Gap Assessment Report Section 5.4 – Regulatory Actions Review ***Associated Resolution***: GI-20-RS1

SECTION 3 – GI-20 BACKGROUND INFORMATION AND RESOLUTION STRATEGY
This Global Issue includes one gap related to implementation of corrective actions to address Action Notices raised by the CNSC during a desktop review of the Maintenance and Reliability Program at Pickering. The objective of the CNSC review was to verify whether the maintenance activities have been executed in a timely manner to maintain acceptable availability and reliability for the selected systems and components. Three Action Notices (AN1, AN2 and AN3) under CNSC Action Item 2017-48-2365 were initiated in the CNSC report titled "Desktop Review Report: Maintenance and Reliability: PRPD-2017-022" in P-CORR-00531-05281 [GI-20-1]. Action Notices AN1 and AN3 have since been closed by the CNSC in P-CORR-00531-05622 [GI-20-2] and P-CORR-00531-05461 [GI-20-3], respectively. Action Notice AN2 remains open as one action is still in progress. *PRPD-2017-022-AN2 – In order to demonstrate compliance with CSA N286-12 Clause 4.9, that the existing corrective actions are effective to reduce the number of repeated component failures and deficiencies, and to reduce the component unavailability, OPG is requested to provide quarterly progress updates of the following corrective actions (if not completed) and evaluation of their effectiveness (if fully or partially completed) in reducing the number of component failures and deficiencies until their effectiveness has been adequately demonstrated, by the end of 2018:* • *Unit 1 and 4 Low Pressure Service Water System*   ○ *Replacement of the remaining 4 emergency pumps and the installation of the new self-lubricating (packing) glands*

SECTION 3 – GI-20 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

- *Overhaul of Class IV service water pumps and motors*
- *Unit 5 & 6 Vault Vapour Recovery System*
  - *Oil seal replacement for dryer fan bearing*
  - *Actions to address 3-way damper passing*
- *Unit 5-8 Emergency Water System*
  - *New check valve replacement*
  - *Implementation of loop failure detection for LIA566*
- *Unit 5-8 Emergency Power Generators*
  - *Progress of the major EPG 1 and 2 work during the planned EPG outage in 2017 and 2018 to reduce the EPGs unavailability in long term*

Action Request AR# 28243283 documents a REGM action that OPG undertook to provide the CNSC with an update on Action Notice AN2 of CNSC Action Item 2017-48-12365 by May 20, 2022, as outlined in Attachment 2 of P-CORR-00531-22603 [GI-20-4]. OPG provided an update on AN2 in P-CORR-00531-22913 [GI-20-5] and undertook REGM AR# 28252308 to provide a further update by May 19, 2023. The only outstanding action pertains to the implementation of loop failure detection for the Emergency Water System (EWS) level indicator (67318-LIA566) for Units 5, 6 and 8.

SECTION 4 – GI-20 PRIORITY DETERMINATION

Safety Significance of Global Issue	**Deterministic Considerations**			**Probabilistic Considerations**								**Overall Safety Significance Level**
	E1 – Defence in Depth	E2 – Safety Significance Level	**Overall Deterministic Considerations**	F1 – Reactor Safety – Core Damage Frequency	F2 – Reactor Safety – Defence In Depth	F3 – Public Radiation Safety	F4 – Plant Operability	F5 – Occupational Radiation Safety	F6 – Emergency Preparedness	F7 – Environment	**Overall Probabilistic Considerations**	
	4	N/A	**4**	N/A	4	N/A	N/A	N/A	N/A	N/A	**N/A**	**4**

Addressing this Global Issue assures the maintenance activities have been executed to maintain acceptable availability and reliability for the components identified in CNSC review [GI-20-1].

This Global Issue has Safety Significance Level 4 for deterministic considerations with respect to Defence in Depth (E1), "the issue does not impair capability to protect the safety barriers for any design basis accident sequences". The Safety Significance Level from Table E2 is not applicable. The overall significance level for deterministic considerations is 4.

This Global Issue has no direct impact on the probabilistic considerations, i.e., Core Damage Frequency (F1) (issue does not lead to a reduction of the CDF), Public Radiation Safety (F3), Plant Operability (F4), Occupational Radiation Safety (F5), Emergency Preparedness (F6) and Environment (F7). The resolution of the issue relating to LT566 could enhance safety margin on a parameter of SIS for DBA ($<10^{-3}$/y). Therefore, F2 is assigned Safety Significance Level 4.

In summary, the overall Safety Significance Level is 4.

SECTION 5 – GI-20 RESOLUTION PLAN	
GI-20-RS1	Complete Regulatory Management action (AR# 28252308) for providing a status update on Action Notice AN2 of CNSC Action Item 2017-48-12365 and continue to provide future status updates until field implementation of Engineering Change (EC) 132846 for 67138-LT566/LIA566 loop failure detection for EWS RB Water Level Measurement is complete. OPG is actively progressing this work and has committed to provide the CNSC with an update by May 19, 2023.

SECTION 6 – GI-20 GLOBAL ISSUE REFERENCES

[GI-20-1] CNSC Letter, "Pickering NGS: CNSC Compliance Verification Activity: Pickering Maintenance and Equipment Reliability – Action Item 2017-48-12365", P-CORR-00531-05281, January 24, 2018.

[GI-20-2] CNSC Letter, "Pickering NGS – CNSC Staff Review of OPG Response to Action Item 2017-48-12365 (AN1 and AN2)", P-CORR-00531-05622, January 24, 2019.

[GI-20-3] CNSC Letter, "Pickering NGS – CNSC Staff Review of OPG Response to Action Item 2017-48-12365 and Closure of Action Item 2014-4-4856", P-CORR-00531-05461, July 26, 2018.

[GI-20-4] OPG Letter, "Pickering NGS: Update on Action Notice AN2 CNSC Action Item 2017-48-12365, Pickering Maintenance and Equipment Reliability", P-CORR-00531-22603, May 20, 2021.

[GI-20-5] OPG Letter, "Pickering NGS: Status Update on Action Notice AN2 of CNSC Action Item 2017-48-12365, Pickering Maintenance and Equipment Reliability PRPD-2017-022", P-CORR-00531-22913, May 19, 2022.

B.10 GI-24 SAFETY ANALYSIS TO SUPPORT THE EXTENDED OPERATING PERIOD

SECTION 1 – GI-24 GLOBAL ISSUE SUMMARY			
The goal of GI-24, Safety Analysis to Support the Extended Operating Period, is to demonstrate the adequacy of the safety margins of the plant with aged HTS conditions covering the extended commercial operating period. This Global Issue has one proposed Resolution Statement addressing four PSR2-B gaps. GI-24 is Safety Significance Level 2 based on deterministic considerations. The Resolution Plan requires updating the aging safety analysis model and to perform the required deterministic safety analysis. Completion of the Resolution Plan will support and strengthen Levels 2 and 3 defence-in-depth for the extended commercial operating period.			
Safety Significance Level:	2	Category:	Analytical

SECTION 2 – GI-24 ASSOCIATED PSR2-B GAPS	
G24-RS1-04-19.5	The Pickering 5-8 HTS aged thermal hydraulic model was developed for a target End of Life (EOL) at 12,200 EFPD (292.8 kEFPH) which is beyond the end of 2024 for the most limiting Pickering 5-8 unit, Unit 6. Based on current estimates, most of the Pickering 5-8 units are expected to exceed 12,200 EFPD before the end of 2026, hence the models may not support operation up to the end of 2026. Therefore, this is a PSR2-B gap. ***Source:*** Reassessment of IIP Action G24-RS1-04-19.5 ***Associated Resolution Statement:*** GI-24-RS2
G24-RS1-04-19.6	The Pickering 5-8 HTS aged thermal hydraulic model has been developed for a target EOL at 12,200 EFPD (292.8 kEFPH) which is beyond the end of 2024 for the most limiting Pickering 5-8 unit, Unit 6. Based on current estimates, most of the Pickering 5-8 units are expected to exceed 12,200 EFPD before the end of 2026. The current HTS aging safety analysis for LOF do not account for Pickering 5-8 operation up to the end of 2026. Therefore, this is a PSR2-B gap. ***Source:*** Reassessment of IIP Action G24-RS1-04-19.6 ***Associated Resolution Statement:*** GI-24-RS2
G24-RS1-04-19.7	The Pickering 5-8 HTS aged thermal hydraulic models have been developed for a target EOL at 12,200 EFPD (292.8 kEFPH) which is beyond the end of 2024 for the most limiting Pickering 5-8 unit, Unit 6. Based on current estimates, most of the Pickering 5-8 units are expected to exceed 12,200 EFPD before the end of 2026. The current HTS aging safety analysis for SBLOCA do not account for Pickering 5-8 operation up to the end of 2026. Therefore, this is a PSR2-B gap. ***Source:*** Reassessment of IIP Action G24-RS1-04-19.7 ***Associated Resolution Statement:*** GI-24-RS2

SECTION 2 – GI-24 ASSOCIATED PSR2-B GAPS	
G24-RS1-04-19.8	The Pickering 5-8 HTS aged thermal hydraulic models have been developed for a target EOL at 12,200 EFPD (292.8 kEFPH) which is beyond the end of 2024 for the most limiting Pickering 5-8 unit, Unit 6. Based on current estimates, most of the Pickering 5-8 units are expected to exceed 12,200 EFPD before the end of 2026. The current HTS aging safety analysis for NOP do not account for Pickering 5-8 operation up to the end of 2026. Therefore, this is a PSR2-B gap. ***Source:*** Reassessment of IIP Action G24-RS1-04-19.8 ***Associated Resolution Statement:*** GI-24-RS2

SECTION 3 – GI-24 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

This Global Issue contains four Gaps related to safety analysis of aged HTS conditions.

The HTS aging safety analysis models for Pickering NGS Units 5 to 8 were updated on February 21, 2019 and documented in [GI-24-1]. CNSC staff have reviewed Heat Transport aging analysis and the TUF Thermal-Hydraulics Computer Program validation basis per Attachment 1 of [GI-24-2] and accepted G24-RS1-04-19.5 as closed on June 29, 2020 [GI-24-2]. The HTS aging safety analyses for Units 5-8 were updated [GI-24-3], [GI-24-4] and [GI-24-5] and the associated IIP Resolution Action G24-RS1-04-19 was accepted as closed in November 2020 [GI-24-6].

The current Pickering Units 5 to 8 HTS aging thermal hydraulic models are valid to a target EOL at 12,200 Equivalent Full Power Days (EFPD) (292.8 kEFPH). Based on current estimates [GI-24-7], most of the Pickering 5-8 units are expected to exceed 12,200 EFPD before the end of 2026. Therefore, HTS aging safety analysis models and the safety analysis of the events most impacted by aging (SBLOCA, LOF and Neutron Overpower (NOP)) may require updating to support extended operation to the end of 2026.

In 2022, operations at Pickering indicated that there is an increasing trend in the Reactor Inlet Header (RIH) temperature. Updated safety analysis was performed to support operation at 100% Full Power with a higher High Transport Low Pressure (HTLP) setpoint, which will be implemented via a design change that is currently underway for both SDS1 and SDS2. OPG recognizes that the current HTS aging analysis for 12,200 EFPD may not bound operation of Pickering 5-8 to the end of 2026 and is planning to update the safety analyses to cover future aged conditions [GI-24-8].

SECTION 4 – GI-24 PRIORITY DETERMINATION

Safety Significance of Global Issue	Deterministic Considerations			Probabilistic Considerations								Overall Safety Significance Level
	E1 – Defence in Depth	E2 – Safety Significance Level	**Overall Deterministic Considerations**	F1 – Reactor Safety – Core Damage Frequency	F2 – Reactor Safety – Defence In Depth	F3 – Public Radiation Safety	F4 – Plant Operability	F5 – Occupational Radiation Safety	F6 – Emergency Preparedness	F7 – Environment	**Overall Probabilistic Considerations**	
	N/A	2	**2**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	**2**

Resolution of this Global Issue will ensure that deterministic safety analysis accounts for aging effects for the operational life of the station, confirming that deterministic safety analysis acceptance criteria continue to be met when aging effects are accounted for. The ongoing safety analysis program updates the relevant accident analysis to account for aging effects, as well as any physical or operational enhancements that mitigate the effects of aging on safety margins. OPG will ensure that the Pickering safety analysis accurately accounts for the aging effects of the Heat Transport System.

Regarding deterministic considerations, this Global Issue pertains to analysis and is not directly related to any physical barriers. Therefore, this Global Issue is not directly applicable to Defence in Depth (E1). For Safety Significance Level (E2), updating the safety analysis to account for aging effects over the operational life of the station will confirm the adequacy of safety margins. Based on past experience, future updates of the safety analysis may identify some potential reduction in margin. Table E2 in the PSR2 Basis Document associates "some reduction in margin" with Safety Significance Level 2. Consequently, the overall Safety Significance Level for deterministic considerations is 2.

This Global Issue has no direct impact on the probabilistic considerations, i.e., Core Damage Frequency (F1), Defence in Depth (F2), Public Radiation Safety (F3), Plant Operability (F4), Occupational Radiation Safety (F5), Emergency Preparedness (F6) and Environment (F7). Therefore, the probabilistic considerations are not directly applicable to this issue.

In summary, deterministic considerations dictate that this Global Issue has a Safety Significance Level of 2. The ongoing safety analysis program [GI-24-8] identifies potential aging impacts and addresses them in advance of potential adverse effects on safety margins.

SECTION 5 – GI-24 RESOLUTION PLAN

GI-24-RS2	Update the Heat Transport System (HTS) aging safety analysis models and perform the required safety analysis of events most impacted by aging (Small Break Loss of Coolant Accident (SBLOCA), Loss of Flow (LOF) and Neutron Overpower (NOP)) to support extended operation for Pickering 5-8. (Reassessment of IIP Actions G24-RS1-04-19.5, G24-RS1-04-19.6, G24-RS1-04-19.7, G24-RS1-04-19.8)

SECTION 6 – GI-24 GLOBAL ISSUE REFERENCES

[GI-24-1] OPG Report, "Development of 12200 EFPD TUF Aged Models for Pickering NGS B", NK30-REP-03500-0736983 R001, June 26, 2019.

[GI-24-2] CNSC Letter, "Pickering NGS, Update on CNSC staff review of the OPG submissions related to the Integrated Implementation Plan (IIP) actions: G24-RS1-04-19.5, G24-RS1-04-19.6, G24-RS1-04-19.7 and G24-RS1-04-19.8", P-CORR-00531-06080, June 29, 2020.

[GI-24-3] OPG Report, "Pickering Units 5-8 Loss of Flow Trip Effectiveness Assessments for Operation up to 12200 EFPD", N-REP-03500-0766071, June 26, 2019.

[GI-24-4] OPG Report, "Pickering Units 5-8 Small Break Loss of Coolant Accidents Trip Effectiveness Assessments for Operation up to 12200 EFPD", N-REP-03500-0766072, June 26, 2019.

[GI-24-5] OPG Report, "Pickering Units 5 to 8 NOP Analysis for 12200 EFPD", NK30-REP-03100-0772425, June 20, 2019.

[GI-24-6] CNSC Letter, "Pickering NGS – CNSC staff review of Request for Closure of Periodic Safety Review 2 Integrated Implementation Plan Resolution Action: G24-RS1-04-19", P-CORR-00531-06230, November 2020.

[GI-24-7] OPG Plan, "Fuel Channels Life Cycle Management Plan", N-PLAN-01060-10002 R023, October 12, 2022.

[GI-24-8] OPG Letter, "Progress Report on OPG Heat Transport System Aging Safety Analysis", N-CORR-00531-23574, March 8, 2023.

B.11 GI-31 DETERMINISTIC SAFETY ANALYSIS

SECTION 1 – GI-31 GLOBAL ISSUE SUMMARY			
The goal of GI-31, Deterministic Safety Analysis, is to improve Deterministic Safety Analysis margins. This Global Issue comprises one Acceptable Deviation, which addresses one D-PSR SF5 EO. GI-31 is Safety Significance Level 4 based on deterministic considerations. The proposed Resolution Plan assesses this issue as an Acceptable Deviation because of its very low safety significance. The dose assessments in the Pickering Safety Report safety assessments apply atmospheric dilution factors (ADFs) and dose conversion factors (DCFs). Importance of other factors to atmospheric concentration calculations is not explicitly assessed, however, there are considerable conservatisms in the methodology that provide reasonable assurance that the impact of not assessing the importance of other factors has no adverse effect on the calculated dose.			
Safety Significance Level:	4	Category:	Analytical

SECTION 2 – GI-31 ASSOCIATED PSR2-B GAPS	
D-PSR SF5-EO1	The D-PSR Incremental Clause-by-Clause review of CSA N288.2-19 identified one Enhancement Opportunity which is applicable to Safety Factor 5 (Deterministic Safety Analysis). Clause 6.1.1.2 identifies that "The calculation of atmospheric concentrations should account for depletion of the radioactivity in the airborne plume by radioactive decay and deposition, and for the ingrowth of decay products. The importance of other factors to atmospheric concentration calculations should be assessed (e.g., resuspension/re-emission)". However, it could not be confirmed that the importance of other factors to atmospheric concentration calculations (e.g., resuspension/re-emission) was assessed in the NK38-SR-03500-10002, "Darlington Safety Report" or NK38-REP-09701-10326, "Darlington Retube Waste Processing Building – Safety Assessment". Therefore, this was identified as a D-PSR EO. ***Source:*** Code Review for CSA N288.2-19, Clause 6.1.1.2 ***Associated Resolutions:*** GI-31-AD3

SECTION 3 – GI-31 BACKGROUND INFORMATION AND RESOLUTION STRATEGY
This Global Issue contains one gap related to Deterministic Safety Analysis, specifically to Clause 6.1.1.2 of CSA N288.2-19. An EO was identified against Clause 6.1.1.2 in CSA N288.2-19 which identifies that "*The calculation of atmospheric concentrations should account for depletion of the radioactivity in the airborne plume by radioactive decay and deposition, and for the ingrowth of decay products. The importance of other factors to atmospheric concentration calculations should be assessed (e.g., resuspension/re-emission)*". However, it could not be confirmed that the importance of other factors to atmospheric concentration calculations was assessed in PNGS Safety Reports [GI-31-1][GI-31-2].

SECTION 3 – GI-31 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

The dose assessments in the Pickering Safety Report safety assessments apply ADFs and DCFs [GI-31-1][GI-31-2]. Importance of other factors to atmospheric concentration calculations is not explicitly assessed, however, there are considerable conservatisms in the methodology that provide reasonable assurance that the impact of not assessing the importance of other factors has no adverse effect on the calculated dose. Examples of these conservatisms include:

1. Cloud removal processes such as radioactive decay, dry deposition and wet deposition, are not credited, thus artificially increasing the concentrations of airborne materials in the cloud.
2. This approach also introduces conservatism into the dose assessment because some radioactive materials, such as iodine and particulates, are considered more hazardous in air than when deposited on the ground.
3. All releases were assumed to be at ground level and conservative roughness lengths for individual dilution factors were used.
4. In many cases the assessments are deliberately conservative. For example, where there is a range of possible values of a certain parameter, the value which maximizes the radiation dose is chosen.

For new analysis, ADDAM is the industry standard tool for dose calculations, for which a code applicability assessment is required in accordance with REGDOC-2.4.1. All key phenomena associated with the event are identified and the importance of the phenomena evaluated against acceptance criteria. Key parameters are then identified for each important phenomenon and ranked in accordance with their importance in influencing the applicable acceptance criteria. For example, the identification and ranking of phenomena governing atmospheric dispersion, and the applicability and validation of ADDAM for each key phenomena has been addressed for Pickering Common Cause Event analysis [GI-31-3].

SECTION 4 – GI-31 PRIORITY DETERMINATION

Safety Significance of Global Issue	**Deterministic Considerations**			**Probabilistic Considerations**								**Overall Safety Significance Level**
	E1 – Defence in Depth	E2 – Safety Significance Level	**Overall Deterministic Considerations**	F1 – Reactor Safety – Core Damage Frequency	F2 – Reactor Safety – Defence In Depth	F3 – Public Radiation Safety	F4 – Plant Operability	F5 – Occupational Radiation Safety	F6 – Emergency Preparedness	F7 – Environment	**Overall Probabilistic Considerations**	
	N/A	4	**4**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	**4**

The conservative assumptions in the dose assessments in the Pickering Safety Reports more than compensate for the potential effect that other factors (such as resuspension/re-emission) may have on atmospheric concentration calculations. Therefore, this EO has a Very Low Safety Significance with respect to indirect impact on Defence-in-Depth (A2) and is prioritized as Level 4.

SECTION 4 – GI-31 PRIORITY DETERMINATION

This Global Issue pertains to deterministic safety analysis, so it has no direct impact on the probabilistic considerations, i.e., Core Damage Frequency (F1), Defence in Depth (F2), Public Radiation Safety (F3), Plant Operability (F4), Occupational Radiation Safety (F5), Emergency Preparedness (F6) and Environment (F7). Therefore, the probabilistic considerations are not directly applicable to this issue.

