



Canadian Nuclear
Safety Commission

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de sûreté nucléaire

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STATUS REPORT ON POWER REACTORS

RAPPORT D'ÉTAPE SUR LES CENTRALES NUCLÉAIRES

This document summarized the status of
the Power Reactor Facilities as of February
4, 2025.

Ce rapport résume le rapport d'étape sur
les centrales nucléaires en date du 4 février
2025.

Signed on / Signé le

Alexandre Viktorov, Ph. D.
Director General, Directorate of Power Reactor Regulation
Directeur général, Direction de la réglementation des centrales nucléaires

1. Power Reactors Status as of February 4, 2025

1.1 Bruce A and B

Operational Status
Unit 1 is at Full Power
Unit 2 is at Full Power
Unit 3 is Shut Down for Major Component Replacement (MCR)
Unit 4 is Shut Down for Major Component Replacement (MCR)
Unit 5 is Shut Down for Planned Maintenance Outage
Unit 6 is at Full Power
Unit 7 is at Full Power
Unit 8 is at Full Power
Licensing
Power Reactor Operating Licence expires on September 30, 2028.
Comments
<p>The Unit 3 MCR Project started in March 2023 and remains on schedule.</p> <ul style="list-style-type: none"> • Installation of Calandria Tubes and Calandria Tube Inserts is in progress. • Steam Generator Replacement lifts are in progress. • Fuel loading is expected in December 2025. Prior to fuel loading, Bruce Power will seek removal of the hold point from CNSC staff. <p>The Unit 4 MCR Project started on February 1, 2025.</p> <ul style="list-style-type: none"> • Defueling the reactor is in progress. • Next steps include a chemical decontamination of the primary heat transport (PHT) system to reduce radiation exposure to workers, draining and drying the PHT and moderator systems, and installing bulkheads to isolate Unit 4 from containment.
Event Notifications and Updates
CNSC staff continue to monitor OPG and Bruce Power’s progress on the neutron exposure event. The additional material and responses to staff’s GNSCR 12(2) request was received by January 31, 2025, and the review is now underway.
Actions from previous Commission meetings
<ol style="list-style-type: none"> 1. The Commission directed CNSC staff to track on-going work on hydrogen equivalent concentration (Heq) research and development (R&D) in a Record of Decision (DEC 23-H103) issued on October 13, 2023. The progress update is provided in Section 1.5 of this report. 2. During the meeting held on January 29, 2025, the Commission directed CNSC staff to provide additional technical information on industry’s progress on Heq research and development activities. CNSC staff acknowledge the request and are preparing a response to this action, to be provided at a later date.

1.2 Darlington

Operational Status
Unit 1 is at 98% Full Power
Unit 2 is at 93% Full Power
Unit 3 is at Full Power
Unit 4 is Shut Down for Refurbishment
Licensing
Power Reactor Operating Licence expires on November 30, 2025 <ul style="list-style-type: none"> • OPG submitted a licence renewal application on May 31, 2024 • Commission hearing (Part 1) will be March 26, 2025, with the public hearing (Part 2) taking place June 24-26, 2025.
Comments
Unit 1 has been reduced to 98% full power to perform maintenance on the high pressure feedwater heat exchanger. Unit 2 has been reduced to 93% full power due to a leak on a relief valve and excessive vibration. Unit 4 refurbishment started in July 2023. <ul style="list-style-type: none"> • Pressure tube installation is in progress. • Regulatory Hold Point 1 (approval to load fuel) is anticipated for September 05, 2025.
Event Notifications and Updates
CNSC staff continue to monitor OPG and Bruce Power’s progress on the neutron exposure event. The additional material and responses to staff’s GNSCR 12(2) request was received by January 31, 2025, and the review is now underway.
Actions from previous Commission meetings
None

1.3 Pickering

Operational Status
Unit 1 is shut down for Safe Storage
Unit 2 is in a Safe Storage State
Unit 3 is in a Safe Storage State
Unit 4 is shut down for Safe Storage
Unit 5 is at Full Power
Unit 6 is at Full Power
Unit 7 is at 93% Full Power
Unit 8 is at Full Power

Licensing
Power Reactor Operating Licence expires on August 31, 2028. OPG is authorized to operate Units 5-8 until December 31, 2026, up to a maximum of 305,000 equivalent full power hours.
Comments
Unit 1 was shut down on October 1, 2024, and is transitioning to safe storage. Defueling is expected to be completed by March 2025.
Unit 4 was shut down on December 31, 2024, and is transitioning to safe storage. Defueling is expected to be completed by June 2025.
Unit 7 has been reduced to 93% Full Power due to fuel handling unavailability.
Event Notifications and Updates
On January 30, the Pickering station experienced a fire in Unit 4 outside of Airlock 6. The fire was a result of a synthetic nylon rope contacting a permanently installed heater. Emergency Response Team members suppressed the fire with extinguishers and ventilated the area to clear the smoke. On Friday, January 31, OPG held a safety stand down and CNSC staff conducted a reactive field inspection to verify the adequacy of OPG’s response and corrective actions to prevent recurrence. There were no adverse consequences to workers, the public, and the environment as a result of this event and no safety provisions were affected.
Actions from previous Commission meetings
None

1.4 Point Lepreau

Operational Status
The reactor is at Full Power
Licensing
Power Reactor Operating Licence expires on June 30, 2032
Comments
Event Notifications and Updates
None
Actions from previous Commission meetings
None

1.5 Other

CNSC staff assessment of progress on hydrogen equivalent concentration (Heq) research and development (R&D) program commitments by Bruce Power and OPG

In [DEC 23-H103](#), the Commission directed “CNSC staff to provide updates on Bruce Power’s progress in its research and development (R&D) activities through the regular Status Report on

Power Reactors, which is presented at each public Commission Meeting. CNSC staff shall develop a consolidated table to track and communicate the ongoing work to the Commission through the aforementioned Status Report on Power Reactors”.

