



**ORDER BY A DESIGNATED OFFICER UNDER PARAGRAPH 37(2)(f) AND  
SUBSECTION 35(1) OF THE *NUCLEAR SAFETY AND CONTROL ACT***

UNCLASSIFIED

e-Doc 6612592

File 4.01.03

**Date of Order:** July 26, 2021

**TO:**

Ontario Power Generation Inc.  
700 University Avenue  
Toronto, Ontario  
M5G 1X6

**IN RELATION TO:**

Canadian Nuclear Safety Commission (CNSC) licence number PROL 13.02/2025 issued pursuant to the *Nuclear Safety and Control Act*, which authorizes Ontario Power Generation (OPG) to operate the Darlington Nuclear Generating Station. Licence condition 6.1 for PROL 13.02/2025 requires that OPG shall comply with requirements documented in CSA standard N285.8-15, *Technical requirements for in-service evaluation of zirconium alloy pressure tubes in CANDU reactors*, with respect to fitness-for-service assessments of Darlington fuel channels.

**RATIONALE:**

The CNSC became aware that pressure tubes in two reactors operated by Bruce Power were found to exceed the 120 hydrogen equivalent concentration ([Heq]) limit established by the Commission for that licensee. The [Heq] prediction models used in assessment of fuel channel fitness for service under-predicted the elevated [Heq] in specific locations of pressure tubes. This discovery reveals that the [Heq] models used in fracture toughness assessment of fuel channel fitness for service in Darlington NGS Units 1 and 4 may also underestimate [Heq] in specific locations of pressure tubes. OPG received a request per Subsection 12(2) of the *General Nuclear Safety and Control Regulations* [1] to evaluate this information as it may pertain to Darlington NGS and to confirm that all units in operation are currently operating within their approved licensing basis. Darlington NGS Unit 2 was refurbished in 2020, and has not operated long enough to generate pressure tubes with elevated [Heq]. Darlington NGS Unit 3 is currently undergoing refurbishment.

ORDER:

Prior to the restart of Units 1 or 4, following any outage that results in the cooldown of the heat transport system, OPG shall obtain authorization from the Commission to restart.

Prior to seeking such authorization, OPG shall either:

- a. carry out inspection and maintenance activities that demonstrate with a high degree of confidence that pressure tube [Heq] is within OPG's licensing basis, *per* licence condition G.1, and submit results of such activities to CNSC staff;

or

- b. carry out inspection and maintenance activities that demonstrate with a high degree of confidence that no flaws are present in the region of pressure tubes where the models failed to conservatively predict the elevated [Heq], and submit results of such activities to CNSC staff.

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Ramzi Jammal  
Designated Officer  
Canadian Nuclear Safety Commission

Dated at Ottawa, Ontario, Canada this 26th day of July 2021.

**References:**

1. CNSC Letter, "Darlington and Pickering NGS: Request pursuant to Subsection 12(2) of the *General Nuclear Safety and Control Regulations*: Issues Relating to Measurement of Hydrogen Concentration in Pressure Tubes", July 13, 2021. e-Doc [6603931](#)