In summary, the overall Safety Significance Level is 4 based on deterministic considerations.

SECTION 5 – GI-31 RESOLUTION PLAN

GI-31-AD3	The importance of other factors to atmospheric concentration calculations is not explicitly assessed in the Pickering Safety Reports. However, the conservative assumptions in the dose assessment methodology more than compensate for the potential effect that other factors (such as resuspension/re-emission) may have on atmospheric concentration calculations. Therefore, this EO has a Very Low Safety Significance and is assessed as an Acceptable Deviation. (D-PSR SF5-EO1)

SECTION 6 – GI-31 GLOBAL ISSUE REFERENCES

[GI-31-1] OPG Report, "Pickering Nuclear 1-4 Safety Report: Part 3 – Accident Analysis, NA44-SR-01320-00002 R005, October 5, 2018.

[GI-31-2] OPG Report, "Pickering Nuclear 5-8 Safety Report: Part 3 – Accident Analysis, NK30-SR-01320-00003 R005, October 21, 2019.

[GI-31-3] OPG Report, "Assessment of Code Applicability, Validation Basis, and Accuracy for TUF, SGLEAK, GOTHIC, and ADDAM for Use in Pickering A and B Common-Cause Event Analyses", N-REP-03500-10083 R001, March 2018.

B.12 GI-40 ACCIDENT MANAGEMENT

SECTION 1 – GI-40 GLOBAL ISSUE SUMMARY			
The goal of GI-40, Accident Management, is to demonstrate that the recommendations from the CNSC's review of the Darlington SAMG program have been reviewed for their applicability to Pickering NGS and implemented accordingly. This Global Issue comprises one item requiring No Further Action, which addresses one D-PSR SF11 EO. GI-40 is Safety Significance Level 4 based on deterministic considerations. OPG has reviewed the recommendations made by the CNSC in NK38-CORR-00531-22610 [GI-40-3] for their applicability to Pickering NGS, and updated Severe Accident Management Guidelines (SAMG) program documentation as appropriate.			
Safety Significance Level:	4	Category:	Programmatic

SECTION 2 – GI-40 ASSOCIATED PSR2-B GAPS	
D-PSR SF11-EO1	Clause 4.2.5 of REGDOC-2.3.2 Version 2 (2015) specifies requirements relating to Severe Accident Management Guidelines (SAMG) program documentation, and a gap against this clause has been identified that relates to issues identified by CNSC staff from a table-top review of the Darlington SAMG program documented in NK38-CORR-00531-22610. Several of the issues raised by the CNSC relate to the technical basis for the SAMG program documents. This review was performed against the 2013 version of REGDOC-2.3.2 which specifically addressed SAMG and continues to be a component of the Accident Management requirements in REGDOC-2.3.2 Version 2 (2015). The issues raised by the CNSC in NK38-CORR-00531-22610 are included in this EO. ***Source:*** Code Review for REGDOC-2.3.2 Version 2 (2015), Clause 4.2.5 ***Associated Resolutions:*** GI-40-NFA1

SECTION 3 – GI-40 BACKGROUND INFORMATION AND RESOLUTION STRATEGY
This Global Issue consists of one D-PSR SF11 EO related to SAMG program documentation. The CNSC performed a desktop inspection of the Severe Accident Management (SAM) program at OPG, documented in NK38-CORR-00531-22610 [GI-40-3]. The CNSC identified one Notice of Non-Compliance (NNC1) and 32 recommendations against REGDOC-2.3.2 Version 2 (2015) [GI-40-2]. NNC1 had the following actions: *DPRD-2021-09434-NNC1 – In order for OPG to become compliant with OPG-PROC-0178 and N-PROC-AS-0028, CNSC staff request OPG to:* *(1) develop the following reference timelines for all proposed mitigating strategies regardless of their classification in all Severe Accident Guides (SAGs) and Severe Challenge Guides (SCGs) as these timelines are needed as guidance by the Technical Support Group (TSG) per the guidelines instructions:* *- Time for Strategy Implementation* *- Timeframe for Strategy to Take Effect* *(2) amend NK38-SAM-09013-MCR-04.27 R002 (EI-27) with instruction for air admission through Vault Vapour Recovery System (VVRS) that are consistent with Tables 4-1 and 4-2 of NK38-SAM-09013-10000-SAG06-R001 and NK38-SAM-09013-10000-SCG03-R001*

SECTION 3 – GI-40 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

OPG dispositioned the first action in a response to the CNSC in NK38-CORR-00531-22642 [GI-40-3]. The second action is a Darlington specific issue, and therefore, it is not applicable to Pickering NGS.

The 32 recommendations from the CNSC desktop inspection are listed in Appendix D of NK38-CORR-00531-22610 [GI-40-3]. The 32 recommendations can be largely categorized into three categories: clarifications and improvements to SAMG procedures, assessment of equipment capabilities during severe accident conditions and installation of equipment to measure/monitor plant conditions during a severe accident. These observations are in reference to Darlington-specific SAM procedures, however, there are some that apply to Pickering-specific SAM procedures as well.

The recommendations related to the SAM program identified in NK38-CORR-00531-22610 have been assessed for their applicability to Pickering NGS [GI-40-4] and AR# 28252363 was initiated to track the issuance of updated SAMG documents. All actions associated with AR# 28252363 are complete. Therefore, no further action is required.

SECTION 4 – GI-40 PRIORITY DETERMINATION

Safety Significance of Global Issue	**Deterministic Considerations**			**Probabilistic Considerations**								**Overall Safety Significance Level**
	E1 – Defence in Depth	E2 – Safety Significance Level	**Overall Deterministic Considerations**	F1 – Reactor Safety – Core Damage Frequency	F2 – Reactor Safety – Defence In Depth	F3 – Public Radiation Safety	F4 – Plant Operability	F5 – Occupational Radiation Safety	F6 – Emergency Preparedness	F7 – Environment	**Overall Probabilistic Considerations**	
	N/A	4	**4**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	**4**

This Global Issue consists of one SF11 EO related to CNSC recommendations for SAMG program documentation and equipment for monitoring plant status for severe accident conditions.

This Global Issue is not related to any physical barriers. Therefore, this Global Issue is not applicable to Defence in Depth (E1). Safety Significance Level (E2) is assigned Safety Significance Level 4 since the issue is related to low frequency events and sequences but may need more attention when it is later reviewed along with other issues (the definition of Safety Significance Level 4 for E2). Hence, the overall Safety Significance Level of 4 for deterministic considerations is dictated by the E2 categorization.

This Global Issue has no direct impact on probabilistic considerations, i.e., Core Damage Frequency (F1), Defence in Depth (F2), Public Radiation Safety (F3), Plant Operability (F4), Occupational Radiation Safety (F5), Emergency Preparedness (F6) and Environment (F7). Therefore, these probabilistic considerations are not directly applicable.

The overall Safety Significance Level is 4 based on deterministic considerations.

SECTION 5 – GI-40 RESOLUTION PLAN	
GI-40-NFA1	The recommendations related to the SAM program identified in NK38-CORR-00531-22610 [GI-40-3] have been assessed for their applicability to Pickering NGS [GI-40-4] and AR# 28252363 was initiated to track the issuance of updated SAMG documents. All actions associated with AR# 28252363 are complete. Therefore, no further action is required. (D-PSR SF11-EO1)

SECTION 6 – GI-40 GLOBAL ISSUE REFERENCES

[GI-40-1] CNSC Letter, "Darlington NGS – CNSC Desktop Inspection Report: DPRD-2021-09434 – Severe Accident Management Guidelines (SAMGs) Implementation, New Action Item 2021-13-11178", NK38-CORR-00531-22610, May 26, 2021.

[GI-40-2] CNSC Regulatory Document, "Accident Management", REGDOC-2.3.2 Version 2, September 2015.

[GI-40-3] –OPG Letter, "Darlington NGS – Response to CNSC Staff's Desktop Inspection Report: DRPD-2021-09434 – Severe Accident Management Guidelines (SAMGs) Implementation, Action Item 2021-13-11178", NK38-CORR-00531-22642, July 15, 2021.

[GI-40-4] OPG Memo, "Darlington SAMG – Response to Recommendations from CNSC Inspection", N-REF-03611-1013172, May 18, 2022.

B.13 GI-43 SAFETY-RELATED STRUCTURES (NON-CONTAINMENT) FOR NUCLEAR POWER PLANTS

SECTION 1 – GI-43 GLOBAL ISSUE SUMMARY
The goal of GI-43, Safety-Related Structures (Non-Containment) for Nuclear Power Plants, is to confirm the validity of the Condition Assessments (CAs) for the non-Containment Safety-Related Structures for the extended operation period. This Global Issue comprises one Resolution Statement addressing one PSR2-B gap. GI-43 is Safety Significance Level 3 based on deterministic and probabilistic defence-in-depth considerations. All PSR2 CAs have been completed and documented in P-CORR-01060-0798589 [GI-43-1]. No issues were found that impact nuclear safety. OPG is in the process of reviewing the existing aging management strategy for non-Containment safety-related structures to confirm that the bases are valid for the extension of commercial operation to the end of 2026. Additional follow-up actions that are necessary for Pickering 5-8 operation up to the end of 2026 will be tracked and managed under the existing Aging Management Program.

Safety Significance Level:	3	Category:	Programmatic, Analytical

SECTION 2 – GI-43 ASSOCIATED PSR2-B GAPS	
G43-RS3-06-31.1	OPG is in the process of reviewing existing CA reports for PSR2-B. The purpose of the review is to confirm that the bases for the CA screening, conclusions, recommendations, rationalization and follow-up actions are still valid for the extension of commercial operation to the end of 2026 and to determine if any additional follow-up actions are necessary because of this extension. ***Source:*** Reassessment of IIP Action G43-RS3-06-31.1 ***Associated Resolution:*** GI-43-RS4

SECTION 3 – GI-43 BACKGROUND INFORMATION AND RESOLUTION STRATEGY
This Global Issue contains one PSR2-B gap related to the non-Containment Safety-Related Structures for the extended operating period to the end of 2026. As part of the PSR2, the CAs for the non-Containment safety-related civil structures required under the IIP Action G43-RS3-06-31.1 have been completed and documented as per the Integrated Aging Management program [GI-43-2], and the Aging Management process [GI-43-3]. The resulting recommendations, actions and dispositions have been included in the Condition Assessment Recommendations and Actions Management database and are managed in accordance with P-GUID-0160-10001 [GI-43-4]. The completion of IIP Action G43-RS3-06-31.1 is documented in P-CORR-01060-0798589 [GI-43-1]. The aging management strategies for non-containment safety structures have since been documented in the Aging Management Plan for Concrete Containment Structures and Safety Related Structures [GI-43-5] and inspections will be carried out in accordance with the Pickering Safety Related Structures Periodic Inspection Program.

SECTION 3 – GI-43 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

In support of the extended commercial operation to the end of 2026, OPG is in the process of reviewing the existing aging management strategy for non-Containment safety-related structures to confirm that the bases for the Aging Management Plan [GI-43-5] and the Periodic Inspection Program are valid for the extension of commercial operation to the end of 2026. Follow-up actions identified by the review will be managed under the Aging Management Program, and therefore, this Global Issue is categorized as both analytical and programmatic.

SECTION 4 – GI-43 PRIORITY DETERMINATION

Safety Significance of Global Issue	Deterministic Considerations			Probabilistic Considerations								Overall Safety Significance Level
	E1 – Defence in Depth	E2 – Safety Significance Level	**Overall Deterministic Considerations**	F1 – Reactor Safety – Core Damage Frequency	F2 – Reactor Safety – Defence In Depth	F3 – Public Radiation Safety	F4 – Plant Operability	F5 – Occupational Radiation Safety	F6 – Emergency Preparedness	F7 – Environment	**Overall Probabilistic Considerations**	
	3	N/A	**3**	N/A	3	N/A	N/A	N/A	N/A	N/A	**3**	**3**

This Global Issue is related to the fitness for service of safety-related structures (Non-Containment). As discussed in Section 3 of this Global Issue, OPG is reviewing the current aging management strategy to confirm that it is valid for the extended operation to the end of 2026.

Regarding deterministic considerations, this Global Issue is assigned a Safety Significance Level 3 for Defence in Depth (E1) on the basis that the issue is related to non-containment civil safety related structures associated with safety functions for DBAs. Safety Significance Level (E2) is not directly applicable since this Global Issue can potentially have a direct nuclear safety impact per E1. Hence, the overall Safety Significance Level of 3 for deterministic considerations is dictated by the E1 categorization.

Regarding probabilistic considerations, the issue has Safety Significance Level 3 for Reactor Safety – Defence in Depth (F2). This is because the issue is related to the reliability of safety related structures. The other probabilistic considerations, i.e., Core Damage Frequency (F1), Public Radiation Safety (F3), Plant Operability (F4), Occupational Radiation Safety (F5), Emergency Preparedness (F6) and Environment (F7), are not directly applicable. Hence, the overall Safety Significance Level of 3 for probabilistic considerations is dictated by the F2 categorization.

In summary, the overall Safety Significance Level is 3.

SECTION 5 – GI-43 RESOLUTION PLAN	
GI-43-RS4	Complete PSR2-B review of the aging management strategy for non-Containment safety-related civil structures. The purpose of the review is to confirm that the bases for the associated Aging Management Plan (N-PLAN-01060-10004) and the Periodic Inspection Program remain valid for the extended operation and to determine if any follow-up actions are necessary for extended operation of Pickering 5-8 up to the end of 2026. (PSR2 IIP Action G43-RS1-06-31.1)

SECTION 6 – GI-43 GLOBAL ISSUE REFERENCES

[GI-43-1] OPG Internal Memorandum, "Supporting Documentation for the Completion of G08-RS1-06-13 and G43-RS3-06-31", P-CORR-01060-0798589, November 4, 2019.

[GI-43-2] CNSC OPG Program, "Integrated Aging Management", N-PROG-MP-0008 R008, July 17, 2020.

[GI-43-3] OPG Procedure, "Aging Management Process", N-PROC-MP-0060 R007, May 3, 2022.

[GI-43-4] OPG Guideline, "Condition Assessment Recommendations and Actions Management", P-GUID-01060-10001 R001, October 29, 2018.

[GI-43-5] OPG Plan, "Aging Management Plan for Concrete Containment Structures and Safety Related Structures", N-PLAN-01060-10004 R003, December 8, 2022.

B.14 GI-50 N285.4 PIP / DOCUMENTATION REVISION

SECTION 1 - GI-50 GLOBAL ISSUE SUMMARY			
The goal of GI-50, N285.4 PIP/Documentation Revision, is to demonstrate conformance with CSA N285.4, Periodic Inspection of CANDU Nuclear Power Plant Components. This Global Issue comprises two Acceptable Deviations and one item requiring No Further Action, which address six D-PSR Gaps identified from a code review of CSA N285.4-19. GI-50 is Safety Significance Level 4 based on deterministic considerations. The scope of this issue includes the following: • gaps regarding the execution of inspections where alternate measures are justified, and concessions have been accepted by the CNSC; • documentation gaps where requirements in CSA N285.4-19 are not addressed in the Periodic Inspection Program (PIP) Plans but addressed elsewhere in OPG procedures, instructions or plans; and, • a gap regarding the lack of formal CNSC acceptance of the method used to evaluate metallurgical examination results for steam generator tubes. The gap regarding CNSC acceptance of evaluation methods for steam generator tubing has been subsequently closed. As the existing OPG inspection practices do not impair or jeopardize the safety function of piping and fuel channels, the remaining gaps are assessed as Acceptable Deviations based on their very low Safety Significance.			
Safety Significance Level:	4	Category:	Programmatic

SECTION 2 - GI-50 ASSOCIATED PSR2-B GAPS	
D-PSR SF2-3	D-ISR identified gaps for concessions within the compliance matrix of each of the piping PIP Plans and the Fuel Channel PIP Plans. However, there is no assurance that a similar concession would be forthcoming for a refurbished plant. This gap is concession-related and continues to be associated with N285.4-19. ***Source:*** Code Review for CSA N285.4-19, multiple clauses ***Associated Resolutions:*** GI-50-AD1
D-PSR SF2-4	Clause 12.2.2.1 in CSA N285.4-19 requires additional Pressure Tube-Calandria Tube (PT-CT) gap measurements within 50 mm of annulus spacer locations. This is a new requirement currently not addressed in Periodic Inspection Program (PIP) Plans. ***Source:*** Code Review for CSA N285.4-19, Clause 12.2.2.1 ***Associated Resolutions:*** GI-50-AD2
D-PSR SF2-5	Clause 12.3.2.2.2 in CSA N285.4-19 requires H_{eq} measurements in specific areas of the rolled joint region, which are not explicitly specified in the Darlington Periodic Inspection Program (PIP) Plans. ***Source:*** Code Review for CSA N285.4-19, Clause 12.3.2.2.2 ***Associated Resolutions:*** GI-50-AD2

SECTION 2 - GI-50 ASSOCIATED PSR2-B GAPS	
D-PSR SF2-6	Clause 12.6.4 in CSA N285.4-19 requires assessment of the structural integrity of the fuel channel pressure tubes following an unanticipated operating event that results in an excursion outside the normal operating temperature and pressure limits defined in the design documentation. The Fuel Channel Periodic Inspection Program (PIP) Plans do not include this requirement. ***Source:*** Code Review for CSA N285.4-19, Clause 12.6.4 ***Associated Resolutions:*** GI-50-AD2
D-PSR SF4-2	Clause 12.2.5.2.3 and Clause 12.2.5.2.4 in CSA N285.4-19 have been introduced with new Acceptable Standard for Pressure Tube-Calandria Tube (PT-CT) contact and Annulus Spacer Movement. While the current PT-CT gap and spacer location inspection practices at DNGS meet the requirement of the clauses, the current Periodic Inspection Program (PIP) Plans do not specify these criteria. ***Source:*** Code Review for CSA N285.4-19, Clauses 12.2.5.2.3 and 12.2.5.2.4 ***Associated Resolutions:*** GI-50-AD2
D-PSR SF4-4	Clause 14.4.5.1.2 in N285.4-19 requires that the evaluation method used to demonstrate that examination results satisfy the acceptance standards of Clause 14.4.5.2 shall be accepted for use by the AHJ. However, OPG does not have formal CNSC acceptance of the methodology for destructive metallurgical examination. ***Source:*** Code Review for CSA N285.4-19, Clause 14.4.5.1.2 ***Associated Resolutions:*** GI-50-NFA2

SECTION 3 - GI-50 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

This Global Issue consists of six Gaps, one related to CNSC concessions and five related to new requirements from N285.4-19 for Major Components. These are programmatic gaps against CSA N285.4-19. The discussion below provides the assessment of the extent to which Pickering meets the intent of the new requirements of CSA N285.4-19.

CSA N285.4-05 is listed in the Licensing Basis Publication table for Licence Condition (LC) 6.1 in the PNGS Licence Conditions Handbook (LCH) [GI-50-1], along with CSA N285.4-19 for specific clauses of the standard only. CSA N285.4-14 Update #1 is listed in the Guidance Publication table for LC 6.1. In December 2017 in P-CORR-00531-05193 [GI-50-2], OPG indicated that, as an alternative to compliance with the 2014 Edition of CSA N285.4, OPG would provide the CNSC with the dispositions to CSA N285.4-14 gaps identified for Pickering 5-8 from a compliance perspective. In July 2018, OPG provided this information to the CNSC [GI-50-3], and undertook a Regulatory Management action to provide the CNSC with updated Periodic Inspection Program (PIP) plans for Pickering 5-8 incorporating the Clauses 12 to 14 of CSA N285.4-14. In accordance with this commitment, the consolidated Pickering 5-8 PIP plans NK30-PIP-31100-00005 R00 [GI-50-4], NK30-PIP-33126-00001 R003 [GI-50-5] and NK30-PLAN-33110-10008 Sheet: SEC. 006 R001 [GI-50-6] incorporate dispositions of PSR2 gaps for the Major Components. OPG subsequently performed a gap analysis of Clauses 12 to 14 of CSA N285.4-19 to address the incremental gaps between the 2014 and 2019 editions, and concluded that there are no significant gaps which have an impact on FFS for extended operations to the end of 2026 [GI-50-7].

SECTION 3 - GI-50 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

D-PSR Gap SF2-3: Gap SF2-3 is related to the concessions granted by the CNSC for compliance with several CSA N285.4-05 clauses regarding the execution of inspections. Appendix D of Attachment 1 and Tables 1 and 2 of Attachment 2 of the enclosure to P-CORR-00531-05335 [GI-50-3] provide a detailed assessment of the concessions in the Pickering PIPs. These assessment provide the rationale for a variance to the Standard and the accepted alternate measures for inspection described in the PIPs. The assessment confirms that the inspection history and OPEX have not indicated any adverse condition or raised any concern regarding the concessions. OPG intends to continue to use current concessions in the PIPs until the end of commercial operation of the plant. Therefore, this is assessed as an Acceptable Deviation.