Although the Commission's direction was to report specifically on Bruce Power's progress on its R&D activities, CNSC staff note that the Heq-related R&D program is conducted jointly between Bruce Power and OPG.

R&D plans from OPG and Bruce Power were presented to the Commission during a [Meeting](#) held on November 1-3, 2022 ([CMD 22-M37.1](#) and in [CMD 22-M37.3](#), respectively).

CNSC staff have completed a detailed review of the fourth semi-annual update provided by industry. Overall, CNSC staff are satisfied with the progress being made. CNSC staff have generated the following general observations from the review of interim deliverables:

1. Regions of elevated Heq similar to those observed at the outlet end of pressure tubes can be reproduced when modelling circumferential temperature gradients associated with flow bypass around fuel bundles in tubes subject to later life diametral creep.
2. Regions of elevated Heq similar to those observed at the inlet end of pressure tubes can be reproduced when simulating late life geometry of the pressure tube and fuel channel components.
3. Work is underway to demonstrate the expected evolution of the regions of elevated Heq for bounding end-of-life conditions to determine if it will be possible for the regions to extend to locations where they will interact with flaws requiring analysis.
4. Testing completed to date suggests that existing crack growth rate models are valid for material with elevated Heq. However, crack initiation models may require refinement as testing has suggested that current models may overestimate the crack initiation threshold for certain flaws in material with elevated Heq.
5. Recent preliminary findings from fracture toughness testing indicate that the fracture toughness model may require refinement for material with elevated Heq.
6. Observations 4 and 5 will have no impact on pressure tube fitness for service evaluations if the Heq modelling for end-of-life conditions, mentioned in Observation 3, demonstrates that the regions of elevated Heq will not expand to locations where they interact with flaws requiring analysis.

Progress against the original completion dates provided in the R&D plans summarized in [CMD 25-M5](#), presented during a Commission Meeting held on January 29, 2025 and reproduced in the table below, continues to be acceptable. Delays from originally planned completion dates are due to scope increases and scheduling adjustments. CNSC staff are satisfied that these delays do not impact the current safety case for reactor operation and are not likely to impact the overall project deliverable.

R&D Activity	Planned Completion Date (from CMD 22-M37.1 and 22-M37.3)	Updated Status of R&D Activities
Update finite element software to simulate outlet rolled joint Heq evolution	Fall 2023	Software has been updated. Verification and validation activities are underway with a TCD of Fall 2025
Develop finite element software to simulate inlet rolled joint Heq evolution	Fall 2023	Software has been developed. Verification and validation activities are underway with a TCD of Fall 2025
Perform evaluation to assess the potential impact of the high levels of Heq on flaws at the inside surface of pressure tubes near the inlet region of interest	Fall 2023	Preliminary work was completed. Sensitivity studies for key input parameters are underway
Improve characterization of ‘blip’ and expected evolution of the inlet region of elevated Heq with continued operation	Spring 2024	Work has been completed*
Confirm the potential roles of hydrogen isotope ingress and redistribution on the development of the inlet regions of elevated Heq	Summer 2023	Original work scope has been completed. Sensitivity studies are underway with a TCD of Summer 2025*
Improve characterization of solubility behaviour of hydrogen isotopes in tubes with elevated Heq	Winter 2024	Work has been completed
Enhance modeling of temperature distributions near the outlet rolled joint region of pressure tubes	Summer 2023	Work has been completed
Define input parameters required for interim updates to the Heq model	Summer 2023	Work has been completed
Develop interim Heq model	Fall 2024	Work has been completed*

R&D Activity	Planned Completion Date (from CMD 22-M37.1 and 22-M37.3)	Updated Status of R&D Activities
Validation activities for the interim Heq model to support development of final comprehensive model	Fall 2025	Progressing as planned
Define input parameters required for the final comprehensive Heq model	Summer 2025	Progressing as planned
Define the relative importance of variables influential to Heq evolution	Fall 2025	Progressing as planned
Develop the final comprehensive Heq model	Winter 2026	Progressing as planned
Complete hydride related crack initiation experiments for unirradiated material at Heq of 220 ppm or higher	Fall 2024	Bruce Power and OPG have revised the completion date to Spring 2025
Complete fatigue crack initiation experiments for unirradiated material at Heq of 220 ppm or higher	Fall 2024	Bruce Power and OPG have revised the completion date to Spring 2025
Complete crack initiation experiments for irradiated material with elevated Heq without flaws present	Fall 2024	Bruce Power and OPG have revised the completion date to Spring 2025
Complete crack initiation and crack growth experiments for irradiated material with elevated Heq with flaws present	Fall 2024	Bruce Power and OPG have increased the scope of this activity. Completion date has been revised to Spring 2025

“ * ” denotes updates since last report to the Commission ([CMD 25-M5](#))

The next semi-annual R&D update is expected from Bruce Power and OPG in March 2025.