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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 May 8, 2025.

Ce rapport résume le rapport d'étape sur les centrales nucléaires en date du 8 mai 2025.

Signed on / Signé le
14-May-2025

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Canada

1. Power Reactors Status as of May 8, 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 at Full Power
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
The Unit 3 MCR Project started in March 2023 and remains on schedule. • Installation of Calandria Tubes and Calandria Tube Inserts has been completed. • Fuel Channel and Upper Feeder installation is in progress. • Steam Generator Replacement work is 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. The Unit 4 MCR Project started in February 2025 and remains on schedule. • All 480 fuel channels have been defueled. • Next steps include draining and drying the primary heat transport and moderator systems and installing bulkheads to isolate Unit 4 from containment.
Event Notifications and Updates
Neutron Exposure Event: CNSC staff were satisfied with Bruce Power's responses on the GNSCR 12(2) request regarding potential neutron exposure of workers, which was discovered on June 3, 2024, and detailed in CMD-24-M35, Event Initial Report - Potential Neutron Exposure of Workers. The action item associated with the event is considered closed. On March 15, 2025, Bruce B entered into a station emergency as a result of a moderator spill that occurred during the Unit 5 planned outage. While repoising Shutdown System 2 using an approved procedure, workers discovered that the gadolinium mixing tank was overfilled with moderator system heavy water (D2O), causing it to spill. This resulted in the accumulation of airborne tritium and spreading into adjacent rooms.

Workers placed the equipment in a safe state and evacuated the area. Bioassays confirmed that there were no individuals that exceeded the action level of 2 mSv. Tritium emissions did not exceed the regulatory environmental action level.

A Preliminary Event Report, in accordance with REGDOC-3.1.1, was submitted to the CNSC on March 21, 2025. CNSC staff conducted surveillance and monitoring, inspection and submission review activities in response to the event and concluded that appropriate actions were taken by Bruce Power.

CNSC staff will be providing an Event Initial Report on the increased fish impingement event at Bruce A in a separate agenda item, CMD 25-M24.

Actions from previous Commission meetings

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 1.6 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's response is provided to the Commission in CMD 25-M27.

1.2 Darlington

Operational Status
Unit 1 is at Full Power
Unit 2 is at 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

- OPG submitted a licence renewal application on May 31, 2024
- Commission hearing (Part 1) was held on March 26, 2025, with the public hearing (Part 2) will take place on June 24-26, 2025.

Comments

Unit 4 refurbishment started in July 2023.

- Moderator fill is under way
- Scaffolding installation for lower feeder installation is in progress.
- Regulatory Hold Point 1 (approval to load fuel) is anticipated for August 24, 2025.

Event Notifications and Updates

Neutron Exposure Event: CNSC staff were satisfied with OPG's responses on the GNSCR 12(2) request regarding potential neutron exposure of workers, which was discovered on

June 3, 2024, and detailed in CMD-24-M35, Event Initial Report - Potential Neutron Exposure of Workers. The action Item associated with the event is considered closed.
Actions from previous Commission meetings
During the public meeting held on November 7, 2024, the Commission directed CNSC staff to provide further information on the Unit 1 reactor trip event. On October 24, 2024, Unit 1 experienced a reactor trip due to steam generator low level during Return-to-Service from the refurbishment outage. This event is safety significant as the main heat sink was impacted and was not available during Unit startup. Fuel cooling was not challenged by this event and station systems responded as required. OPG has completed their root cause investigation and determined the root cause to be that the use of the procedure preparation/verification checklist was optional as per their governance and was not used. This checklist provides prompts to ensure components are left in their baseline position and provides additional defense in depth to ensure correct alignment of the plant. In this case, OPG personnel did not field verify that the valves were in their baseline positions, but rather only performed a database verification, which did not match field conditions. As a result of the event, OPG immediately initiated and implemented several corrective actions including, the mandatory use by the outage team of the procedure verification checklist, and for outage operations team to verify any alignment discrepancies in-field and to establish a two-month time limit on alignment verifications. CNSC staff are currently conducting a reactive inspection as a result of this event to confirm whether the corrective actions proposed and implemented by OPG address the issue and prevent re-occurrence. Any non-compliances identified through this inspection will continue to be subject to CNSC oversight.