D-PSR SF2-4: The new requirement in Clause 12.2.2.1 in CSA N285.4-19 requires Pressure Tube-Calandria Tube (PT-CT) gap measurements within 50 mm of annulus spacer locations. In practice, gap measurements at garter spring/spacer locations within 50 mm are performed in accordance with I-INS-30676-50027 [GI-50-8]. However, this requirement is not explicitly identified as a requirement in the PIP Plan. Therefore, it is a documentation gap.

D-PSR SF2-5: Clause 12.3.2.2.2 in CSA N285.4-19 specifies the minimum number of hydrogen equivalent concentration (H_{eq}) measurements in specific areas of the rolled joint region. Detailed guidance for and scope of H_{eq} measurements is provided in the Fuel Channel Life Cycle Management Plan (LCMP), N-PLAN-01060-10002 [GI-50-9] and meets the requirements outlined in Clause 12.3.2.2.2 (e.g., minimum of 10 rolled joints scrapes). However, this requirement is not identified in the PIP Plan. Therefore, this represents a documentation gap.

D-PSR SF2-6: Clause 12.6.4 in CSA N285.4-19 requires assessment of the structural integrity of the fuel channel pressure tubes following an unanticipated operating event that results in an excursion outside the normal operating temperature and pressure limits defined in the design documentation.

Per Section 5.0 of N-REP-31100-10061 [GI-50-10], if there is an event which raises concern about the integrity of pressure tubes, the standard practice is to review and assess impact on pressure tubes. However, this requirement is not explicitly identified as a requirement in the PIP Plan. Therefore, this is only a documentation gap.

D-PSR SF4-2: Clause 12.2.5.2.3 and Clause 12.2.5.2.4 in CSA N285.4-19 have introduced a new acceptance standard for Pressure Tube-Calandria Tube (PT-CT) contact and Annulus Spacer movement.

Section 4.5.2 of the PIP Plan [GI-50-4] describes the acceptance criteria for dimensional inspections. Specifically, it indicates that it must be assured that there is no PT-CT contact at the end of the next periodic inspection interval, which aligns with N285.4-19. Acceptance criteria for the PT-CT gap at annulus spacer locations and displacement of annulus spacers are described in Appendix C of I-INS-31100-50031, "Pressure Tube to Calandria Tube Gap Analysis" [GI-50-11], and Section 9.2 of I-INS-31100-50023, "Evaluation and Reporting of Garter Spring Locations – ANDE MK2 or ANDE CIGAR Hybrid" [GI-50-12], respectively. However, these acceptance criteria are not currently specified in the PIP Plan. Thus, this represents a documentation gap only.

D-PSR SF4-4: The intent of Clause 14.4.5.1.2 has been clarified by the responsible CSA committee resulting in the closure of this gap. Clause 14.4.5.1.2 in N285.4-19 requires that the evaluation method used to demonstrate that Steam Generator (SG) tube metallurgical examination results satisfy the acceptance standards of Clause 14.4.5.2 shall be accepted for use by the AHJ.

SECTION 3 - GI-50 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

Clause 14.4.5.2 requires unexpected deterioration to be identified and assessed using the acceptance standards in Clause 14.2.5.2, which in turn defines acceptable conditions as either a) reportable indications from current and previous examinations not exceeding 40% of the nominal wall thickness before the end of the next periodic inspection interval; or b) indications that show no deterioration has occurred since the previous examination. In summary, Clause 14.4.5.1.2 applies to the evaluation method applied in the fitness-for-service and integrity assessments that are performed when unexpected deterioration is identified. As described in the Steam Generators PIP [GI-50-6], fitness-for-service assessments are performed in accordance with COG-07-4089, "Fitness-for-Service Guidelines for Steam Generator and Preheater Tubes, Section 1: Evaluation Procedures and Acceptance Criteria" [GI-50-13]. This methodology was accepted by the CNSC subject to two conditions in N-CORR-00531-19163 [GI-50-14]. CNSC acceptance is ultimately provided with acceptance of the flaw disposition which encompasses the supporting fitness-for-service assessment and its evaluation methods. Therefore, based on the information presented above, the intent of Clause 14.4.5.1.2 is met and Gap SF4-4 is closed.

SECTION 4 - GI-50 PRIORITY DETERMINATION

Safety Significance of Global Issue	**Deterministic Considerations**			**Probabilistic Considerations**								**Overall Safety Significance Level**
	E1 – Defence in Depth	E2 – Safety Significance Level	**Overall Deterministic Considerations**	F1 – Reactor Safety – Core Damage Frequency	F2 – Reactor Safety – Defence In Depth	F3 – Public Radiation Safety	F4 – Plant Operability	F5 – Occupational Radiation Safety	F6 – Emergency Preparedness	F7 – Environment	**Overall Probabilistic Considerations**	
	4	4	**4**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	**4**

This Global Issue consists of gaps related to the new requirements for Pickering PIPs introduced by CSA N285.4-19 for inspection requirements.

For D-PSR SF2-3, inspection history and OPEX have not indicated any adverse condition or raised any concern regarding the concessions granted by the CNSC. For D-PSR Gaps SF2-4, SF2-5, SF2-6 and SF4-2, OPG complies with the requirements of the new/revised clauses and the gaps are only documentation gaps. Gap SF4-4 is closed. Given the existing practices meet the requirements or the intent of the standard, theses gaps are categorized as a Safety Significance Level 4 for E1. The issue is assigned Safety Significance Level 4 for E2 on the basis that the issue is not significant. Hence, the overall Safety Significance Level of 4 for deterministic considerations.

For probabilistic considerations, this Global Issue has no direct impact on the probabilistic considerations, i.e., Core Damage Frequency (F1) or Defence in Depth (F2), nor does it impact Public Radiation Safety (F3), Plant Operability (F4), Occupational Radiation Safety (F5), Emergency Preparedness (F6) or Environment (F7). Therefore, probabilistic considerations are not applicable.

The overall Safety Significance Level for this Global Issue is 4 based on deterministic considerations.

SECTION 5 - GI-50 RESOLUTION PLAN	
GI-50-AD1	OPG has obtained concessions from the CNSC for several clauses in CSA N285.4 related to extent of inspection. Per Appendix D of Attachment 1 and Tables 1 and 2 of Attachment 2 of the enclosure to P-CORR-00531-05335 [GI-50-3], the inspection history and OPEX have not indicated any adverse condition or raised any concern regarding the concessions specified in the PIPs. OPG intends to continue to use current compliance concessions in the Periodic Inspection Program Plans until the end of commercial operation of the plant. This is a very low safety significance issue and has been addressed to the extent practicable. Therefore, it is assessed as an Acceptable Deviation. (D-PSR SF2-3)
GI-50-AD2	Clauses 12.2.2.1, 12.3.2.2.2, 12.2.5.2.3, 12.2.5.2.4 and 12.6.4 impose new requirements in CSA N285.4-19. OPG inspection practices already meet the intent of the requirements in these clauses, however the requirements are not reflected in the Pickering PIPs. Since these gaps are documentation related only, adopting the 2019 edition of the standard for operation to the end of 2026 provides no safety benefit. As such, these gaps are assessed as an Acceptable Deviation. (D-PSR SF2-4) (D-PSR SF2-5) (D-PSR SF2-6) (D-PSR SF4-2)
GI-50-NFA2	Clause 14.4.5.1.2 of N285.4-19 requires CNSC acceptance of the evaluation methods used to demonstrate that unexpected deterioration identified during metallurgical examination of steam generator tubes meet the acceptance standards. Fitness-for-service assessments for steam generator tubes are performed in accordance with guidelines in COG-07-4089 [GI-50-13] which have been conditionally accepted by the CNSC in N-CORR-00531-19163 [GI-50-14]. The methodology is also accepted as part of CNSC acceptance of the flaw disposition which encompasses the supporting fitness-for-service assessment and its evaluation methods. Therefore, based on the information presented above, the intent of Clause 14.4.5.1.2 is met and Gap SF4-4 is closed. No further action is required. (D-PSR SF4-4)

SECTION 6 – GI-50 GLOBAL ISSUE REFERENCES

[GI-50-1] CNSC, "Pickering Nuclear Generating Station, Licence Conditions Handbook", LCH-PR-48.00/2028 R005, February 24, 2023.

[GI-50-2] OPG Letter, "Pickering NGS: Application Requirements for Power Reactor Operating Licence Renewal - Compliance with CSA Standard N285.4-14", P-CORR-00531-05193, December 15, 2017.

[GI-50-3] OPG Letter, "Pickering NGS: Application Requirements for Power Reactor Operating Licence Renewal - Compliance with CSA Standard N285.4-14", P-CORR-00531-05335, July 5, 2018.

[GI-50-4] OPG Plan, "Pickering Nuclear 5-8 Fuel Channel Pressure Tubes Periodic Inspection Program Plan", NK30-PIP-31100-00005 R00, May 31, 2019.

[GI-50-5] OPG Plan, "Pickering Nuclear Units 5-8 Fuel Channel Feeder Pipes Periodic Inspection Program Plan", NK30-PIP-33126-00001 R003, January 21, 2019.

[GI-50-6] OPG Plan, "Pickering Units 5-8 In Service Inspection Plan", NK30-PLAN-33110-10008 Sheet: SEC. 006 R001, January 18, 2019.

[GI-50-7] OPG Memorandum, "Pickering NGS Units 5-8: CSA N285.4-19 Gap Analysis of Clauses 12, 13 and 14 Evaluated Up to the End of 2026", NK30-CORR-03641-1085328, April 11, 2023.

[GI-50-8] OPG Procedure, "ANDE CIGAR Hybrid System – Data Acquisition – Gap Measurement", I-INS-30676-50027 R010, March 13, 2019.

[GI-50-9] OPG Plan, "Fuel Channels Life Cycle Management Plan", N-PLAN-01060-10002 R023, October 12, 2022.

SECTION 6 – GI-50 GLOBAL ISSUE REFERENCES

[GI-50-10] OPG Report, "Compliance Plan for Long-Term Use of CSA N285.8 for In-Service Evaluation of Zirconium Alloy Pressure Tube", N-REP-31100-10061 R005, August 6, 2020.

[GI-50-11] OPG Instruction, "Pressure Tube to Calandria Tube Gap Analysis", I-INS-31100-50031 R011, May 28, 2020.

[GI-50-12] OPG Instruction, "Evaluation and Reporting of Garter Spring Locations – ANDE MK2 or ANDE CIGAR Hybrid", I-INS-31100-50023 R003, May 24, 2019.

[GI-50-13] COG Report, "Fitness-for-Service Guidelines for Steam Generator and Preheater Tubes, Section 1: Evaluation Procedures and Acceptance Criteria", COG-07-4089 R02, October 2016.

[GI-50-14] CNSC Correspondence, "Darlington NGS and Pickering NGS: Fitness-for-Service Guidelines for Steam Generator and Preheater Tubes, COG-07-4089-R2", N-CORR-00531-19163, April 11, 2018.

B.15 GI-52 FIRE PROTECTION – NBCC AND NFCC

SECTION 1 - GI-52 GLOBAL ISSUE SUMMARY			
The goal of GI-52, Fire Protection, is to demonstrate an appropriate degree of conformance with the new and revised requirements of 2015 edition of National Building Code of Canada (NBCC) and National Fire Code of Canada (NFCC). This Global Issue comprises two proposed Resolution Statements, which address two D-PSR-SF1 Gaps. GI-52 is Safety Significance Level 3 based on deterministic defence-in-depth considerations. The proposed Resolution Plan for this Global Issue comprises activities to update current governance documents to include new codes or standards, consider appropriate and practicable design changes that would meaningfully improve fire safety and consider revising the requirements or interval of inspections and drills to satisfy the requirements of NBCC (2015) and NFCC (2015).			
Safety Significance Level:	3	Category:	Engineering, Programmatic

SECTION 2 - GI-52 ASSOCIATED PSR2-B GAPS	
D-PSR SF1-10	Darlington NGS alignment with 10 Clauses of Part 3, "Fire Protection, Occupant Safety and Accessibility" of the 2015 edition of the National Building Code of Canada (Clauses 3.1.8.4, 3.1.8.5, 3.1.8.7, 3.1.8.11, 3.1.9.4, 3.2.9.1, 3.3.1.20, 3.4.6.11, 3.4.6.18 and 3.6.1.3) could not be demonstrated. As such this has been identified as a D-PSR gap. These Clauses have been grouped into one D-PSR gap which applies to new construction or modifications at DNGS because: a) the NBCC is not intended to be used to enforce the retrospective application of new requirements to existing buildings; and b) the more stringent fire protection requirements of CSA N293-12 already apply to the SSCs within the scope of D-PSR. ***Source:*** Code Review for NBCC (2015), Clauses 3.1.8.4, 3.1.8.5, 3.1.8.7, 3.1.8.11, 3.1.9.4, 3.2.9.1, 3.3.1.20, 3.4.6.11, 3.4.6.18 and 3.6.1.3 ***Associated Resolutions:*** GI-52-RS1
D-PSR SF1-11	Darlington NGS does not currently align with 11 Clauses of the 2015 edition of the National Fire Code of Canada (NFCC) (Clauses 2.2.2.4 (5), 2.7.1.8, 2.8.2.5, 2.8.3.2, 3.1.2.4, 4.2.2.2, 4.5.2.1 (4), 4.5.6.14 (2), 5.5.5.3, 6.5.1.8 and 6.8.1.1). As such, this has been identified as a D-PSR Gap. These non-compliant Clauses have been grouped into one D-PSR gap. ***Source:*** Code Review for NFCC (2015), Clauses 2.2.2.4 (5), 2.7.1.8, 2.8.2.5, 2.8.3.2, 3.1.2.4, 4.2.2.2, 4.5.2.1 (4), 4.5.6.14 (2), 5.5.5.3, 6.5.1.8 and 6.8.1.1 ***Associated Resolutions:*** GI-52-RS2

SECTION 3 - GI-52 BACKGROUND INFORMATION AND RESOLUTION STRATEGY

This Global Issue contains two D-PSR SF1 Gaps related to the NBCC (2015) and the NFCC (2015).

The first gap (D-PSR SF1-10) groups non-compliances against ten clauses of Part 3, "Fire Protection, Occupant Safety and Accessibility" of NBCC (2015):

- Clause 3.1.8.4 contains new requirements related to the allowable leakage rate of door assemblies, smoke dampers and combination smoke/fire dampers, which includes new referenced standards (i.e., CAN/ULC-S112.1, "Leakage Rated Dampers for Use in Smoke Control Systems" and ANSI/UL-1784, "Air Leakage Tests of Door Assemblies and Other Opening Protectives").
- Clause 3.1.8.5 now references NFPA 105, "Smoke Door Assemblies and Other Opening Protectives".
- Clause 3.1.8.7 specifies new installation requirements for smoke dampers or combinations of smoke/fire dampers.
- Clause 3.1.8.11 provides requirements for the installation of smoke dampers.
- Clause 3.1.9.4 discusses outlet boxes across a wall assembly and now references CAN/ULC-S115, "Fire Tests of Firestop Systems".
- Clause 3.2.9.1 provides requirements related to testing of integrated fire protection and life safety systems and includes CAN/ULC-S1001, "Integrated Systems Testing of Fire Protection and Life Safety Systems" as a new referenced standard.
- Clause 3.3.1.20, Sentence (2) was added to specify the minimum requirements for fire separations that are penetrated by the ventilation systems required for power-ventilated enclosures in laboratories.
- Clause 3.4.6.11 specifies new requirements related to exit door construction, location and corresponding signage. The new requirements of Sentence (2) are related to the maximum threshold for a doorway used to confine the spillage of flammable liquids, Sentence (3) related to the maximum height of the step in front of an exit door where there is a risk of blockage by ice or snow, and for the requirement of Sentence (6) related to visible signs or physical barriers prohibiting such obstructions are currently present on the exterior side of the applicable doors.
- Clause 3.4.6.18 is now applicable to all building heights (not just 6-storey buildings as specified in NBCC (2010)).
- Clause 3.6.1.3 is new and references CAN/CSA-B72-M, "Installation Code for Lightning Protection Systems" for compliance with lightning protection.

PNGS design, operation and governance documents do not explicitly address the new or revised requirements in NBCC (2015) identified above.

As indicated in Sentence A-1.1.1.1 (1) of Division A Part 1 of NBCC (2015), *it is not intended that the NBCC be used to enforce the retrospective application of new requirements to existing buildings or existing portions of relocated buildings, unless specifically required by local regulations or bylaws.* Therefore, the requirements of the affected clauses of NBCC (2015) Part 3 only apply to future plant modifications.

The second gap (D-PSR SF1-11) groups eleven non-compliance with respect to Clauses of the 2015 edition of the National Fire Code of Canada (NFCC) (Clauses 2.2.2.4 (5), 2.7.1.8, 2.8.2.5, 2.8.3.2, 3.1.2.4, 4.2.2.2, 4.5.2.1 (4), 4.5.6.14 (2), 5.5.5.3, 6.5.1.8 and 6.8.1.1). Those non-compliances relate to:

- New applicable codes or standards:
  a) Clause 2.2.2.4, Sentence (5) has a new requirement for testing of fire dampers, smoke dampers, combination smoke/fire dampers and fire stop flaps in accordance with NFPA 80.
  Current inspection procedures/manuals do not explicitly discuss the additional types of dampers discussed in Clause 2.2.2.4, nor do they specifically refer to NFPA 80 for their testing requirements.

b) Clause 4.5.2.1, Sentence (4) and Clause 4.5.6.14, Sentence (2) (c) updated a referenced Standard, CAN/ULC-S667, for metallic piping systems for underground installations for flammable and combustible liquids. Reference to CAN/ULC-S667 could not be found in any PNGS design related documents.

c) Clause 6.8.1.1 requires compliance with CAN/ULC-S1001 for the testing and maintenance of interconnections between fire protection and life safety systems. Reference to CAN/ULC-S1001 could not be found in any PNGS design or testing related documents.

- Clause 2.7.1.8 of NFCC (2015) requires that exit doors that lead to the outdoors be protected from being obstructed by objects. No evidence can be found that visible signs or physical barriers prohibiting such obstructions are currently present on the exterior side of applicable doors at PNGS.
- Clause 2.8.2.5, Sentence (3) of NFCC (2015) has a new requirement that explicitly requires the fire safety plan for a building or facility within the scope of Sections 3.1 (Indoor and Outdoor Storage), 4.1 (Flammable and Combustible Liquids) and 5.1 (Hazardous Processes and Operations) to be kept at the principal entrance to the building or facility. No evidence can be found that this is currently done.

  This not a significant technical change as at PNGS the emergency response team are the primary responders onsite and have full documentation of fire safety plan details at all times.
- Clause 2.8.3.2 of NFCC (2015) specifies a new interval and requirement for holding fire drills in laboratories. This new requirement is not reflected in OPG emergency drill procedures. Table 1 of Section 1.1.1 of N-INS-09076-10005, "Planning, Development and Evaluation of Conventional Drills and Exercises" [GI-52-1] presents the minimum drill and exercise frequency requirements and does not include requirements for fire drills in laboratories.
- Clauses 3.1.2.4 and 4.2.2.2 of NFCC (2015) relate to revised and new requirements for Storage Arrangement and Conditions. These are not considered a significant change as the requirements in these are already inherently performed at OPG facilities, in line with the guidelines provided in OPG-GUID-08963-0001, "Handling and Storage of Hazardous Materials" [GI-52-2]. However, the new and revised requirements are not explicitly reflected in OPG procedures related to management of hazardous/dangerous material (e.g., OPG-PROC-0126 [GI-52-3]).
- Clause 5.5.5.3 of NFCC (2015) provides new requirements related to compressed gases storage in laboratories. While OPG meets the intent of some of the changes in this clause, the revisions are not explicitly reflected in OPG/PNGS procedures ([GI-52-2] [GI-52-3] [GI-52-4]).
- Clause 6.5.1.8 of NFCC (2015) is a new clause with requirements to inspect exit signs. Per P-REP-71400-00013, "Pickering Nuclear Generating Station Fixed Fire Protection Systems Inspection, Testing and Maintenance (ITM) Report" [GI-52-5], exit signs are inspected during monthly routines in accordance with P-ERP-71400-00010 [GI-52-6]. However, no evidence can be found to indicate that the inspections confirm that the exit signs will be visible upon failure of the primary power supply.

The strategy to resolve the above issues should include:

- Updating current applicable governance documents to include, when appropriate, new codes or standards,
- Consider appropriate and practicable design changes that would meaningfully improve fire safety, and
- Consider revising, when appropriate and practicable, the requirements or interval of inspections or drills to satisfy the requirements of the NFCC (2015).

