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Presentation from Ontario Power Generation

Présentation d' Ontario Power Generation

Hydrogen Equivalent Concentration in Pressure Tubes for Nuclear Power Plants

Responses from OPG to request pursuant to Subsection 12(2) of the *General Nuclear Safety and Control Regulations*: Issues Relating to Measurement of Hydrogen Equivalent Concentration in Pressure Tubes

Concentration d'hydrogène équivalent dans les tubes de force pour les centrales nucléaires

Réponses d'OPG à la demande en vertu du paragraphe 12(2) du *Règlement général sur la sûreté et la réglementation nucléaires* : Enjeux concernant la mesure de la concentration d'hydrogène équivalent dans les tubes de force

Commission Meeting

Réunion de la Commission

September 3, 2021

Le 3 septembre 2021

OPG Pressure Tube Fitness for Service Assessment

Commission Meeting

September 3, 2021

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Outline

- 1 | Introduction & Opening Remarks
- 2 | OPG Pressure Tube Fitness for Service Assessment in Light of Bruce Power Heq Discovery
- 3 | Closing Remarks



Opening Remarks

- OPG's Inspection Program is robust, comprehensive and meets/exceeds CSA Standards
- OPG has a good understanding of Hydrogen equivalent concentration (Heq) behavior in Pressure Tubes, including in the region of interest from the Bruce Power OPEX
- OPG Heq values are within the licensing basis with considerable margins, and all Pressure Tubes are demonstrated to be fit for service
- OPG has responded to the CNSC 12(2) letter and considers to have unconditionally met the requirements of the Orders with confidence that Pickering/Darlington units can be safely re-started following any outage

Pressure Tube Fitness for Service Assessment



OPG's Response to 12(2) Letter

CNSC Item 1: Confirm receipt of the information from Bruce Power related to this discovery.

OPG Response:

- Information related to the discovery of elevated Heq in the Bruce Power Pressure Tubes has been received
- This information has been considered in OPG's assessment of Pressure Tube Fitness for Service

OPG proactively and carefully considered the Bruce Power OPEX

OPG's Response to 12(2) Letter

CNSC Item 2: Analyze the impact of this information on the demonstration of pressure tube fitness for service.

OPG Response:

- Additional engineering analysis completed and submitted demonstrating continued Pressure Tube Fitness for Service
- Concluded that Pickering Units 1, 4, 5, 6, 7, 8 and Darlington Units 1 and 4 Pressure Tubes remain fit for service
- Is based on review of extensive OPG inspections (in-reactor scrape and removed tube samples) and very few previously dispositioned flaws in the region of interest

OPG's Response to 12(2) Letter

OPG Response to CNSC Item 2 (cont'd):

- Pickering Units 1 and 4 are not in extended operation and Heq levels are expected to remain well within licensing limits
- Darlington Unit 2 has been recently refurbished and remains fit for service
- Darlington Unit 3 is currently shutdown for refurbishment

OPG has high confidence that Pressure Tubes are Fit for Service at Pickering & Darlington stations

OPG's Response to 12(2) Letter

CNSC Item 3: Conduct necessary tests and analysis to verify that operation of all reactors at OPG stations remains within their licensing basis.

OPG Response:

- Based on a review of all past measured Heq data, the Heq values for all OPG units are confirmed to be within the licensing basis, including samples taken from ex-service material in the region of interest from the Bruce Power OPEX
- High levels of Heq, on the order of the Bruce Power discovery, have not been observed in any OPG units
- In the unlikely event of any high Heq existing in the region of interest, OPG is confident no Pressure Tube flaws exist therein or they are dispositioned as safe in accordance with CSA Standards

Operation of all OPG reactors is confirmed to be within their licensing basis

OPG's Response to 12(2) Letter

CNSC Item 4: Inform CNSC of any other measures taken in response to this information.

OPG Response:

- Proactively investigating potential adjustments to existing scrape tooling for upcoming outages to optimize sampling at the top of the pressure tube
- Engaged with industry partners on work to further understand the mechanism behind the Bruce Power OPEX and associated Heq modeling enhancements
- Future planned outage inspection/scrape programs will be optimized based on this OPEX

OPG future planned outages will be informed by industry Heq OPEX

Concluding Remarks



Summary

- OPG has a robust fitness for service program and extensive defence-in-depth measures in place to ensure safe reactor operation
- OPG has a good understanding of Heq behavior in pressure tubes
- Heq values are significantly lower at Pickering and Darlington units and are within the licensing basis
- OPG is confident that our Heq models remain valid for pressure tube fitness for service assessment
- OPG has no flaws of significance in the region of interest from the Bruce Power OPEX, as supported by extensive inspections and assessments in accordance with CSA Standards
- Continued safe operation of OPG units is assured

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