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 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. The Unit is defueled, and the Primary Heat Transport (PHT) System is drained and undergoing vacuum drying. PHT vacuum drying is expected to be complete by June 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.
Event Notifications and Updates
None
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
None
Event Notifications and Updates
On March 17th, the station was taken offline to repair Reactor Building concrete cooling fans. CNSC site staff attended post-shutdown meetings and were satisfied that the plant was safely shutdown, and the fans were repaired according to station procedures. The station was returned to operation March 24th. On March 20th, the CNSC issued an administrative monetary penalty to NB Power for failure to comply with Licence Condition 2.1 of the Power Reactor Operating Licence due to continued violations with Hours of Work and Recovery requirements in REGDOC-2.2.4, Fitness for Duty: Managing Worker Fatigue. NB Power paid the AMP on April 7, 2025. CNSC staff continue to monitor and assess NB Power's corrective actions through normal processes. The Notice of Violation is posted on the CNSC website: Administrative monetary penalty issued to New Brunswick Power Corporation (cnsc-ccsn.gc.ca) **Neutron Exposure Event:** CNSC staff were satisfied with NB Power's responses on the GNSCR 12(2) request regarding potential neutron exposure of workers, which was discovered on June 3, 2024, and detailed in CMD-24-M35, Event Initial Report - Potential Neutron Exposure of Workers. The action Item associated with the event is considered closed.
Actions from previous Commission meetings
None

1.5 Darlington New Nuclear Project

Construction Status – DNNP-1
Major construction initiatives in progress: • Excavation of vertical shaft for Condenser Cooling Water Intake tunnel • Excavation for, and installation of, pile (“caisson”) foundations for the Turbine, Radwaste, and Control Buildings
Licensing
Power Reactor Construction Licence issued on April 04, 2025, expires on March 31, 2035. OPG is authorized to construct a single BWRX-300 reactor and any supporting infrastructure for up to three (3) additional reactors. LCH revision 0 was issued on April 14, 2025. Summary status of the DNNP and OPG’s progress toward each regulatory hold point: · RHP-1: Installation of the Reactor Building (RB) Foundation Changes to RHP1 commitments: None Status: 21 open, 3 closed, 24 total · RHP-2: Installation of the Reactor Pressure Vessel (RPV) Changes to RHP2 commitments: None Status: 23 open, 0 closed, 23 total · RHP-3: Fuel-Out Commissioning Changes to RHP3 commitments: None Status: 7 open, 0 closed, 7 total
Comments
None
Event Notifications and Updates
A serious worker injury occurred on April 9, 2025 requiring worker transport off-site and hospitalization. Ontario Ministry of Labour, Immigration, Training and Skills Development (MLTSD) was called to investigate, with the investigation ongoing. CNSC staff will provide further details to the Commission through the Event Initial Report item at a separate agenda item, CMD 25-H28.
Actions from previous Commission meetings
None

1.6 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).

Since CNSC staff's last update to the Commission in CMD 25-M17, industry has provided their fifth semi-annual update. CNSC staff's review of this latest update is ongoing, and the results of this review will be presented to the Commission at a future status update.

Progress against the original completion dates provided in the R&D plans summarized in CMD 25-M17, presented during a Commission Meeting held on February 25, 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 with a TCD of Fall 2025

R&D Activity	Planned Completion Date (from CMD 22-M37.1 and 22-M37.3)	Updated Status of R&D Activities
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
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

R&D Activity	Planned Completion Date (from CMD 22-M37.1 and 22-M37.3)	Updated Status of R&D Activities
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

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