SECTION 4 - GI-52 PRIORITY DETERMINATION

Safety Significance of Global Issue	Deterministic Considerations			Probabilistic Considerations								Overall Safety Significance Level
	E1 – Defence in Depth	E2 – Safety Significance Level	**Overall Deterministic Considerations**	F1 – Reactor Safety – Core Damage Frequency	F2 – Reactor Safety – Defence In Depth	F3 – Public Radiation Safety	F4 – Plant Operability	F5 – Occupational Radiation Safety	F6 – Emergency Preparedness	F7 – Environment	**Overall Probabilistic Considerations**	
	3	4	**3**	4	N/A	N/A	N/A	N/A	N/A	N/A	**4**	**3**

This Global Issue includes one D-PSR SF1 Gap that groups ten non-compliances with respect to the requirements of Part 3, "Fire Protection, Occupant Safety and Accessibility" of NBCC (2015) and one D-PSR SF1 Gap that groups eleven non-compliances with respect to Clauses of NFCC (2015). Those non-compliances are related to new applicable codes or standards, requirement to protect exit doors, requirements for storage arrangement, requirements related to compressed gases, requirements for exit signs inspection and fire drills in laboratories.

Deterministic Considerations (D-PSR SF1-10)

Defence in Depth (E1) is prioritized as a level 3 because the safety function of the fire protection system can be affected by the gaps, but the effect does not impair the capability to terminate a fire event. The Fire Hazard Assessment (FHA) [GI-52-7][GI-52-8] and Fire Safe Shutdown Analysis (FSSA) [GI-52-9][GI-52-10] demonstrate that the safety objectives of the Station are maintained under postulated fire scenarios without credits for protection systems. The gaps are therefore assigned a Safety Significance Level of 3.

For (E2), the need to update applicable governance documents to include new codes or standards or to consider revising the requirements to satisfy the requirements of the NBCC-2015 have very low safety significance. The Safety Significance Level (E2) is therefore prioritized as a level 4.

Therefore, a Safety Significance Level of 3 is selected for deterministic considerations.

Deterministic Considerations (D-PSR SF1-11)

Some non-compliances pertain to physical barriers, while others are programmatic in nature. Therefore, both deterministic considerations are applicable.

Defence in Depth (E1) is assigned Safety Significance Level 3 because the relevant non-compliances may affect the safety function but the effect does not impair the capability to terminate a fire event. The non-compliances are thus considered to be of low safety significance.

The need to update current applicable governance documents to include new codes or standards or to consider revising the requirements or interval of inspections or drills to satisfy the requirements of the NFCC have very low safety significance. The Safety Significance Level (E2) is therefore prioritized as a level 4.

The overall Safety Significance Level is 3 for deterministic considerations.

SECTION 4 - GI-52 PRIORITY DETERMINATION

Probabilistic Considerations (D-PSR SF1-10 and SF1-11)

For probabilistic considerations, the Probabilistic Safety Assessment includes fire events, but the gaps associated with this Global Issue have insignificant impact on Core Damage Frequency (F1). Therefore, Safety Significance Level 4 is assigned. Defence in Depth (F2) is not impacted, nor is Public Radiation Safety (F3), Plant Operability (F4), Occupational Radiation Safety (F5), Emergency Preparedness (F6) or Environment (F7). Therefore, the Safety Significance Level is 4 for probabilistic considerations.

In summary, the overall Safety Significance Level is 3 due to deterministic considerations.

SECTION 5 - GI-52 RESOLUTION PLAN

GI-52-RS1	Apply NBCC 2015 Part 3 for future construction or modification related to fire protection, occupant safety and accessibility. (D-PSR-SF1-10) Note: As indicated in Sentence A-1.1.1.1 (1) of Division A Part 1 of NBCC (2015), *it is not intended that the NBCC be used to enforce the retrospective application of new requirements to existing buildings or existing portions of relocated buildings, unless specifically required by local regulations or bylaws.* Therefore, the requirements of the affected clauses of NBCC (2015) Part 3 only apply to future plant modifications.
GI-52-RS2	Update current applicable governance documents to include the new requirements, codes or standards identified in NFCC 2015 and develop strategy for appropriate and practicable design and programmatic changes. (D-PSR-SF1-11)

SECTION 6 – GI-52 GLOBAL ISSUE REFERENCES

[GI-52-1] OPG Instruction, "Planning, Development and Evaluation of Conventional Drills and Exercises", N-INS-09076-10005 R008, July 11, 2022.

[GI-52-2] OPG Guideline, "Handling and Storage of Hazardous Materials", OPG-GUID-08963-0001 R005, October 4, 2019.

[GI-52-3] OPG Procedure, "Hazardous Material Management", OPG-PROC-0126 R002, May 23, 2019.

[GI-52-4] OPG Procedure, "Chemistry Laboratory Safety", P-CLP-78200-0025 R011, March 17, 2022.

[GI-52-5] OPG Report, "Pickering Nuclear Generating Station Fixed Fire Protection Systems Inspection, Testing and Maintenance (ITM) Report", P-REP-71400-00013 R000, August 9, 2019.

[GI-52-6] OPG Procedure, "Monthly Exit Inspections", P-ERP-71400-00010 R003, November 24, 2021.

[GI-52-7] OPG Report, "Fire Hazard Assessment – Pickering A Nuclear Generating Station", NA44-REP-71400-10003 R003, October 20, 2022.

[GI-52-8] OPG Report, "Fire Hazard Assessment – Pickering B Nuclear Generating Station", NK30-REP-71400-10002 R004, October 20, 2022.

[GI-52-9] OPG Report, "Fire Safe Shutdown Analysis – Pickering A Nuclear Generating Station", NA44-REP-71400-00023 R002, October 20, 2022.

[GI-52-10] OPG Report, "Fire Safe Shutdown Analysis – Pickering B Nuclear Generating Station", NK30-REP-71400-00001 R005, May 20, 2022.

B.16 GI-53 REASSESSMENT OF QUALIFED LIFE AS DOCUMENTED IN THE ENVIRONMENTAL QUALIFICATION ASSESSMENTS

SECTION 1 – GI-53 GLOBAL ISSUE SUMMARY			
The goal of GI-53, Reassessment of Qualified Life as Documented in the Environmental Qualification Assessments, is to confirm the environmental qualification of components for the extended operating period for components whose qualification would otherwise expire (referred to as life-limited components). This Global Issue comprises one proposed Resolution Statement addressing one PSR2-B Gap. GI-53 is Safety Significance Level 3 based on deterministic and probabilistic considerations. The proposed Resolution Plan comprises of activities to re-assess the Environmental Qualification Assessments (EQAs) for life-limited EQ components to support extended Pickering 5-8 operation up to the end of 2026. Completion of the proposed Resolution Plan will support and strengthen Level 3 defence-in-depth for the extended operating period.			
Safety Significance Level:	3	Category:	Analytical

SECTION 2 – GI-53 ASSOCIATED PSR2-B GAPS	
G12-RS1-05-17.1	As part of PSR2, the Pickering NGS EQAs were reviewed to identify where the currently documented qualified lives of components do not support continued service beyond 2020, and EQAs were revised where required to support continued service of related EQ components to 2024. Updates to the EQAs may be required to maintain component qualification for extended operation up to the end of 2026. This represents a PSR2-B gap. ***Source:*** Reassessment of IIP Action G12-RS-05-17.1 for extended operation ***Associated Resolution:*** GI-53-RS1

SECTION 3 – GI-53 BACKGROUND INFORMATION AND RESOLUTION STRATEGY
This Global Issue contains one PSR2-B Gap related to the Environmental Qualification of equipment. As part of PSR2, the Pickering NGS EQAs were reviewed to identify where the documented qualifications of components do not support continued service beyond 2020. Where service life gaps were found, re-assessment of EQAs and specific EQ actions were initiated to support operating the related components to the end of 2024 [GI-53-1]. Although the reassessments and revisions of EQAs under the IIP Action G12-RS1-05-17.1 for operation to the end of 2024 include sufficient conservativism for margin to avoid any cliff-edge effects, a review of Environmentally Qualified life-limited components impacted by operation past 2024 needs to be undertaken.

SECTION 4 – GI-53 PRIORITY DETERMINATION

Safety Significance of Global Issue	Deterministic Considerations			Probabilistic Considerations								Overall Safety Significance Level
	E1 – Defence in Depth	E2 – Safety Significance Level	**Overall Deterministic Considerations**	F1 – Reactor Safety – Core Damage Frequency	F2 – Reactor Safety – Defence In Depth	F3 – Public Radiation Safety	F4 – Plant Operability	F5 – Occupational Radiation Safety	F6 – Emergency Preparedness	F7 – Environment	**Overall Probabilistic Considerations**	
	3	N/A	**3**	3	3	N/A	N/A	N/A	N/A	N/A	**3**	**3**

Resolution of this Global Issue will complete Environmental Qualification re-assessments to ensure the equipment will perform its safety functions in support of extended operation.

Regarding deterministic considerations, the Safety Significance Level determined from Table E1 in the PSR2 Basis Document is 3. This is because ensuring Environmental Qualification for extended operation will ensure the capability of safety provisions will effectively mitigate a harsh environment initiating event and the issue does not affect the safety function capability for more than one level of protection. Safety Significance Level (E2) is considered not applicable, since this Global Issue has a direct nuclear safety impact, whereas E2 primarily relates to issues that impact other objectives or are indirectly related to nuclear safety. The overall Safety Significance Level for deterministic considerations is 3.

Regarding probabilistic considerations, Safety Significance Level 3 is assigned for Reactor Safety – Core Damage Frequency (F1). Potential failure of equipment due to all causes (including a harsh environment) is accounted for in the Probabilistic Safety Assessment, and resolution of this Global Issue will ensure that the assumptions in the Probabilistic Safety Assessment regarding equipment failure frequency remain valid. Defence in Depth (F2) is assigned Safety Significance Level 3. This is on the basis that confirming Environmental Qualification of the equipment associated with Systems Important to Safety (SIS) precludes a reduction in the reliability of a SIS or a back-up system. This Global Issue has no impact on the other probabilistic considerations, and therefore, these considerations are not applicable. In summary, the overall Safety Significance Level is 3.

SECTION 5 – GI-53 RESOLUTION PLAN

GI-53-RS1	Re-assess Pickering NGS EQAs to support extended operation of Pickering 5-8 to the end of 2026. (Reassessment of IIP Action G12-RS1-05-17.1)

SECTION 6 – GI-53 GLOBAL ISSUE REFERENCES

[GI-53-1] OPG Letter, "Project Completion Assurance Summary: PN EQA Part 1 Revisions", P-CORR-03651-0798139, November 15, 2019.

Appendix C: Ranking Results

Proposed Global Issue Resolution Statements presented in Section 5 of the Global Issue Tables in Appendix B are ranked using the methodology and Value Tree technique described in Section 5.5 and Appendix C of the PSR2 GAR. The method is applied to Global Issue proposed Resolution Statements that have identified actions. Acceptable Deviations and No Further Action statements do not go through the ranking process.

The results of applying the ranking methodology are shown in Table 9. For each proposed Resolution Statement, the associated Value Tree objective is shown, along with the Objective Weight and the values of the Time and Impact attributes, along with the rationale for each. Finally, the Utility Score and Ranking Value are shown.

The results in Table 9 are normalized to 100, and the normalized Ranking Values of the proposed Resolution Statements are shown in Table 7.

Table 9: Global Issue Proposed Resolution Statement Ranking

Global Issue/RS Title	Objective	Objective Weight	Objective Justification	Time Attribute	Time Attribute Justification	Impact Attribute	Impact Attribute Justification	Utility Score	GI-RS Ranking Value	Normalized Ranking Value
GI-1-RS5 Update the Fuel Channels Pressure Tubes PIP Plan for Pickering 5-8 (NK30-PIP-31100-00005) to reflect an extended operating period up to the end of 2026. (Reassessment of IIP Action G01-RS2-06-02.1)	2. Enhanced Confidence in the fitness for service of SSCs	0.29	The issue is indirectly related to FFS for fuel channels.	5	Issue resolution can occur within 2 years, with immediate impact on the objective.	4	Updating the PIP to reflect the extended operating period has an indirect and major impact on the confidence in FFS of Fuel Channels.	0.70	0.203	70
GI-1-RS6 Demonstrate the continued FFS of fuel channels for Pickering 5-8 for the extended operating period up to the end of 2026. FFS of fuel channels includes demonstration of sufficient margin on the FFS limits of the pressure tubes, calandria tubes and garter springs (annulus spacers) during the continued operational life of the plant. (Reassessment of IIP Actions G01-RS3-06-03.1, and G01-RS4-06-04.2 to G01-RS4-06-04.4)	2. Enhanced Confidence in the fitness for service of SSCs	0.29	The issue is indirectly related to FFS for fuel channels.	5	Issue resolution can occur within 2 years, with immediate impact on the objective.	5	Demonstrating the FFS for the extended operating period has a direct and major impact on the confidence in FFS of fuel channels.	1.00	0.290	100
GI-1-RS7 Demonstrate Fitness-for-Service for Zr-Nb-Cu and Inconel X-750 Pickering Units 5 to 8 Spacers for the extended operation to the end of 2026. (SF4-3)	2. Enhanced Confidence in the fitness for service of SSCs	0.29	The issue is indirectly related to FFS for fuel channels.	5	Issue resolution can occur within 2 years, with immediate impact on the objective.	5	Completing the FFS assessment has a direct and major impact on the confidence in FFS of fuel channels.	1.00	0.290	100
GI-1-RS8 Develop and submit an implementation plan for developing inputs to satisfy the methodology in the Non-Mandatory Annex G of CSA N285.8-18, Update #1 to perform uncertainty analyses in probabilistic evaluations where the threshold requirement is met per CSA N285.8. (D-PSR SF4-6)	2. Enhanced Confidence in the fitness for service of SSCs	0.29	The issue is indirectly related to FFS for fuel channels.	3	Issue resolution can occur within 4 years, with immediate impact on the objective.	1	Developing the methodology and updating the Compliance Plan has negligible impact on the confidence in FFS of fuel channels since the methodology can not be developed until after 2025.	0.03	0.009	3

Global Issue/RS Title	Objective	Objective Weight	Objective Justification	Time Attribute	Time Attribute Justification	Impact Attribute	Impact Attribute Justification	Utility Score	GI-RS Ranking Value	Normalized Ranking Value
GI-2-RS2 Demonstrate the continued FFS of feeders for Pickering 5-8 for the extended operating period up to the end of 2026. FFS of feeders includes demonstration that predicted feeder condition, with identified and planned mitigations, is acceptable for the intended operation. (Reassessment of IIP Action G02-RS1-06-05.1)	2. Enhanced Confidence in the fitness for service of SSCs	0.29	The issue is directly related to FFS for feeders.	5	Issue resolution can occur within 2 years, with immediate impact on the objective.	5	Demonstrating the FFS for the extended operating period has a direct and major impact on the confidence in FFS of feeders.	1.00	0.290	100
GI-3-RS2 Demonstrate the continued FFS of steam generators for Pickering 5-8 for the extended operating period up to the end of 2026. FFS of steam generators includes demonstration that predicted steam generator condition, with identified and planned mitigations, is acceptable for the intended operation. (Reassessment of IIP Action G03-RS1-06-06.1)	2. Enhanced Confidence in the fitness for service of SSCs	0.29	The issue is directly related to FFS for the steam generators.	5	Issue resolution can occur within 2 years, with immediate impact on the objective.	5	Demonstrating the FFS for the extended operating period has a direct and major impact on the confidence in FFS of the steam generators.	1.00	0.290	100
GI-4-RS3 Demonstrate the continued FFS of reactor components and structures for Pickering 5-8 for the extended operating period up to the end of 2026. This includes demonstration that predicted reactor components and structures condition, with identified and planned mitigations, is acceptable for the intended operation. This also includes the required inspection activities to update the CT-LISS nozzle gap assessments and identification of mitigation strategies if CT-LISS contact is predicted within the extended operating period. (Reassessment of IIP Action G04-RS1-06-07.1, G04-RS2-06-08.1 and G04-RS2-06-08.2)	2. Enhanced Confidence in the fitness for service of SSCs	0.29	The issue is directly related to FFS for reactor components.	5	Issue resolution can occur within 2 years, with immediate impact on the objective.	5	Demonstrating the FFS for the extended operating period has a direct and major impact on the confidence in FFS of reactor components.	1.00	0.290	100
GI-20-RS1 Complete Regulatory Management action (AR# 28252308) for providing a status update on Action Notice AN2 of CNSC Action Item 2017-48-12365 and continue to provide future status updates until field implementation of Engineering Change (EC) 132846 for 67138 LT566/LIA566 loop failure detection for EWS RB Water Level Measurement is complete.	2. Enhanced Confidence in the fitness for service of SSCs	0.29	The resolution of the issue relating to LT566/LIA566 could enhance safety margin on a parameter of a SIS for DBA.	5	Issue resolution can occur within 2 years, with immediate impact on the objective	3	Resolving the issue will have a direct and minor impact on the objective. The component is associated with a parameter of a SIS for DBA.	0.46	0.133	46

Global Issue/RS Title	Objective	Objective Weight	Objective Justification	Time Attribute	Time Attribute Justification	Impact Attribute	Impact Attribute Justification	Utility Score	GI-RS Ranking Value	Normalized Ranking Value
GI-24-RS2 Update the Heat Transport System (HTS) aging safety analysis models and perform the required safety analysis of events most impacted by aging (Small Break Loss of Coolant Accident (SBLOCA), Loss of Flow (LOF) and Neutron Overpower (NOP)) to support extended operation for Pickering 5-8. (Reassessment of IIP Actions G24-RS1-04-19.5, G24-RS1-04-19.6, G24-RS1-04-19.7, G24-RS1-04-19.8)	3. Enhanced confidence in the safety analyses	0.21	Aging analysis models need to be developed and the safety analysis impacted by aging is required to be updated to demonstrate the adequacy of safety margins for extended operation.	5	Issue resolution can occur within 2 years, with immediate impact on the objective.	5	The resolution of this issue will have a direct and major impact on the objective. Completing the required safety analysis will directly support the safety case for continuing operation.	1.00	0.210	72
GI-43-RS4 Complete PSR2-B review of the aging management strategy for non-Containment safety-related civil structures. The purpose of the review is to confirm that the bases for the associated Aging Management Plan (N-PLAN-01060-10004) and Periodic Inspection Program remain valid for the extended operation and to determine if any follow-up actions are necessary for extended operation of Pickering 5-8 up to the end of 2026. (PSR2 IIP Action G43-RS1-06-31.1)	2. Enhanced Confidence in the fitness for service of SSCs	0.29	Condition Assessments are related to FFS.	5	Issue resolution can occur within 2 years, with immediate impact on the objective.	3	The resolution of this issue will have a direct and minor impact on the objective. The process established to address the aging management strategy for these structures will have a direct impact on FFS of affected SSCs.	0.46	0.133	46
GI-52-RS1 Apply NBCC 2015 Part 3 for future construction or modification related to fire protection, occupant safety and accessibility. (D-PSR-SF1-10)	1.Enhanced confidence that the design of SSCs support modern safety practices	0.17	Completing these tasks will close minor deviations from modern code (NBCC-2015) for future design of SSCs and operation related to fire protection.	5	Issue resolution can occur within 2 years, with immediate impact on the objective.	3	The resolution of this issue will have a direct and minor impact on the objective. The current barriers and practices are effective but may need to be updated to reflect new code requirements (NBCC-2015).	0.46	0.078	27
GI-52-RS2 Update current applicable governance documents to include the new requirements, codes or standards identified in NFCC 2015 and develop strategy for appropriate and practicable design and programmatic changes. (D-PSR-SF1-11)	1.Enhanced confidence that the design of SSCs support modern safety practices	0.17	Completing the changes for meeting the safety intent of new/revised clauses of NFCC-2015 will enhance the confidence in the design of the SSCs.	4	The update of governance can occur within 2 years, however, the implementation (existing SSCs) would take 2-3 years.	3	The resolution of this issue will have a direct and minor impact on the objective. The current barriers and practices are effective but may need to be updated to reflect new code requirements (NFCC-2015).	0.31	0.053	18
GI-53-RS1 Re-assess Pickering NGS EQAs to support extended operation of Pickering 5-8 to the end of 2026. (Reassessment of IIP Action G12-RS1-05-17.1)	2. Enhanced Confidence in the fitness for service of SSCs	0.29	Environmental qualifications of the equipment and their Condition Assessments impact the FFS.	5	Issue resolution can occur within 2 years, with immediate impact on the objective.	3	Resolving the issue will have a direct and minor impact on the FFS of environmentally qualified components.	0.46	0.133	46

ONTARIO POWER GENERATION

Report

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PICKERING NGS PERIODIC SAFETY REVIEW 2 – B (PSR2-B) INTEGRATED IMPLEMENTATION PLAN

Pickering NGS Periodic Safety Review 2 – B (PSR2-B) Integrated Implementation Plan

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Revision Summary

Revision Number	Date	Comments
R00	May 19, 2023	Initial issue.

Executive Summary

Pickering Nuclear Generating Station (NGS) underwent a Periodic Safety Review (PSR), referred to as “PSR2”, which included the assessment of the Safety Factor Review Tasks and modern Laws, Regulations, Codes and Standards (LRCSs) in the PSR2 Assessment Basis [1]. The reviews conducted under PSR2 assessed a period of extended operation to the end of 2028, with the understanding that an extension of the commercial operation of certain units beyond 2024 would be possible if supported by a reassessment of the impact of such extended operation on the time-dependent elements (i.e., the Resolution Actions from PSR2 which are only valid for commercial operation until the end of 2024) of PSR2 on the design and licensing basis that demonstrates acceptability. The requirements for this reassessment are specified in Licence Condition 15.1 of the Pickering NGS Licence Conditions Handbook (LCH) [2].

The Global Assessment Report (GAR) amendment, captured in the PSR2-B GAR [3], presents the results of the reassessment, completed in support of the extended commercial operation of only Pickering Units 5-8 beyond 2024 to the end of the year 2026, with Pickering Units 1 and 4 shutting down in 2024. This assessment is referred to as “PSR2-B”.

The PSR2-B review of Pickering NGS meets the elements of CNSC REGDOC-2.3.3 [4] and CSA N290.18-17, “Periodic Safety Review for Nuclear Power Plants” [5], using guidance from IAEA SSG-25, “Periodic Safety Review for Nuclear Power Plants” [6].

The Global Assessment for PSR2 [7] demonstrated that the Pickering NGS design, condition, operation, processes and management system provides assurance of continued safe operation of the plant during the extended operating period to the end of 2028, with the commercial operation to the end of 2024. All Resolution Actions identified by the PSR2 Global Assessment [7] have been completed as part of the Integrated Implementation Plan (IIP) and closure accepted by the CNSC as of June 30, 2021 [8]. With completion of the Resolution Actions, OPG satisfied the commitments made under the licence for the PSR2.

The PSR2-B GAR [3] is a companion to the PSR2 Global Assessment, and the two assessments constitute the Global Assessment to support extended operation to the end of 2026. The PSR2-B GAR [3] reassesses the time-dependent elements in PSR2 GAR and the new or revised requirements since PSR2 to confirm the validity of the PSR2 conclusions for the additional two years of commercial operation of Units 5 to 8, and to identify any additional actions required beyond those that have already been achieved in the Pickering PSR2 Integrated Implementation Plan (IIP) [9]. The assessment in PSR2-B GI Gap Assessment Report [10] to identify the gaps for consideration in the Pickering PSR2-B Global Assessment includes a review of the Pickering PSR2 Global Issues (GIs) requiring “Reassessment Beyond 2024” in the PSR2 GAR [7], a review of open regulatory actions and an assessment of D-PSR gaps for applicability to Pickering NGS. By including the results from the D-PSR, the PSR2-B assessment takes into account safety significant changes in requirements since the PSR2 was completed and the effectiveness issues related to programs and practices common to the OPG nuclear fleet [11].

The PSR2-B Global Assessment identified 41 PSR2-B Gaps mapped into 14 existing PSR2 Global Issues and 2 new Global Issues (GI-52 and GI-53). Twenty-two gaps were identified

from the reassessment of PSR2 Global Issues impacted by PNGS Operation beyond 2024, one gap was identified from the review of open regulatory actions and 18 gaps were identified from the assessment of D-PSR Gaps for applicability to PNGS. The issues identified consist primarily of gaps related to completion of fitness for service assessments for Major Components and other Structures, Systems and Components (SSCs), safety analysis to address the aging of SSCs for the extended period, and gaps against requirements in modern LRCSs. Thirteen Resolution Statements have been proposed and ranked for resolution under the IIP. Six new Acceptable Deviations have been identified and 11 gaps are resolved as requiring No Further Action.

The issues identified in the PSR2-B Global Assessment that are of higher significance pertain to preparing fitness for service assessments of the Major Components.

Aging Management reviews performed in support of PSR2 confirmed that the condition of SSCs is well understood, and that plant safety and reliability are maintained through a set of systematic and planned surveillance, testing, inspection, and maintenance activities using best industry practices and Operating Experience (OPEX). Fitness for service of Major Components is demonstrated and re-assessed on an on-going basis through planned inspections and maintenance, and assessment of inspection results in accordance with applicable CSA Standards using well established programmatic controls.

Resolution Statements have been proposed to demonstrate fitness for service of Major Components for the extended operating period of Pickering Units 5 to 8 up to the end of 2026. In addition, the aging management strategy for non-Containment safety-related structures will be reviewed to confirm its validity, given the extended operation of Pickering Units 5 to 8 to 2026. Required follow-up actions will be managed under the existing Major Components and Integrated Aging Management Programs. OPG is also committed to updating the safety analysis of Postulated Initiating Events most impacted by aging to support Pickering Units 5 to 8 extended commercial operation.

The PSR2-B GAR [3] concluded that the current plant design, condition, operation, processes and management system will ensure continued safe operation of Pickering Units 5 to 8 for an additional two years of operation. The issues identified are primarily gaps related to completion of fitness for service assessments for Major Components, safety analysis updates to address the aging of SSCs for the extended period, and requirements in modern LRCSs. Resolution of these gaps are addressed under the PSR2-B IIP (this document).

Similar to the PSR2-B GAR [3], the PSR2-B IIP is a companion to the PSR2 IIP [9]. Completion of the IIP actions outlined in both the PSR2 IIP [9] and the PSR2-B IIP will ensure resolution of the gaps identified in both the PSR2 GAR [7] and the PSR2-B GAR [3] and support continued operation of Pickering NGS Units 5 to 8 to the end of 2026.

This document represents the final step in the PSR process that further demonstrates OPG's commitment to safe, reliable operation, and maintaining a healthy nuclear safety culture.

OPG is committed to continuous improvement in safety at all of its nuclear facilities and has robust comprehensive programs in place that are aligned with industry best practices for

ensuring the condition of important SSCs important to safety are well understood and well maintained. The actions within this PSR2-B IIP will further enhance safety and reliability.

1.0 OVERVIEW

OPG is assessing the extension of commercial operation of Pickering Units 5-8 to the end of the year 2026 and requires a supporting safety assessment for this extended operation. Therefore, the PSR2-B reassessed the time-dependent elements (i.e., the Resolution Actions from PSR2 which are only valid for commercial operation until the end of 2024) of PSR2, to assess the applicability of the PSR2 bases for an additional two years of commercial operation and identify any additional actions required to support the extended commercial operation.

Pickering NGS underwent a Periodic Safety Review, referred to as “PSR2”, from 2016 to 2018, in support of operation extension to 2024. OPG was granted a 10-year Power Reactor Operating Licence (PROL) for Pickering NGS for the period of August 31, 2018, to August 31, 2028.

PSR2 was conducted as a subsequent PSR, building on the review basis of earlier OPG PSR work and other associated assessments (termed as “PSR1”), consisting of:

- The Pickering B Integrated Safety Review (ISR), completed in 2009 and performed in support of refurbishment and continued operation (for another 30 years) of the Pickering 5 to 8 units;
- Pickering 1,4 integrated safety assessments performed during the Pickering A Return to Service work (circa 2000), in support of approval to restart the Pickering 1,4 units; and
- The Darlington ISR, completed in 2011 with a “code refresh review” performed in December 2013, in support of refurbishment and continued operation of the Darlington.

The Safety Factor reviews conducted under PSR2 assessed a period of extended operation to the end of 2028. In conducting the PSR2 Global Assessment, the development of Resolution Plans considered whether the resolution activities would be different for a scenario with operation to 2024 (the nominal planning basis for the units), or for operation beyond 2024. In cases where detailed resolution activities were only identified to address commercial operations to 2024, the Global Issue (GI) Resolution Plan was identified as requiring “Reassessment Beyond 2024”. The GI Resolution Plans not requiring reassessment for beyond 2024 were evaluated for the period of extended operation of Pickering NGS units to the end of 2028, and therefore, are not time-sensitive to the proposed extension to 2026. The results of the PSR2 assessments were documented in the PSR2 Global Assessment Report (GAR) [7] and actioned in the PSR2 Integrated Implementation Plan (IIP) [9].

Hence, the PSR2 fully assessed the safe operation of Pickering NGS to 2024, with the understanding that an extension of the commercial operation of certain units beyond 2024 would be possible, if supported by a reassessment of the impact of such extended operation on the licensing basis and continued plant safety.

The requirements for this reassessment are specified in the Pickering NGS Licence Conditions Handbook (LCH), LCH-PR-48.00/2028 R004, for Licence Condition 15.1 [2].

The elements of PSR2-B consist of the following three phases:

(i) An assessment to identify additional gaps for consideration in the Pickering PSR2 Global Assessment, including a review of the Pickering PSR2 GIs to evaluate the impact of commercial operations beyond 2024, a review of open regulatory actions and an assessment of Darlington NGS D-PSR gaps and Enhancement Opportunities (EOs) for applicability to PNGS.

This phase is complete, and the results are documented in GI Gap Assessment Report [10].

(ii) An amendment to the Pickering PSR2 Global Assessment Report [7] to assess the acceptability of Pickering Units 5 to 8 for continued operation over the extended period, and to identify the necessary improvements.

This phase is complete, and the results are documented in the PSR2-B GAR [3].

(iii) An amendment (this document) to the Pickering PSR2 IIP [9] to reflect the results of the PSR2-B Global Assessment Report (GAR).

The PSR2-B Re-Assessment Strategy is documented in Reference [12]. The PSR2-B Re-Assessment Strategy [12] defines the scope and methodology for conducting the Pickering PSR2-B.

1.1 Pickering NGS Performance

1.1.1 Safety Performance

Safety at all of OPG's facilities is an overriding priority and essential in the pursuit of achieving high performance goals.

Combining a safe robust design with mature programs that meet or exceed industry standards and regulatory requirements has allowed OPG to operate Pickering NGS safely for over 40 years. Continuous investments in plant condition, driven by strong reliability programs, and an OPG leadership team that is committed to safety have enhanced performance throughout the plant's life.

Pickering NGS continues to have strong performance in all areas of safety with a conventional safety performance rating that is in the industry's top quartile.

OPG has comprehensive Probabalistic Safety Assessments (PSA) in place for Pickering NGS 1,4 and Pickering NGS 5 to 8 that demonstrate the likelihood of a serious accident remains acceptable in accordance with requirements [14][15].

1.1.2 Condition of Major Components

OPG has in place well established programs and processes that meet or exceed applicable regulatory requirements for ensuring that the physical condition of SSCs remain fit-for-service as required by Section 6.1 of the LCH [2].

The current regulatory requirement is that major components, including fuel channels, be inspected as required by CSA. The inspection results are compared against acceptance criteria defined in the appropriate CSA Standard and when required by the CSA standard, OPG submits fitness for service assessments for CNSC acceptance to support return of the unit to service. In addition, inspection results are reported to CNSC following unit restart in accordance with the reporting criteria defined in the appropriate CSA Standard.

1.2 Pickering NGS PSR2-B

The major input to the PSR2-B Global Assessment was the GI Gap Assessment in [10], which included the following reviews:

- Reassessment of existing PSR2 Global Issues flagged for “Reassessment Beyond 2024” to identify impacts due to the extension of Pickering Units 5 to 8 commercial operation to 2026.
- Review of open PNGS licensing issues as of September 2022 to determine whether new issues are addressed by existing Global Issues.
- Review of gaps and EOs from the D-PSR to determine applicability to PNGS and identify new Global Issues for PNGS where applicable.

The PSR2-B Global Assessment consisted of the following elements:

1. Development of Global Issues by integrating and consolidating the Gaps identified in the GI Gap Assessment Report [10].
2. Prioritization of Global Issues.
3. Development of proposed Resolution Plans with consideration of safety benefits, practicability, and the interfaces between the Gaps and Global Issues.
4. Ranking of Global Issue Resolution Statements.
5. The aggregate impact of Acceptable Deviations and an assessment of Defence-in-Depth.
6. Assessment of overall acceptability of extending the commercial operation of Pickering Units 5 to 8 beyond 2024 to 2026.

For items 5 and 6 above, the PSR2 GAR [7] conclusions serve as the basis for this assessment.

Each of the above steps is described in more detail in Section 3.0 of the PSR2-B GAR [3], and the results are presented in Section 4.0 through to Section 12.0 of the PSR2-B GAR [3].

The final phase of the PSR2-B process is the IIP (this document) which defines Resolution Actions to address Global Issues. Each Resolution Action is completed through the execution of one or more IIP Actions.

2.0 PSR2-B GLOBAL ASSESSMENT

The methodology for the conduct of assessments and the associated framework of the Global Assessment is described in the PSR2 GAR [7]. The PSR2 Global Assessment Framework, described in detail in Section 5 and Appendix C of PSR2 GAR [7], is the basis for assessing the relative importance of addressing Global Issues in terms of aspects such as their safety significance and impact of their resolution. The same methodology and the framework were used to assess the new and revised Global Issues in PSR2-B.

The subsections below describe the steps of the overall methodology used for performing the Global Assessment for PSR2-B.

2.1 Development of Global Issues

The first step in the Global Assessment methodology is the review and accumulation of the gaps identified and consolidating them into GIs. The overall safety significance of a given GI is based on the gap with the highest safety significance, even though individual gaps grouped in the same GI may have a lower safety significance.

The following information for each Gap is collected:

- Origin of Gap (i.e., PSR2 Resolution Statement, PSR2 IIP Action, D-PSR Gap, Open Pickering NGS Regulatory Action Item)
- Gap identification number and title
- Associated modern Laws, Regulations, Codes and Standards (if applicable)
- Description of the Gap

The newly identified PSR2-B gaps are then grouped into the existing PSR2 Global Issues or into new PSR2-B Global Issues according to their topical similarities.

2.2 Prioritization of Global Issues

The Global Issues developed in Section 2.1 are prioritized with respect to nuclear safety into one of four categories, based on their Safety Significance Level as described in Section 3.3.3 of the PSR2 Basis Document [1], and shown in Table 1 below.

Table 1: Safety Significance Levels

Safety Significance Level	Impact on Nuclear Safety
1	High
2	Medium
3	Low
4	Very Low

The basis for prioritization of each Global Issue is provided in Appendices E and F of the PSR2 Basis Document [1], and comprises Deterministic and Probabilistic considerations.

The Deterministic considerations are:

- Defence-in-Depth (E1)
- Safety Significance Levels (E2)

Using the guidelines provided in Appendix E of the PSR2 Basis Document [1], a Safety Significance Level of 1, 2, 3 or 4 is assigned to each Deterministic consideration based on whether the Global Issue has a high, medium, low or very low impact on nuclear safety for the consideration being evaluated. A Safety Significance Level of 1, 2, 3 or 4 is then assigned to the overall Deterministic consideration based on the most safety significant result. For Deterministic considerations that are not relevant to the Global Issue, the prioritization is recorded as “N/A” or “Not Applicable”.

There are 7 Probabilistic considerations, as follows:

- Reactor Safety Core Damage Frequency (F1)
- Reactor Safety Defence-in-Depth (F2)
- Public Radiation Safety (F3)
- Plant Operability (F4)
- Occupational Radiation Safety (F5)
- Emergency Preparedness (F6)
- Environment (F7)

Using the guidelines provided in Appendix F of the PSR2 Basis Document [1], a Safety Significance Level of 1, 2, 3 or 4 is assigned to each Probabilistic consideration based on whether the Global Issue has a high, medium, low or very low impact on nuclear safety for the consideration being evaluated. A Safety Significance Level of 1, 2, 3 or 4 is then assigned to the overall Probabilistic consideration based on the most safety

significant result. For Probabilistic considerations that are not relevant to the Global Issue, the prioritization is recorded as “N/A” or “Not Applicable”.

The overall Safety Significance Level for the Global Issue is then assigned based on the Safety Significance Level of whichever overall consideration, Deterministic or Probabilistic, has the highest nuclear safety impact.

The results of the prioritization of the Global Issues, including the Safety Significance Level assigned to each Global Issue and the accompanying rationale, are provided in Section 4 of each Global Issue Table in Appendix B of the PSR2-B GAR [3].

The outcome of the Global Issue Safety Significance Level assessment is documented in Section 4 of each Global Issue summary in Appendix B of the PSR2-B GAR [3]. A Safety Significance Level between 1 and 4, or N/A, is assigned for each of the considerations in Appendix E and Appendix F of the PSR2 Basis Document [1]. N/A means that the Global Issue has no impact on the particular consideration, so the corresponding table in the PSR2 Basis Document is not applicable for the purposes of assessing the Safety Significance Level. The overall Safety Significance Level for each Global Issue corresponds to the highest impact on nuclear safety (smallest Safety Significance Level number) of the individual considerations.

The results of the prioritization of PSR2-B Global Issues are presented in Section 6.0 of the PSR2-B GAR [3].

2.3 PSR2-B Global Issues

The Gaps listed in Section 4.0 of the PSR2-B GAR [3] are grouped into Global Issues in Appendix B of the PSR2-B GAR [3], according to their topical similarities, i.e., based on the related discipline, governing process or relevant modern codes and standards, with consideration of any interfaces, overlaps and similarities among the Gaps.

A total of 16 Global Issues are identified for the Pickering NGS PSR2-B. The 41 Gaps identified are mapped into 14 existing PSR2 Global Issues and 2 new Global Issue (GI-52 and GI-53). Twenty-two gaps were identified from the reassessment of PSR2 Global Issues impacted by Pickering NGS Operation beyond 2024, one gap was identified from the review of open regulatory actions and 18 gaps were identified from the assessment of D-PSR Gaps applicability to Pickering NGS.

The Global Issue Titles are listed in Table 2. Full descriptions and assessment of each Global Issue are provided in Global Issue Tables in Appendix B of the PSR2-B GAR [3].

Table 2: PSR2-B Global Issues

Global Issue #	Global Issue Title	Safety Significance Level
GI-1	Fitness for Service for Fuel Channels	1
GI-2	Fitness for Service for Feeders	1
GI-3	Fitness for Service for Steam Generators	1
GI-4	Fitness for Service for Reactor Components and Structures	2
GI-8	Completion / Updating of the Condition Assessments	3
GI-15	Governance Issues	4
GI-16	Concession Related to N285.5-M90	4
GI-19	Fitness for Service of Containment for the Extended Operating Period	4
GI-20	Governance Implementation / Effectiveness Issues	4
GI-24	Safety Analysis to Support the Extended Operating Period	2
GI-31	Deterministic Safety Analysis	4
GI-40	Accident Management	4
GI-43	Safety-Related Structures (Non-Containment) for Nuclear Power Plants	3
GI-50	N285.4 PIP / Documentation Revision	4
GI-52	Fire Protection – NBCC and NFCC	3
GI-53	Reassessment of Qualified Life as Documented in the EQAs	3

The PSR2-B gaps are associated with the existing PSR2 GIs, with the exception of two D-PSR Gaps in a new Global Issue (GI-52) and a new Global Issue related to EQAs (GI-53). These Global Issues are then prioritized with respect to their overall impact on nuclear safety, and Resolution Plans are developed for all Global Issues.

2.4 Development of Resolution Plans

Proposed Resolution Plans for Global Issues are formulated with consideration of interfaces between the various Gaps to ensure that the proposed Resolution Plans complement each other. Proposed Resolution Plans are developed for all Global Issues and consider safety benefits and practicability. Insights from available site Probabilistic Safety Assessments [14][15] may be used in evaluating the benefit/practicality of potential options, where appropriate.

Proposed Resolution Plans may include proposed Resolution Statements which are actions defined to address a Gap. Proposed Resolution Statements are primarily proposed for Global Issues that have been prioritized with a Safety Significance Level of 1 or 2 (i.e., high or medium impact on nuclear safety), and for Global Issues with Safety Significance Level 3 if a practicable solution is readily evident.

Consistent with Section 3.3.3 of the PSR2 Basis Document [1], Resolution Statements are not proposed for all PSR2 Gaps. Gaps with Safety Significance Level 4 (i.e., very low impact on nuclear safety) are generally assessed as Acceptable Deviations. Gaps with Safety Significance Level 3 (i.e., low impact on nuclear safety) for which a practicable solution is not readily evident are also assessed as Acceptable Deviations. Acceptable Deviations are not tracked beyond the Global Assessment phase of PSR2 [1]. However, the impacts of Acceptable Deviations are considered in the Defence-in-Depth Assessment to determine the aggregate impact on the defence-in-depth capability of the plant.

The proposed Global Issue Resolution Plans for each Global Issue are documented in Appendix B – Global Issues and Proposed Resolution Plans of the PSR2-B GAR [3]. These consist of the following statement types:

- Resolution Statements (RS): An activity is defined to address the Gap(s).
- No Further Action (NFA): Work is already completed or is underway outside of PSR2 to address the related Gap(s), or information has been found to obviate the Gap(s).
- Acceptable Deviation (AD): The Gap(s) have been assessed to have a Very Low Safety Significance Level, or are Low Safety Significance Level items and a practicable resolution is not readily evident.
- Cross Reference (XRF): An action that addresses the Gap(s) is covered by another Resolution Statement.

To facilitate binning of potential work, proposed Resolution Plans are categorized as one or more of the following types of enhancements:

- Programmatic (changes to governing programs and procedures)
- Engineering (repair/replacement or design changes)

- Analytical (engineering analysis, deterministic safety analysis, probabilistic safety assessment or hazard analysis)

The categorization is identified in Section 1 of each Global Issue Table in Appendix B of the PSR2-B GAR [3]. In some cases, the proposed Resolution Statements entail work in more than one of these categories.

The Global Issues and the Resolution Plans undergo several reviews during the Global Assessment process. These reviews consider factors such as the priority previously determined (Safety Significance Level), the contribution to defence-in-depth and the significance of the source (e.g., the type of document that generated the Gap(s) leading to the Global Issue). The proposed resolutions identified in this report are also presented to OPG Senior Management for their review and acceptance.

2.5 Ranking of Resolution Statements

The purpose of ranking proposed Resolution Statements is to determine the activities that will be most effective in enhancing safety.

All Global Issue Resolution Statements with identified actions are ranked from 1 to N in decreasing importance such that 1 is the most important and N, which is the total number of Resolution Statements, is the least important.

The ranking is determined through the application of a value-tree method for solving multi-attribute decision problems, as described in Section 5.5 and Appendix C of the PSR2 GAR [7]. The ranking of each proposed Resolution Statement is based on the weight and a two-variable utility function that accounts for impact and time attributes. The impact attribute is a measure of how directly or strongly the issue impacts the objective, while the time attribute accounts for how long it would take to implement and realize the associated objective. The two variable utility function is used to generate a utility matrix, and the time and impact ratings for each proposed Resolution Statement are used together with the utility matrix to obtain a numerical value that represents the utility score for resolving the proposed Resolution Statement. The Ranking Number of the proposed Resolution Statement is then calculated by multiplying its utility score by its weight.

Acceptable Deviations and No Further Action statements do not go through the ranking process; only proposed Resolution Statements with identified actions are ranked.

2.6 Defence-in-Depth Assessment

As part of the PSR2 Global Assessment, a Defence-in-Depth assessment was performed which supported extended operation at Pickering NGS by demonstrating the extent to which the safety requirements of defence-in-depth are fulfilled at Pickering NGS. The overall assessment was an important element in supporting the proposed enhancement plans and the planned operational strategy over the period of PSR2.

The PSR2 assessment of defence-in-depth and its conclusions in PSR2 GAR [7] serve as the basis for the PSR2-B review. The approach taken in the assessment in PSR2 is based on the Defence-in-Depth requirements identified in CNSC REGDOC-2.3.3 [4], with specific assessment guidance provided by the IAEA Safety Report Series No. 46, "Assessment of Defence in Depth for Nuclear Power Plants" [16]. The approach analyzes the five independent levels of defence. All levels of defence-in-depth rely on multiple barriers of protection to prevent or limit equipment failures or human errors and mitigate the consequences should these failures or errors occur. The intent of the review was to confirm that for each of the five levels of defence, barriers are not unnecessarily challenged, and if they are, they do not all fail.

The following five levels of defence, listed below are defined in IAEA INSAG-10 Defence in Depth in Nuclear Safety [17]:

Level 1: Prevention of abnormal operation and failures

Level 2: Control of abnormal operation and detection of failures

Level 3: Control of accidents within the design basis

Level 4: Control of severe plant conditions, including prevention of accident progression and mitigation of the consequences of severe accidents

Level 5: Mitigation of radiological consequences of significant releases of radioactive materials

The Defence-in-Depth assessment considered the overall plant, as well as the identified strengths, acceptable deviations, and the proposed resolutions to the Global Issues listed in the Global Assessment.

The defence-in-depth concept applied to the Global Assessment was consistent with IAEA INSAG-10, Defence in Depth in Nuclear Safety [17]. The assessment used elements of the process described in IAEA SRS-46, Assessment of Defence in Depth for Nuclear Power Plants [16].

It was confirmed that the applicable safety principles from IAEA SRS-46 [16] for the concept of defence-in-depth was applied at the Pickering NGS design stage and throughout its operation over a period of several decades. At the design stage, the focus was on the first three levels of defence-in-depth: prevention of operation outside normal operating conditions, control of abnormal conditions, and provision of safety systems to effectively mitigate Design Basis Accidents (DBA). The capability of station systems and processes for responding to emergencies to mitigate the consequences of BDBAs, including severe accidents, was considered for defence-in-depth Levels 4 and 5.

The Defence-in-Depth assessment confirmed that at Pickering NGS, effective Level 1 barriers are ensured through the original conservative design, supplemented by design

enhancements implemented since initial operation, comprehensive operating and maintenance programs in place, and ongoing continuous improvements based on national and international OPEX. Given the focus and priority placed on equipment reliability to address the findings in the areas of the equipment condition, this level of defence will continue to be strong and effective for Pickering NGS.

The assessment of defence-in-depth Level 2 confirmed that the provisions in place at Pickering NGS are mature and robust. This is further enhanced by the completed implementation the PSR2 Resolution Plans related to Level 2.

The Defence-in-Depth Assessment confirms that the Pickering NGS has strong Level 3 barriers due to the high quality of the design that includes extensive mitigating provisions, comprehensive emergency operating procedures, and a robust set of safety analyses. The completed implementation of REGDOC-2.4.1 [18] and REGDOC-2.4.2 [19], and the planned safety analysis updates (GI-24) for the extended operation beyond 2024 further sustain and enhance the safety requirements of Level 3.

The PSR2 assessments and the review of safety principles show that design features and procedural provisions are in place and are effective for defence-in-depth Level 4. The measures considered at the first three levels ensure maintenance of the structural integrity of the core and limit potential radiation hazards to members of the public. The complete implementation of Fukushima Actions, Phase 2 EME and SAMG has further strengthened defence-in-depth Level 4.

The assessment of defence-in-depth Level 5 confirmed that the coordinated emergency response capability of the various response organizations and the implementation of OPEX from the Fukushima event supports the Level 5 defence-in-depth provisions.

The enhancement to the Emergency Response Projection Software as part of the PSR2 IIP Action (G26-RS1-10-22) [9] has further enhanced the response for defence-in-depth Level 5.

The detailed review of provisions for each level of defence presented in Section 18 and Appendix D of PSR2 GAR [7] confirmed that Pickering NGS design and operation have adequate and effective barriers in all applicable levels of defence-in-depth and that significant improvements to barriers have been implemented.

The comprehensiveness of the assessment in PSR2 GAR [7] is assured by assessing each of the safety principles, which are supported by multiple and overlapping provisions for each level of defence-in-depth. Furthermore, each defence-in-depth level is supported by multiple safety principles providing a second layer of overlap of provisions across levels of defence-in-depth. The defence-in-depth has been further strengthened with the implementation of the PSR2 Resolution Plans and completion of associated IIP Actions [9].

The adequacy of these provisions has also been confirmed by the comprehensive PSAs. The Pickering NGS PSAs [14][15] demonstrate that the overall plant design has a Core Damage Frequency and Large Release Frequency within the OPG risk-based Safety Goals, indicating robustness in the design and reliable equipment that is capable of responding effectively to accident scenarios.

For the PSR2-B, the defence-in-depth assessment included consideration and confirmation that the conclusions of the assessment in PSR2 are not impacted by the Global Issues identified in PSR2-B. The PSR2-B assessment considered the following elements:

- The key physical improvements, analytical evaluations and programmatic enhancements that have been completed since PSR2, and how these improvements and enhancements supports the baseline plant meeting the requirements of defence-in-depth.

- The positive impact on defence-in-depth of the enhancements associated with the proposed Resolution Plans for PSR2-B from the PSR2-B GAR [3].

- Confirmation that the PSR2-B Acceptable Deviations do not have a significant adverse effect on defence-in-depth, either individually or when aggregated.

2.7 Evaluation of Acceptability of Operation of Pickering Units 5 to 8 to 2026

This step assembles the results of the previous steps of the PSR2-B assessment to evaluate the overall acceptability of extended Pickering Units 5 to 8 operation to 2026 on the basis of a balanced view of all of the findings. The PSR2-B Global Assessment [3] considers the PSR2 Global Assessment conclusions in [7], the improvements implemented since the PSR2 assessment, the proposed enhancements identified, and the Defence-in-Depth Assessment.

2.8 Pickering PSR2-B Conclusions

This amendment to the Global Assessment reassessed the time-dependent elements in PSR2 GAR and the new or revised requirements since PSR2 to confirm the validity of the PSR2 conclusions for two additional years of commercial operation for Units 5 to 8 to the end of 2026. Furthermore, by including the results from the D-PSR, the PSR2-B assessment takes into account safety significant changes in requirements since the PSR2 was completed and effectiveness issues related to programs and practices common to the OPG nuclear fleet.

Also, as part of PSR2-B, the Condition Assessment of SSCs in PSR2 scope were re-evaluated to confirm the validity of the existing recommendations from PSR2, the technical bases and rationalizations, given the extended operation of Pickering Units 5 to 8 to 2026.

The assessment of newly identified Acceptable Deviations confirmed there is no impact on the conclusions of the Global Assessment, either individually or in aggregate. In addition, the Acceptable Deviations in PSR2 [7] identified as requiring "Reassessment Beyond 2024" were reassessed to confirm that they are not time sensitive to extended operation from 2024 to 2026 of Pickering Units 5 to 8.

Finally, the assessment confirms that the Global Issues identified by PSR2-B do not invalidate the conclusions of the assessment in the PSR2 GAR, and the defence-in-depth will be further strengthened with the implementation of the proposed Resolution Plans.

The Global Assessment concluded that the current plant design, condition, operation, processes and management system will ensure continued safe operation of Pickering Units 5-8 for an additional two years of operation beyond 2024. Resolution of these gaps will be addressed under the IIP (this document).

3.0 INTEGRATED IMPLEMENTATION PLAN

The third and final phase of the PSR2-B process is the Integrated Implementation Plan that defines Resolution Actions to address Global Issues. Each Resolution Action is completed through the execution of one or more IIP Actions.

Appendices A, B and C of this document define the Resolution Actions and their supporting IIP Actions. These actions will be closed when CNSC is satisfied that their corresponding success criteria are met.

Within OPG, accountability for the successful execution of the IIP has been assigned at the appropriate level, ensuring the commitment and engagement of the organization.

Furthermore, OPG has established IIP change control process and reporting arrangements – as part of OPG's Regulatory Management Governance framework – under an existing instruction document, P-INS-03680-00001 [20].

3.1 Resolution Action and IIP Action Identification

The Resolution Actions and their associated IIP Actions are assigned unique identifiers which trace their origin and classification within the PSR2 process.

For example: "G01-RS5-06-01-B" identifies the first Resolution Action ("-01") of the IIP associated with the second Global Assessment Resolution Statement ("-RS5-") related to the first Global Issue ('G01-') associated with CNSC Safety and Control Area six ("-06"). ".1-B" identifies the first IIP Action related to Resolution Action "G01-RS5-06-01-B". The IIP Actions are listed by SCA in Appendix C of this document.

For any IIP Resolution Actions that were identified by the PSR2-B GAR, these are appended with the designation "-B). For example, G01-RS5-06-01.1-B.

Table 3: Example IIP Resolution Action

	Global Issue	Resolution Statement	Safety and Control Area	IIP Resolution Action	IIP Assignment
Resolution Action:	**G01**	**-RS5**	**-06**	**-01-B**	**-**
IIP Action:	G01	-RS5	-06	-01	.1-B
	G01	-RS5	-06	-01	.2-B

The IIP Resolution Actions were transitioned into OPG's Asset Suite Action Tracking as Regulatory Commitment (REGC) Action Requests (ARs), and the IIP Actions were transitioned into Action Tracking as Regulatory Management (REGM) "assignments" associated with the corresponding REGC ARs. Within OPG's Action Tracking, the Resolution Actions are identified by specific AR numbers.

3.2 Completion and Success Criteria

Resolution Actions and their supporting IIP Actions have been developed by Industry Experts in PSR and OPG Subject Matter Experts and were provided specific Completion Criteria. Actions are independently reviewed and approved by OPG senior leadership, to ensure that actions will satisfy the completion and success criteria, and that implementation timelines will be met by responsible Action Owners.

Completion criteria states what is required for the action to be considered complete, identifying a measurable action to be completed. Completion criteria may include completed and documented analysis, system inspections, or installed modifications. A Resolution Action and its supporting IIP Actions all have specific completion criteria. Resolution Action completion criteria defines the measure that the RA, supported by IIP Actions, has been successfully completed.

Success Criteria states what is required for a Resolution Action to be considered successful or effective, identifying a measurable result which is to be achieved. Success Criteria may include submitted aggregate analysis results, system inspection results documented, or confirmation and acceptance of installed modifications. Success Criteria are applied only to Resolution Actions.

4.0 CONCLUSION

The amendment to the Global Assessment reassessed the time-dependent elements in the PSR2 GAR and the new or revised requirements since PSR2 to confirm the validity of the PSR2 conclusions for the additional two years of commercial operation of Pickering Units 5 to 8 to the end of 2026. Furthermore, by including the results from the D-PSR, the PSR2-B assessment takes into account safety significant changes in

requirements since the PSR2 was completed and effectiveness issues related to programs and practices common to the OPG nuclear fleet.

Also, as part of PSR2-B, the Condition Assessment of SSCs in PSR2 scope were re-evaluated to confirm the validity of the existing recommendations from PSR2, the technical bases and rationalizations, given the extended operation of Pickering Units 5 to 8 to 2026.

The assessment of newly identified Acceptable Deviations confirmed there is no impact on the conclusions of the Global Assessment, either individually or in aggregate.

The PSR2-B GAR [3] concluded that the current plant design, condition, operation, processes and management system will ensure continued safe operation of Pickering Units 5 to 8 for an additional two years of operation. The issues identified are primarily gaps related to completion of fitness for service assessments for Major Components and other SSCs, safety analysis updates to address the aging of SSCs for the extended period, and gaps against requirements in modern LRCSs. Resolution of these gaps are addressed under this PSR2-B IIP in Appendix B of this document.

The scope of the PSR2-B IIP is comprised of 19 IIP actions associated with 13 Resolution Statements and 9 Global Issues. The management infrastructure and processes in place [20] will ensure that the IIP action completion progress is monitored and reported, risks are identified early and mitigation plans are put in place as appropriate. The timely completion of the actions as outlined in Appendix B of this document will support the extension of commercial operation of Pickering NGS Units 5 to 8 to the end of 2026.

OPG is committed to continuous improvement in safety at all of its nuclear facilities and has robust comprehensive programs in place that are aligned with industry best practices for ensuring the condition of important SSCs important to safety are well understood and well maintained. The actions within this PSR2-B IIP will maintain or further enhance safety and reliability.

5.0 DEFINITIONS AND ACRONYMS

AFS	Available for Service
AR	Action Request
BDBA	Beyond Design Basis Accident
CNSC	Canadian Nuclear Safety Commission
CSA	Canadian Standards Association
D-PSR	Darlington Periodic Safety Review
DBA	Design Basis Accident
EC	Engineering Change
EO	Enhancement Opportunities
EQ	Environmental Qualification
EQA	Environmental Qualification Assessment
EME	Emergency Mitigating Equipment
GAR	Global Assessment Review
GI	Global Issue
IAEA	International Atomic Energy Agency
IIP	Integrated Implementation Plan
INSAG	International Nuclear Safety Advisory Group
ISR	Integrated Safety Review
LCH	Licence Conditions Handbook
LCMP	Life Cycle Management Plan
LOCA	Loss of Coolant Accident
LOF	Loss of Flow
LRCS	Laws, Regulations, Codes and Standards
NBCC	National Building Code of Canada
NFA	No Further Action
NFCC	National Fire Code of Canada
NGS	Nuclear Generating Station
NOP	Neutron Overpower Protection
OPEX	Operating Experience
OPG	Ontario Power Generation
PIP	Periodic Inspection Program

PROL	Power Reactor Operating Licence
PSA	Probabilistic Safety Assessment
PSR	Periodic Safety Review
PSR2	Periodic Safety Review 2
PSR2-B	Periodic Safety Review 2 - B
REGC	Regulatory Commitment
REGM	Regulatory Management
RB	Reactor Building
RS	Resolution Statement
SAMG	Severe Accident Management Guideline
SBLOCA	Small Break Loss of Coolant Accident
SCA	Safety and Control Area
SF	Safety Factor
SFR	Safety Factor Report
SRS	Safety Reports Series
SSC	Structures, Systems and Components
SSG	Specific Safety Guide
XRF	Cross-reference

6.0 REFERENCES

[1] OPG Report, “Pickering NGS Periodic Safety Review 2 (PSR2) Basis Document”, P-REP-03680-00001 R002, June 29, 2016.

[2] CNSC, “Pickering Nuclear Generating Station, Licence Conditions Handbook”, LCH-PR-48.00/2028 R005, February 24, 2023.

[3] OPG Report, “Pickering NGS Periodic Safety Review 2-B (PSR2-B): Global Assessment Report”, P-REP-03680-00048 R000, April 28, 2023.

[4] CNSC Regulatory Document, “Operating Performance: Periodic Safety Reviews”, REGDOC-2.3.3, April 2015.

[5] CSA Standard, “Periodic Safety Review for Nuclear Power Plants”, N290.18-17, 2017.

[6] IAEA Specific Safety Guide, “Periodic Safety Review for Nuclear Power Plants”, SSG-25, 2013.

[7] OPG Report, “Pickering NGS Global Assessment Report”, P-REP-03680-00032 R001, February 8, 2018.

[8] OPG Correspondence, “Pickering NGS: Submission of the 2021 Integrated Implementation Plan (IIP) Report”, P-CORR-00531-22680 R000, August 19, 2021.

[9] OPG Report, “Pickering Periodic Safety Review 2 (PSR2) Integrated Implementation Plan”, P-REP-03680-00031 R001, February 28, 2018.

[10] OPG Report, “Pickering NGS Periodic Safety Review 2-B (PSR2-B): Global Issues Gap Assessment Report”, P-REP-03680-00047 R000, March 29, 2023.

[11] OPG Report, “DNGS Periodic Safety Review Basis Document”, NK38-REP-03680-11844 R002, January 28, 2021.

[12] OPG Report, “PSR2 Re-Assessment Strategy - B”, P-REP-03680-00051 R001, January 12, 2023.

[13] OPG Correspondence, “Pickering NGS Strategy for the Re-assessment of PSR2 for Pickering Optimization of Shut Down”, P-CORR-00531-22685 R000, June 29, 2021.

[14] OPG Report, “Pickering Nuclear Generating Station A Probabilistic Safety Assessment Summary Report”, NA44-REP-03611-00036 R001, September 28, 2018.

[15] OPG Report, “Pickering Nuclear Generating Station B Probabilistic Safety Assessment Summary Report”, NK30-REP-03611-00021 R001, January 10, 2018.

[16] IAEA Report, “Assessment of Defence in Depth for Nuclear Power Plants”, Safety Report Series No. 46, February 2005.

[17] IAEA Report, “Defence in Depth in Nuclear Safety”, INSAG-10, June 1996.

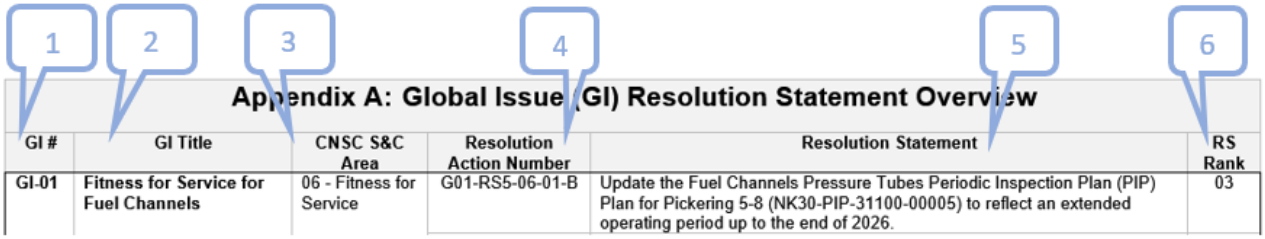
[18] CNSC Regulatory Document, “Deterministic Safety Analysis”, REGDOC-2.4.1, May 2014.

[19] CNSC Regulatory Document, “Probabilistic Safety Assessment for Reactor Facilities”, REGDOC-2.4.2, May 2014.

[20] OPG Instruction, “Pickering Integrated Implementation Plan Administration’, P-INS-03680-00001 R001, January 12, 2021.

Appendix A Global Issue (GI) Resolution Statement Overview

Resolution Statements for Global Issues identified in the PSR2-B Global Assessment Report [3] are listed in Appendix A. Resolution Statements are proposed action statements to address a Global Issue, and are each given a unique Resolution Action numerical identifier for management through [20]. IIP Actions (Appendix B) have been produced as sub-actions of Resolution Actions, the completion of which, will complete the associated Resolution Action.



Appendix A: Global Issue (GI) Resolution Statement Overview

GI #	GI Title	CNSC S&C Area	Resolution Action Number	Resolution Statement	RS Rank
GI-01	Fitness for Service for Fuel Channels	06 - Fitness for Service	G01-RS5-06-01-B	Update the Fuel Channels Pressure Tubes Periodic Inspection Plan (PIP) Plan for Pickering 5-8 (NK30-PIP-31100-00005) to reflect an extended operating period up to the end of 2026.	03

Content

(1) **GI #:** Global Issue (GI) number, as identified in the GAR.
(2) **GI Title:** Description of the GI.
(3) **CNSC S&C Area:** Resolution Action associated REGDOC-2.3.3 Safety and Control Area.
(4) **Resolution Action Number:** Unique numerical Resolution Action reference number used to manage Resolution Actions.
(5) **Resolution Statement:** The Resolution Statement for the associated GI as defined in the Global Assessment Report.
(6) **RS Rank:** Resolution Statement (RS) ranking as identified in the Global Assessment Report, ranked in order of the priority to address the GI, based on the magnitude and timeliness of the benefit to be achieved by its resolution.

Appendix A: Global Issue (GI) Resolution Statement Overview

GI #	GI Title	CNSC S&C Area	Resolution Action Number	Resolution Statement	RS Rank
GI-01	**Fitness for Service for Fuel Channels**	06 - Fitness for Service	G01-RS5-06-01-B	Update the Fuel Channels Pressure Tubes Periodic Inspection Plan (PIP) Plan for Pickering 5-8 (NK30-PIP-31100-00005) to reflect an extended operating period up to the end of 2026.	07
			G01-RS6-06-02-B	Establish the basis for continued demonstration of fitness for service of fuel channels for Pickering 5-8 for the extended operating period up to the end of 2026. Fitness for service of fuel channels includes demonstration of sufficient margin on the FFS limits of the pressure tubes, calandria tubes and garter springs (annulus spacers) during the continued operational life of the plant.	01
			G01-RS7-06-03-B	Demonstrate fitness for service for Zr-Nb-Cu and Inconel X-750 Pickering Units 5 to 8 Spacers for the extended operation to the end of 2026.	02
			G01-RS8-06-04-B	Develop and submit an implementation plan for developing inputs to satisfy the methodology in the Non-Mandatory Annex G of CSA N285.8-15, Update #1 to perform uncertainty analyses in probabilistic evaluations where the threshold requirement is met per CSA N285.8.	13
GI-02	**Fitness for Service for Feeders**	06 - Fitness for Service	G02-RS2-06-05-B	Establish the basis for continued demonstration of fitness for service of feeders for Pickering 5-8 for the extended operating period up to the end of 2026. Fitness for service of feeders includes demonstration that predicted feeder condition, with identified and planned mitigations, is acceptable for the intended operation.	03
GI-03	**Fitness for Service for Steam Generators**	06 - Fitness for Service	G03-RS2-06-06-B	Establish the basis for continued demonstration of fitness for service of steam generators for Pickering 5-8 for the extended operating period up to the end of 2026. Fitness for service of steam generators includes demonstration that predicted steam generator condition, with identified and planned mitigations, is acceptable for the intended operation.	04

Appendix A: Global Issue (GI) Resolution Statement Overview

GI #	GI Title	CNSC S&C Area	Resolution Action Number	Resolution Statement	RS Rank
GI-04	**Fitness for Service for Reactor Components and Structures**	06 - Fitness for Service	G04-RS3-06-07-B	Establish the basis for continued demonstration of fitness for service of reactor components and structures for Pickering 5-8 for the extended operating period up to the end of 2026. This includes demonstration that predicted reactor components and structures condition, with identified and planned mitigations, is acceptable for the intended operation. This also includes the required inspection activities to update the Calandria Tube – Liquid Injection Shutdown System (CT-LISS) nozzle gap assessments and identification of mitigation strategies if CT-LISS contact is predicted within the extended operating period.	05
GI-20	**Governance Implementation / Effectiveness Issues**	01 – Management System	G20-RS1-01-08-B	Complete Regulatory Management action (AR# 28252308) for providing a status update on Action Notice AN2 of CNSC Action Item 2017-48-12365 and complete field implementation of Engineering Change (EC) 132846 for 67138-LT566/LIA566 loop failure detection for EWS RB Water Level Measurement is complete.	10
GI-24	**Safety Analysis to Support the Extended Operating Period**	04 – Safety Analysis	G24-RS2-04-09-B	Update the Heat Transport System (HTS) aging safety analysis models and perform the required safety analysis of Postulated Initiating Events most impacted by aging (Small Break Loss of Coolant Accident (SBLOCA), Loss of Flow (LOF) and Neutron Overpower (NOP)) to support extended operation for Pickering Units 5-8.	06
GI-43	**Safety-Related Structures (Non-Containment) for Nuclear Power Plants**	06 - Fitness for Service	G43-RS4-06-10-B	Complete review of the aging management strategy for non-Containment safety-related structures. The purpose of the review is to confirm that the bases for the associated Aging Management Plan [N-PLAN-01060-10004] and the Periodic Inspection Program remain valid for the extended operation and to determine if any follow-up actions are necessary for extended operation of Pickering Units 5-8 up to the end of 2026.	08
GI-52	**Fire Protection – NBCC and NFCC**	10 - Emergency Management and Fire Protection	G52-RS1-10-11-B	Apply NBCC 2015 Part 3 for future construction or modification related to fire protection, occupant safety and accessibility.	11
			G52-RS2-10-12-B	Update current applicable governance documents to include, when appropriate, the new requirements, codes or standards identified in NFCC 2015 and develop strategy for appropriate and practicable operational and programmatic changes.	12

Appendix A: Global Issue (GI) Resolution Statement Overview

GI #	GI Title	CNSC S&C Area	Resolution Action Number	Resolution Statement	RS Rank
GI-53	**Reassessment of Qualified Life as Documented in the EQAs**	05 – Physical Design	G53-RS1-05-13-B	Re-assess Pickering NGS EQAs to support extended operation of Pickering 5-8 to the end of 2026.	09

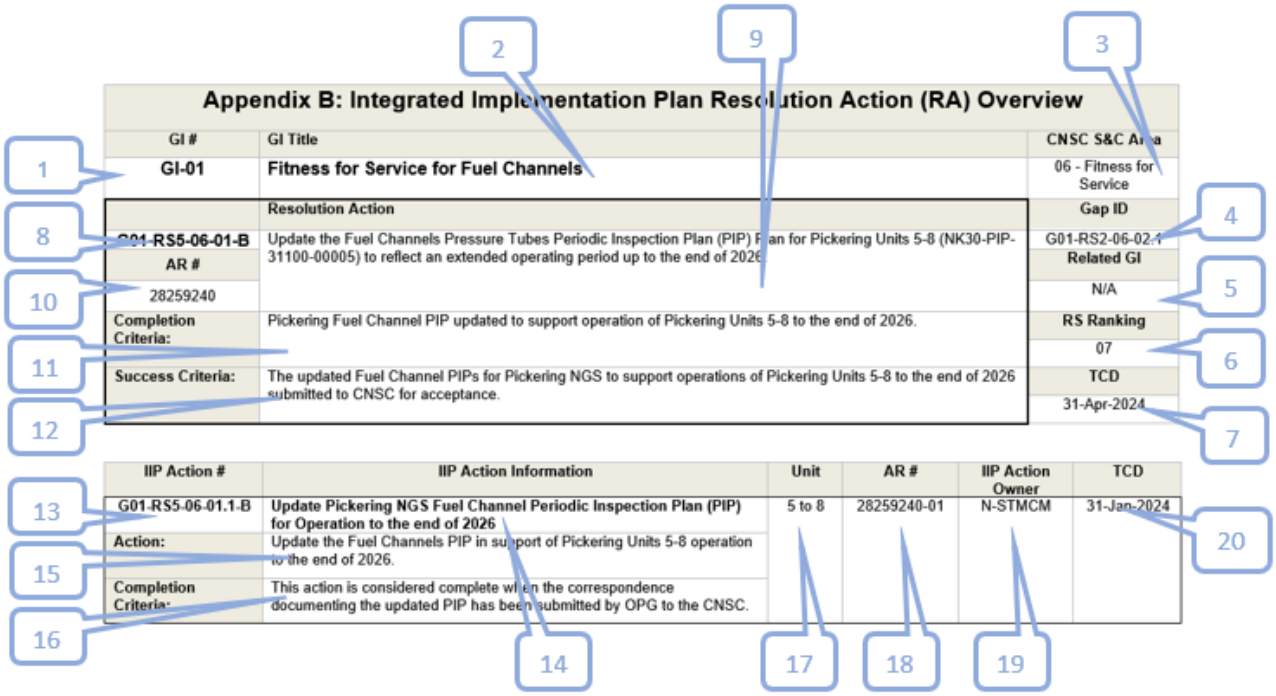
Appendix B Integrated Implementation Plan Resolution Action Overview

Resolution Actions and their supporting IIP Actions are listed in Appendix B. The table is divided into three boxed areas: Global Issue information, Resolution Action, and IIP Action(s), each of which is described in detail below.

Global Issue information is listed at the top of the first table, to correlate the GI Resolution Statement to the associated gap(s), and to link any cross-referenced GIs. The information is used to facilitate understanding of the connection between the GI Gap Assessment Report, the Global Assessment Report, and the IIP.

The Resolution Action box is bolded to highlight the Resolution Action that will address the GI Resolution Statement. The information within the box identifies a unique numerical identifier and Action Request (AR) number used to manage the Resolution Action, and defines the Resolution Action, and the Resolution Action completion and success criteria. The Resolution Action is supported by IIP Actions.

The IIP Actions which support the Resolution Action are listed beneath the Resolution Action box. Each IIP Action is given a unique number, as well as an AR number to be tracked through [20]. The ranked IIP Actions and completion criteria are defined, as well as the associated Pickering NGS unit, IIP Action Owner, and IIP Action target completion date.



Content

Global Issue (GI) Information

(1) **GI #:** Global Issue (GI) number, as identified in the Global Assessment Report.
(2) **GI Title:** Description of the GI.
(3) **CNSC S&C Area:** Resolution Action associated REGDOC-2.3.3 Safety and Control Area.
(4) **Gap ID:** Reassessment of PSR2 IIP Actions, Regulatory Actions and Assessment of D-PSR gaps associated with the GI.
(5) **Related GI:** Cross-referenced (XRF) GIs which will be addressed by the Resolution Action.
(6) **RS Ranking:** Resolution Statement (RS) ranking as identified in the Global Assessment Report, ranked in order of the priority to address the RS, based on the magnitude and timeliness of the benefit to be achieved by its resolution.
(7) **TCD:** Resolution Action target completion date, by year.

Resolution Action Information

(8) **Resolution Action Number:** Unique numerical Resolution Action reference number used to manage Resolution Actions.
(9) **Resolution Action:** Global Issue Resolution Statement as defined in the Global Assessment Report.

(10) **AR #:** Action Request number generated in Asset Suite used to track the Resolution Action to completion through OPG's Action Item Management process.
(11) **Completion Criteria:** Specific criteria for the Resolution Action to be approved as complete by the IIP Manager.
(12) **Success Criteria:** Specific criteria for the Resolution Action to be accepted as closed by the CNSC.

IIP Action Information

(13) **IIP Action #:** Unique numerical IIP Action tracking reference, as a sub-action of the Resolution Action number, used to manage the IIP Action.
(14) **IIP Action Title:** Brief description of the IIP Action that will support completion of the Resolution Action.
(15) **IIP Action Description:** Detailed description of the IIP Action that will support completion of the Resolution Action.
(16) **IIP Action Completion Criteria:** Specific criteria for the IIP Action to be approved as complete by the IIP Action Owner.
(17) **Unit:** Pickering NGS unit(s) that the IIP Action is applicable to. 058 represents common Pickering NGS Units 5 to 8 actions (i.e., not unit specific). Units 5 to 8 represents an action that is specific to each unit.
(18) **AR #:** Action Request number generated in Asset Suite used to track the IIP Action to completion through OPG's Action Item Management process.
(19) **IIP Action Owner:** IIP Action Owner responsible OPG department.
(20) **TCD:** IIP Action target completion date.

Appendix B: Integrated Implementation Plan Resolution Action (RA) Overview

GI #	GI Title	CNSC S&C Area
GI-01	**Fitness for Service for Fuel Channels**	06 - Fitness for Service

	Resolution Action	Gap ID
G01-RS5-06-01-B	Update the Fuel Channels Pressure Tubes Periodic Inspection Plan (PIP) Plan for Pickering Units 5-8 (NK30-PIP-31100-00005) to reflect an extended operating period up to the end of 2026.	G01-RS2-06-02.1
AR #		**Related GI**
28259240		N/A
Completion Criteria:	Pickering Fuel Channel PIP updated to support operation of Pickering Units 5-8 to the end of 2026.	**RS Ranking**
		07
Success Criteria:	The updated Fuel Channel PIPs for Pickering NGS to support operations of Pickering Units 5-8 to the end of 2026 submitted to CNSC for acceptance.	**TCD**
		30-Apr-2024

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G01-RS5-06-01.1-B	**Update Pickering NGS Fuel Channel Periodic Inspection Plan (PIP) for Operation to the end of 2026**	5 to 8	28259240-01	N-STMCM	31-Jan-2024
Action:	Update the Fuel Channels PIP in support of Pickering Units 5-8 operation to the end of 2026.				
Completion Criteria:	This action is considered complete when the correspondence documenting the updated PIP has been submitted by OPG to the CNSC.				

Appendix B: Integrated Implementation Plan Resolution Action (RA) Overview

GI #	GI Title	CNSC S&C Area
GI-01	**Fitness for Service for Fuel Channels**	06 - Fitness for Service

	Resolution Action	Gap ID
G01-RS6-06-02-B	Establish the basis for continued demonstration of fitness for service of fuel channels for Pickering Units 5-8 for the extended operating period up to the end of 2026. Fitness for service of fuel channels includes demonstration of sufficient margin on the FFS limits of the pressure tubes, calandria tubes and garter springs (annulus spacers) during the continued operational life of the plant.	G01-RS4-06-04
AR #		**Related GI**
28259241		N/A
Completion Criteria:	Fuel Channels LCMP (N-PLAN-01060-10002) updated in support of Pickering Units 5-8 operations to the end of 2026.	**RS Ranking**
		01
Success Criteria:	Fuel Channels LCMP (N-PLAN-01060-10002) update issued.	**TCD**
		31-Jul-2024

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G01-RS6-06-02.1-B	**Update upcoming Fuel Channel LCMP for P5-8 to include activities for extended operation to the end of 2026**	5 to 8	28259241-01	N-STMCM	28-Feb-2024
Action:	Update the Fuel Channels LCMP (N-PLAN-01060-10002) to demonstrate the continued fitness for service of Pickering Units 5 to 8 fuel channels, including planned inspections and maintenance schedules, for Pickering Units 5 to 8 extended operation to the end of 2026.				
Completion Criteria:	This action is considered complete when the updated Fuel Channel LCMP (N-PLAN-01060-10002) has been issued.				

Appendix B: Integrated Implementation Plan Resolution Action (RA) Overview

GI #	GI Title	CNSC S&C Area
GI-01	**Fitness for Service for Fuel Channels**	06 - Fitness for Service

	Resolution Action	Gap ID
G01-RS7-06-03-B	Demonstrate fitness for service for Zr-Nb-Cu and Inconel X-750 Pickering Units 5 to 8 Spacers for the extended operation to the end of 2026.	D-PSR SF4-3
AR #		**Related GI**
28259242		N/A
Completion Criteria:	OPG issues documentation to demonstrate fitness for service of the Zr-Nb-Cu and Inconel X-750 spacers in support of Pickering Units 5 to 8 operations to the end of 2026.	**RS Ranking**
		02
Success Criteria:	Correspondence confirming that activities required to demonstrate fuel channel fitness for service, with respect to Zr-Nb-Cu and Inconel X-750 spacers, in support of Pickering Units 5 to 8 operations to the end of 2026 have been completed and submitted by OPG to the CNSC.	**TCD**
		31-Jul-2024

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G01-RS7-06-03.1-B	**Perform spacer testing and reassessment of Inconel X-750 spacers for Pickering Unit 8**	8	28259242-01	N-STMCM	31-Jan-2024
Action:	Perform spacer testing and reassessment of the predictions of maximum load carrying capacity of Inconel X-750 spacers in Pickering 8 (Unit 8 spacer conditions bound Units 5 and 7).				
Completion Criteria:	The action is considered complete when the revised predictions are submitted by OPG to the CNSC for the maximum load carrying capacity of optimized Inconel X-750 spacers for Pickering Unit 8.				

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G01-RS7-06-03.2-B	**Perform spacer testing and evaluation of Zr-Nb-Cu spacers in Pickering Unit 6**	6	28259242-02	N-STMCM	28-Mar-2024
Action:	Perform spacer testing and evaluation of Zr-Nb-Cu spacers in Pickering Unit 6.				
Completion Criteria:	The action is considered complete when the revised evaluation is submitted by OPG to the CNSC for the Zr-Nb-Cu spacers for Pickering Unit 6.				

Appendix B: Integrated Implementation Plan Resolution Action (RA) Overview

GI #	GI Title	CNSC S&C Area
GI-01	**Fitness for Service for Fuel Channels**	06 - Fitness for Service
	Resolution Action	**Gap ID**
G01-RS8-06-04-B	Develop and submit an implementation plan for developing inputs to satisfy the methodology in the Non-Mandatory Annex G of CSA N285.8-15, Update #1 to perform uncertainty analyses in probabilistic evaluations where the threshold requirement is met per CSA N285.8.	D-SFR SF4-6
AR #		**Related GI**
28259244		N/A
Completion Criteria:	Implementation plan for developing input to satisfy the methodology in the Non-Mandatory Annex G of CSA N285.8-15, Update #1 for performing uncertainty analyses in probabilistic evaluations where the threshold requirement is met is developed and submitted by OPG to the CNSC.	**RS Ranking** 12
Success Criteria:	Correspondence submitted by OPG to the CNSC documenting the implementation plan for developing inputs to satisfy the methodology in the Non-Mandatory Annex G of CSA N285.8-15, Update #1 for performing uncertainty analyses in probabilistic evaluations where the threshold requirement is met.	**TCD** 31-May-2024

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G01-RS8-06-04.1-B	**Develop and submit implementation plan for developing inputs to satisfy the methodology in the Non-Mandatory Annex G of N285.8-15, Update #1 for performing uncertainty analyses in evaluations where the threshold requirement is met.**	058	28259244-01	N-STMCM	31-Jan-2024
Action:	Develop implementation plan for developing inputs to satisfy the methodology in the Non-Mandatory Annex G of CSA N285.8-15, Update #1 for performing uncertainty analyses in probabilistic evaluations where the threshold is met and OPG to submit the implementation plan to the CNSC.				
Completion Criteria:	Correspondence submitted by OPG to the CNSC documenting the implementation plan for developing inputs to satisfy the methodology in the Non-Mandatory Annex G of CSA N285.8-15, Update #1 for performing uncertainty analyses in probabilistic evaluations where the threshold is met.				

Appendix B: Integrated Implementation Plan Resolution Action (RA) Overview

GI #	GI Title	CNSC S&C Area
GI-02	**Fitness for Service for Feeders**	06 - Fitness for Service

	Resolution Action	Gap ID
G02-RS2-06-05-B	Establish the basis for continued demonstration of fitness for service of feeders for Pickering Units 5-8 for the extended operating period up to the end of 2026. Fitness for service of feeders includes demonstration that predicted feeder condition, with identified and planned mitigations, is acceptable for the intended operation.	G02-RS1-06-05
AR #		**Related GI**
28259245		N/A
Completion Criteria:	Feeders LCMP (N-PLAN-01060-10001) updated for Pickering Units 5 to 8 extended operations to the end of 2026.	**RS Ranking**
		03
Success Criteria:	Feeders LCMP (N-PLAN-01060-10001) update issued.	**TCD**
		27-Sep-2024

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G02-RS2-06-05.1-B	**Update upcoming Feeder LCMP for P5-8 to include activities for extended operation to the end of 2026**	5 to 8	28259245-01	N-STMCM	31-May-2024
Action:	Update Feeders LCMP (N-PLAN-01060-10001) to demonstrate the continued fitness for service of Pickering Units 5 to 8 Feeders, including planned Feeder inspections and maintenance schedules, for Pickering Units 5 to 8 extended operation to the end of 2026.				
Completion Criteria:	This action is considered complete when the updated Feeders LCMP (N-PLAN-01060-10001) has been issued.				

Appendix B: Integrated Implementation Plan Resolution Action (RA) Overview

GI #	GI Title	CNSC S&C Area
GI-03	**Fitness for Service for Steam Generators**	06 - Fitness for Service

	Resolution Action	Gap ID
G03-RS2-06-06-B	Establish the basis for continued demonstration of fitness for service of steam generators for Pickering Units 5-8 for the extended operating period up to the end of 2026. Fitness for service of steam generators includes demonstration that predicted steam generator condition, with identified and planned mitigations, is acceptable for the intended operation.	G03-RS1-06-06
AR #		**Related GI**
28259247		N/A
Completion Criteria:	Steam Generators LCMP (N-PLAN-33110-10009) updated for Pickering Units 5 to 8 extended operations to the end of 2026.	**RS Ranking**
		04
Success Criteria:	Updated Steam Generators LCMP (N-PLAN-33110-10009) issued.	**TCD**
		27-Sep-2024

IIP Action #	IIP Action Information	Unit	AR #	IIP Action	TCD
G03-RS2-06-06.1-B	**Update Steam Generators LCMP to include Pickering Units 5 to 8 extended operation to the end of 2026**	5 to 8	28259247-01	N-STMCM	31-May-2024
Action:	Update Steam Generators LCMP (N-PLAN-33100-10009) to demonstrate the continued fitness for service of Pickering Units 5 to 8 Steam Generators, including planned Steam Generator inspections and maintenance schedules, for Pickering Units 5 to 8 extended operation to the end of 2026.				
Completion Criteria:	This action is considered complete when the updated Steam Generator LCMP (N-PLAN-33100-10009) has been issued.				

Appendix B: Integrated Implementation Plan Resolution Action (RA) Overview

GI #	GI Title	CNSC S&C Area
GI-04	**Fitness for Service for Reactor Components and Structures**	06 - Fitness for Service
	Resolution Action	**Gap ID**
G04-RS3-06-07-B	Establish the basis for continued demonstration of fitness for service of reactor components and structures for Pickering Units 5-8 for the extended operating period up to the end of 2026. This includes demonstration that predicted reactor components and structures condition, with identified and planned mitigations, is acceptable for the intended operation. This also includes the required inspection activities to update the Calandria Tube – Liquid Injection Shutdown System (CT-LISS) nozzle gap assessments and identification of mitigation strategies if CT-LISS contact is predicted within the extended operating period.	G04-RS1-06-07 G04-RS2-06-08
AR #		**Related GI**
28259248		N/A
Completion Criteria:	Reactor Components and Structures LCMP (N-PLAN-01060-10003) updated for Pickering Units 5 to 8 extended operations to the end of 2026, including the required inspection activities to update the CT-LISS nozzle gap assessments and identification of mitigation strategies if CT-LISS contact is predicted within the extended operating period.	**RS Ranking** 05
Success Criteria:	Updated Reactor Components and Structures LCMP (N-PLAN-01060-10003) issued.	**TCD** 27-Sep-2024

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G04-RS3-06-07.1-B	**Update Reactor Components and Structures LCMP to include Pickering Units 5 to 8 extended operation to the end of 2026**	5 to 8	28259248-01	N-STMCM	31-May-2024
Action:	Update Reactor Components and Structures LCMP (N-PLAN-01060-10003) to demonstrate the continued fitness for service of Pickering Units 5 to 8 Reactor Components and Structures, including the following: • planned Reactor Components and Structures inspections and maintenance schedules, • CT-LISS nozzle gap inspections and any mitigation strategies, if CT-LISS contact is predicted within the extended operating period for Pickering Units 5 to 8 extended operation to the end of 2026.				
Completion Criteria:	This action is considered complete when the updated Reactor Components and Structures LCMP (N-PLAN-01060-10003) has been issued.				

Appendix B: Integrated Implementation Plan Resolution Action (RA) Overview

GI #	GI Title	CNSC S&C Area
GI-20	**Governance Implementation / Effectiveness Issues**	01 – Management System

	Resolution Action	**Gap ID**
G20-RS1-01-08-B	Complete Regulatory Management action (AR# 28252308) for providing a status update on Action Notice AN2 of CNSC Action Item 2017-48-12365 and complete field implementation of Engineering Change (EC) 132846 for 67138-LT566/LIA566 loop failure detection for EWS RB Water Level Measurement.	Regulatory Action
AR #		**Related GI**
28259251		N/A
Completion Criteria:	Field implementation and Available for Service (AFS) complete on Pickering Units 5 to 8 units for 67138-LT566/LIA566 loop failure detection for EWS RB Water Level Measurement.	**RS Ranking**
		09
Success Criteria:	AFS complete for EC 132846 for 67138-LT566/LIA566 loop failure detection on Pickering Units 5 to 8.	**TCD**
		28-Feb-2024

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G20-RS1-01-08.1-B	**Field implement 67138-LT566/LIA566 loop failure detection on 5 to 8 units**	5 to 8	28259251-01	P-PENM	30-Oct-2023
Action:	Field implement EC 132846 for 67138-LT566/LIA566 loop failure detection on Pickering Units 5 to 8.				
Completion Criteria:	AFS complete for EC 132846 for 67138-LT566/LIA566 loop failure detection on Pickering Units 5 to 8.				

Appendix B: Integrated Implementation Plan Resolution Action (RA) Overview

GI #	GI Title	CNSC S&C Area
GI-24	**Safety Analysis to Support the Extended Operating Period**	04 – Safety Analysis

	Resolution Action	Gap ID
G24-RS2-04-09-B	Update the Heat Transport System (HTS) aging safety analysis models and perform the required safety analysis of events most impacted by aging (Small Break Loss of Coolant Accident (SBLOCA), Loss of Flow (LOF) and Neutron Overpower (NOP)) to support extended operation for Pickering Units 5 to 8.	G24-RS1-04-19.5 to 19.8
AR #		**Related GI**
28259249		N/A
Completion Criteria:	The impact of Heat Transport System component aging on the SBLOCA, LOF and NOP accident scenarios are assessed to demonstrate that adequate safety margins exist for Pickering Units 5 to 8 operations to the end of 2026. Results are documented and submitted by OPG to the CNSC.	**RS Ranking**
		06
Success Criteria:	Correspondence confirming that Pickering NGS safety analysis results in support of commercial operations of Pickering Units 5 to 8 to the end of 2026 are submitted by OPG to the CNSC.	**TCD**
		31-Dec-2024

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G24-RS2-04-09.1-B	**Update Heat Transport Aging safety analysis models**	5 to 8	28259249-01	N-SAIP	30-Nov-2024
Action:	Update Safety Analysis models accounting for heat transport system aging for Pickering NGS Units 5 to 8 for operation to the end of 2026.				
Completion Criteria:	This action will be considered complete when Heat Transport Aging safety analysis model for Pickering NGS Units 5 to 8 has been updated and submitted by OPG to the CNSC for operations to the end of 2026.				

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G24-RS2-04-09.2-B	**Complete Loss of Flow Safety Analysis accounting for Heat Transport Aging**	5 to 8	28259249-02	N-SAIP	30-Nov-2024
Action:	Complete required LOF safety analysis for operation to the end of 2026 for Pickering NGS Units 5 to 8.				
Completion Criteria:	This action will be considered complete when the required LOF Safety Analysis for P058 has been updated and submitted by OPG to the CNSC, addressing the impact of Heat Transport System component aging for Pickering NGS Units 5 to 8 operations to the end of 2026.				

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G24-RS2-04-09.3-B	**Complete Small Break Loss of Coolant Accident safety analysis accounting for Heat Transport Aging**	5 to 8	28259249-03	N-SAIP	30-Nov-2024
Action:	Complete required SBLOCA safety analysis for operation to the end of 2026 for Pickering NGS Units 5 to 8.				
Completion Criteria:	This action will be considered complete when the required SBLOCA Safety Analysis for P058 has been updated and submitted by OPG to the CNSC, addressing the impact of Heat Transport System component aging for Pickering NGS Units 5 to 8 operations to the end of 2026.				

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G24-RS2-04-09.4-B	**Complete Neutron Overpower Protection safety analysis accounting for Heat Transport Aging**	5 to 8	28259249-04	N-SAIP	30-Nov-2024
Action:	Complete required NOP safety analysis for operation to the end of 2026 for Pickering NGS Units 5 to 8.				
Completion Criteria:	This action will be considered complete when the required NOP Safety Analysis for P058 has been updated and submitted by OPG to the CNSC, addressing the impact of Heat Transport System component aging for Pickering NGS Units 5 to 8 operations to the end of 2026.				

Appendix B: Integrated Implementation Plan Resolution Action (RA) Overview

GI #	GI Title	CNSC S&C Area
GI-43	Safety-Related Structures (Non-Containment) for Nuclear Power Plants	06 - Fitness for Service

	Resolution Action	Gap ID
G43-RS4-06-10-B	Complete review of the aging management strategy for non-containment safety-related structures. The purpose of the review is to confirm that the bases for the associated Aging Management Plan [N-PLAN-01060-10004] and the Periodic Inspection Program remain valid for the extended operation and to determine if any follow-up actions are necessary for extended operation of Pickering Units 5-8 up to the end of 2026.	G43-RS3-06-31.1
AR #		**Related GI**
28259250		N/A
Completion Criteria:	Review of the aging management strategy for non-containment safety-related structures is complete, and follow-up actions are defined as required. Results are documented and submitted by OPG to the CNSC.	**RS Ranking**
		08
Success Criteria:	Correspondence documenting the results of the review, including any follow-up actions as required, of the aging management strategy for non-containment safety-related structures submitted by OPG to the CNSC.	**TCD**
		31-May-2024

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G43-RS4-06-10.1-B	**Review aging management strategy for non-containment safety-related structures**	058	28259250-01	N-CECIVILM	31-Jan-2024
Action:	Complete the review of the aging management strategy for non-containment safety-related structures. The purpose of the review is to confirm that the bases for the associated Aging Management Plan (N-PLAN-01060-10004) and the Periodic Inspection Program remain valid for the extended operation of Pickering Units 5 to 8 up to the end of 2026 and to identify any follow-up actions as required.				
Completion Criteria:	This action is considered complete when the correspondence documenting the results of the review, including any follow-up actions as required, is submitted by OPG to the CNSC.				

Appendix B: Integrated Implementation Plan Resolution Action (RA) Overview

GI #	GI Title	CNSC S&C Area
GI-52	**Fire Protection - NBCC and NFCC**	10 – Emergency Management and Fire Protection

	Resolution Action	**Gap ID**
G52-RS1-10-11-B	Apply NBCC 2015 Part 3 for future construction or modification related to fire protection, occupant safety and accessibility.	D-PSR SF1-10
AR #		**Related GI**
28259253		N/A
Completion Criteria:	Existing governance reviewed, evaluated and updated, as required, to include use of NBCC 2015 Part 3 for future construction or modifications related to fire protection, occupant safety and accessibility.	**RS Ranking**
		10
Success Criteria:	Existing governance updated, as required, to include usage of NBCC 2015 Part 3 for future construction or modifications related to fire protection, occupant safety and accessibility.	**TCD**
		31-May-2024

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G52-RS1-10-11.1-B	**Review existing governance for alignment with NBCC 2015 Part 3**	058	28259253-01	N-ESEMM	31-Jan-2024
Action:	Review existing governance and evaluate the required changes to align the governance with use of NBCC 2015 Part 3 for future construction or modifications related to fire protection, occupant safety and accessibility.				
Completion Criteria:	Changes to governance submitted for incorporation via appropriate process (e.g., Document Change Request).				

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G52-RS1-10-11.2-B	**Revise existing governance for alignment with NBCC 2015 Part 3**	058	28259253-02	N-ESEMM	31-Jan-2024
Action:	Revise existing governance, as required, based on the review and evaluation.				
Completion Criteria:	Governance revised to incorporate changes to align with NBCC 2015 Part 3.				

Appendix B: Integrated Implementation Plan Resolution Action (RA) Overview

GI #	GI Title	CNSC S&C Area
GI-52	**Fire Protection - NBCC and NFCC**	10 – Emergency Management and Fire Protection

	Resolution Action	Gap ID
G52-RS2-10-12-B	Update current applicable governance documents to include, when appropriate, the new requirements, codes or standards identified in NFCC 2015 and develop strategy for appropriate and practicable operational and programmatic changes.	D-PSR SF1-11
AR #		**Related GI**
28259254		N/A
Completion Criteria:	Existing governance, reviewed, evaluated and updated, as applicable, to incorporate appropriate NFCC 2015 sections and a strategy developed, as applicable, to facilitate operational and programmatic changes.	**RS Ranking**
		11
Success Criteria:	Existing governance updated to include requirements of NFCC 2015 and strategy developed to facilitate any operational or programmatic changes.	**TCD**
		31-May-2024

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G52-RS2-10-12.1-B	**Review existing governance for alignment with NFCC 2015**	058	28259254-01	N-NPFPM	31-Jan-2024
Action:	Review existing governance and evaluate the required changes to align the governance with NFCC 2015.				
Completion Criteria:	Changes to governance submitted for incorporation and tracked via existing processes, as required (e.g., Document Change Request and/or Technical Procedure Action Request).				

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G52-RS2-10-12.2-B	**Revise existing governance for alignment with NFCC 2015**	058	28259254-02	N-NPFPM	31-Jan-2024
Action:	Revise existing governance, as required, based on the review and evaluation.				
Completion Criteria:	Governance revised to incorporate changes to align with NFCC 2015.				

Appendix B: Integrated Implementation Plan Resolution Action (RA) Overview

GI #	GI Title	CNSC S&C Area
GI-53	**Reassessment of Qualified Life as Documented in the EQAs**	05 – Physical Design

	Resolution Action	Gap ID
G53-RS1-05-13-B	Re-assess Pickering NGS EQAs to support extended operation of Pickering Units 5 to 8 to the end of 2026.	G12-RS1-05-17.1
AR #		**Related GI**
28259255		N/A
Completion Criteria:	EQAs are complete to support commercial operation of Pickering Units 5 to 8 to the end of 2026.	**RS Ranking**
		08
Success Criteria:	EQA reassessments are complete to support commercial operation of Pickering Units 5 to 8 to the end of 2026.	**TCD**
		31-May-2024

IIP Action #	IIP Action Information	Unit	AR #	IIP Action Owner	TCD
G53-RS1-05-13.1-B	**Complete Environmental Qualification Assessments (EQA) to support Pickering Units 5 to 8 extended operations**	058	28259255-01	N-MEM	31-Jan-2024
Action:	Assess existing EQAs for Environmentally Qualified life-limited components to support commercial operation of Pickering Units 5 to 8 to the end of 2026.				
Completion Criteria:	EQA reassessments are complete.				

Appendix C PSR2-B Safety and Control Area (SCA) IIP Action Status List

IIP Actions defined in the IIP Resolution Action Overview (Appendix B), are listed by REGDOC-2.3.3 Safety and Control Areas [4] in this Appendix C. The Appendix provides an overview of the IIP Action, associated Pickering NGS unit, and IIP Action target completion dates. The table provides a snapshot of the completion status of the IIP Actions at the time of submission of the IIP Report. IIP Action completion status following the IIP submission is managed through [20], with IIP Action status reported annually to the CNSC.

1 2 3 4 5 6 7

Appendix C: PSR2-B Safety and Control Area (SCA) IIP Action Status List

SCA	SCA Description	IIP Action	IIP Action Title	Unit(s)	IIP Action Target Completion Date	IIP Action Completion Date
1	Management System	G20-RS1-01-08.1-B	Field implement 67138-LT566/LIA566 loop failure detection on 5 to 8 units	5 to 8	30-Oct-2023	
4	Safety Analysis	G24-RS2-04.09.1-B	Update Heat Transport Aging safety analysis models	5 to 8	30-Nov-2024	
		G24-RS2-04.09.2-B	Complete Loss of Flow Safety Analysis accounting for Heat Transport Aging	5 to 8	30-Nov-2024	
		G24-RS2-04.09.3-B	Complete Small Break Loss of Coolant Accident safety analysis accounting for Heat Transport Aging	5 to 8	30-Nov-2024	
		G24-RS2-04.09.4-B	Complete Neutron Overpower Protection safety analysis accounting for Heat Transport Aging	5 to 8	30-Nov-2024	

Content

(1) **SCA:** CNSC Safety and Control Area number, as defined in CNSC REGDOC-2.3.3 [4].
(2) **SCA Description:** CNSC Safety and Control Area description.
(3) **IIP Action:** Unique numerical IIP Action tracking reference, as a sub-action of the Resolution Action number, used to manage the IIP Action.
(4) **IIP Action Title:** Brief description of the IIP action that will support completion of the Resolution Action.
(5) **Unit:** Pickering NGS unit(s) that the IIP Action is applicable to. 058 represents common Pickering NGS Units 5 to 8 actions (i.e., not unit specific). Units 5 to 8 represents an action that is specific to each unit.
(6) **IIP Action Target Completion Date:** IIP Action target completion date.
(7) **IIP Action Completion Date:** IIP Action completion date, approved by the IIP Action Owner.

Appendix C: PSR2-B Safety and Control Area (SCA) IIP Action Status List

SCA	SCA Description	IIP Action	IIP Action Title	Unit(s)	IIP Action Target Completion Date	IIP Action Completion Date
1	**Management System**	G20-RS1-01-08.1-B	Field implement 67138-LT566/LIA566 loop failure detection on 5 to 8 units	5 to 8	30-Oct-2023	
4	**Safety Analysis**	G24-RS2-04.09.1-B	Update Heat Transport Aging safety analysis models	5 to 8	30-Nov-2024	
		G24-RS2-04.09.2-B	Complete Loss of Flow Safety Analysis accounting for Heat Transport Aging	5 to 8	30-Nov-2024	
		G24-RS2-04.09.3-B	Complete Small Break Loss of Coolant Accident safety analysis accounting for Heat Transport Aging	5 to 8	30-Nov-2024	
		G24-RS2-04.09.4-B	Complete Neutron Overpower Protection safety analysis accounting for Heat Transport Aging	5 to 8	30-Nov-2024	
5	**Physical Design**	G53-RS1-05-13.1-B	Complete Environmental Qualification Assessments (EQA) to support Pickering Units 5 to 8 extended operations	058	31-Jan-2024	
6	**Fitness for Service**	G01-RS5-06-01.1-B	Update Pickering NGS Fuel Channel Periodic Inspection Plan (PIP) for Operation to the end of 2026	5 to 8	31-Jan-2024	
		G01-RS6-06-02.1-B	Update upcoming fuel channel LCMP for P5-8 to include activities for extended operation to the end of 2026	5 to 8	28-Feb-2024	
		G01-RS7-06-03.1-B	Perform spacer testing and reassessment of Inconel X-750 spacers for Pickering Unit 8	8	31-Jan-2024	

Appendix C: PSR2-B Safety and Control Area (SCA) IIP Action Status List

SCA	SCA Description	IIP Action	IIP Action Title	Unit(s)	IIP Action Target Completion Date	IIP Action Completion Date
		G01-RS7-06-03.2-B	Perform spacer testing and evaluation of Zr-Nb-Cu spacers in Pickering Unit 6	6	28-Mar-2024	
		G01-RS8-06-04.1-B	Develop and submit implementation plan for developing inputs to satisfy the methodology in the Non-Mandatory Annex G of N285.8-15, Update #1 for performing uncertainty analyses in evaluations where the threshold requirement is met.	058	31-Jan-2024	
		G02-RS2-06-05.1-B	Update upcoming Feeder LCMP for P5-8 to include activities for extended operation to the end of 2026	5 to 8	31-May-2024	
		G03-RS2-06-06.1-B	Update Steam Generators LCMP to include Pickering Units 5 to 8 extended operation to the end of 2026	5 to 8	31-May-2024	
		G04-RS3-06-07.1-B	Update Reactor Components and Structures LCMP to includes Pickering Units 5 to 8 extended operation to the end of 2026	5 to 8	31-May-2024	
		G43-RS4-06-10.1-B	Review aging management strategy for non-containment safety-related structures	058	31-Jan-2024	
10	**Emergency Management and Fire Protection**	G52-RS1-10-11.1-B	Review existing governance for alignment with NBCC 2015 Part 3	058	31-Jan-2024	
		G52-RS1-10-11.2-B	Revise existing governance for alignment with NBCC 2015 Part 3	058	31-Jan-2024	

Appendix C: PSR2-B Safety and Control Area (SCA) IIP Action Status List

SCA	SCA Description	IIP Action	IIP Action Title	Unit(s)	IIP Action Target Completion Date	IIP Action Completion Date
		G52-RS2-10-12.1-B	Review existing governance for alignment with NFCC 2015	058	31-Jan-2024	
		G52-RS2-10-12.2-B	Revise existing governance for alignment with NFCC 2015	058	31-Jan-2024	