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Supplementary Information

Written submission from Ontario Power Generation

In the Matter of

Request for authorization to return Pickering Nuclear Generating Station Unit 5 to service, following its current forced outage

Public Hearing - Hearing in writing based on written submissions

October 2021

Renseignements supplémentaires

Mémoire d' Ontario Power Generation

À l'égard de

Demande concernant l'autorisation de la remise en service de la tranche 5 de la centrale nucléaire de Pickering à la fin de son arrêt prévu actuel

Audience Publique - Audience fondée sur des mémoires

Octobre 2021

Canada

ONTARIO POWER GENERATION

Mark Knutson, P. Eng.
Senior Vice-President
Enterprise Engineering
and Chief Nuclear Engineer

889 Brock Road P82-5A1 Pickering, Ontario L1W 3J2 (905) 839-6746 x5418 mark.knutson@opg.com

OPG Proprietary

October 8, 2021

CD# N-CORR-00531-22916

MR. M. LEBLANC
Commission Secretary

DR. A. VIKTOROV
Director General

Canadian Nuclear Safety Commission
280 Slater Street
Ottawa, Ontario
K1P 5S9

Dear Mr. Leblanc and Dr. Viktorov:

Darlington and Pickering NGS: Sensitivity Analysis to Supplement NK30-CORR-00531-08328 and NK38-CORR-00531-22869

The purpose of this letter is to provide additional sensitivity assessment results that supplement Enclosure 1 of References 1 and 2, and to support OPG's request regarding Pickering Unit 5 in Reference 3. These results provide supporting context regarding the probability of a flaw in the region of interest for Pickering Units 5-8 and Darlington Units 1 and 4.

As highlighted previously in References 1 and 2, OPG has confidence in our understanding of [Heq] in the region of interest of the Bruce Power High [Heq] OPEX. There has been no evidence of high [Heq] of similar magnitude as the Bruce Power OPEX based on the sampling performed to date in this region. Additionally, extensive volumetric and dimensional inspections performed in all OPG Units demonstrate that there remains a very low population of flaws near the outlet rolled joints. Though the general lack of flaws found in OPG units does limit the analytical options for quantifying the potential number of flaws in the uninspected population, the low number of flaws provides evidence of the positive performance of the foreign material exclusion (FME) practices that are in place.

OPG maintains, as discussed in Enclosure 1 of Reference 4, flaws formed within the area of interest are blunt in nature, and are fit for service at elevated [Heq] levels exceeding the Bruce Power OPEX. In order to create a fitness for service concern, both a sufficiently high [Heq] along with a flaw of sufficient stress concentration that hydrides will accumulate and initiate into flaw growth, is required. There has been no evidence of either of these conditions being present in OPG reactors based on hundreds of inspections performed to date.

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If you have any questions, please contact Mr. Paul Fabian, Department Manager, Major Components and Equipment at (289) 314-8521, or by e-mail at paul.fabian@opg.com.

Sincerely,

Mark R. Knutson, P. Eng.
Senior Vice President, Enterprise Engineering
and Chief Nuclear Engineer
Ontario Power Generation Inc.

Attach.

cc: R. Jammal - CNSC (Ottawa)
J. Burta - CNSC (Ottawa)
K. Campbell - CNSC (Ottawa)
C. Chan - CNSC Site Office (Pickering)

Attachment:

1. Supplementary sensitivity analysis to Enclosure 1 of NK30-CORR-00531-08328.

References:

1. OPG Letter, J. Franke to M. Leblanc and A. Viktorov, “Pickering NGS: Request for Authorization to restart following the Pickering Unit 7 fall outage 2021 and pre-authorization to restart following any Pickering Units 5-8 Forced Outage with Heat Transport System Cooldown”, September 28, 2021, CD# NK30-CORR-00531-08328.
2. OPG Letter, S. Gregoris to M. Leblanc and A. Viktorov, “Darlington NGS: Request for Authorization to Restart following the Darlington Unit 4 Fall 2021 Outage and Authorization to Restart following any Darlington Unit 1 or 4 Forced Outage with Heat Transport System Cooldown”, September 29, 2021, CD# NK38-CORR-00531-22869.
3. OPG Letter, J. Franke to M. Leblanc and A. Viktorov, “Pickering NGS: Request for expedited authorization to restart following the Pickering Unit 5 2021 fall forced outage”, October 1, 2021, CD# NK30-CORR-00531-08332.
4. OPG Letter, S. Gregoris and J. Franke to M. Leblanc, “Pickering and Darlington NGS: Submission of Supplemental Information in Response to Designated Officer Orders and to Support Opportunity to be Heard Public Hearing“, September 8, 2021, CD# N-CORR-00531-22866.

ATTACHMENT 1

Supplementary Sensitivity Analysis to Enclosure 1 of NK30-CORR-00531-08328 and NK38-CORR-00531-22869

ATTACHMENT 1

Supplementary Sensitivity Analysis to Enclosure 1 of NK30-CORR-00531-08328 and NK38-CORR-00531-22869

OPG has previously completed a statistical assessment using a 95% confidence interval in Reference [A-1].

Assumptions:

The following assumptions have been used for the flaw population when calculating the mean distribution in Table 1 for a 360 degree region of interest near the outlet burnish mark:

1. OPG has consistently performed rolled joint scrape sampling since 2009 at 50mm inboard of the burnish mark in Pickering Units 5-8 and Darlington Units 1 and 4. There has been no observed high [Heq] measurements of similar magnitude to the Bruce Power OPEX. Therefore, it is assumed that the region of interest can be reduced from 75mm to 50mm inboard of the burnish mark. Given OPG’s high confidence in [Heq] predictions in this region due to scrape sampling locations, P6N04-IND9 may be excluded.

2. Due to the fuel channel configuration at Pickering Unit 5-8, a shield plug is situated in the region of interest, reducing the likelihood of future flaw formation within 85mm inboard of the burnish mark during normal operation (shield plug extends 85mm inboard of the burnish mark). Therefore, if it is assumed that there will be no additional flaw formation for the top 120 degree (OPG’s defined region of interest) and full 360 degree (sensitivity case) quantitative statistical assessments, P5O05-IND1 may be excluded as a rare event.

Based on the methodology utilized in Reference [A-1], and using the assumptions mentioned above, a geometric distribution with zero events could be considered. For comparison purposes, a mean confidence interval has been selected and is provided in Table 1 below.

OPG maintains that the statistical assessment provided in Reference [A-1] remains a conservative methodology of assessing the risk in the uninspected population of the core.

Table 1: Mean Results for 50mm inboard of Burnish Mark - 360 Degree Region of Interest Using a Zero Event Geometric Distribution

				Base Case	Sensitivity Case A	Sensitivity Case B
				All OPG Data	PNGS A / B, DNGS Separate	All OPG and BP Fata
	Number of Inspected	Total Channels	Uninspected Channels	Expected # Dispositionable Flaws	Expected # Dispositionable Flaws	Expected # Dispositionable Flaws
D1	70	480	410	0.5	1.2	0.3
D4	61	480	419	0.6	1.3	0.3
P5	62	380	318	0.4	0.8	0.2
P6	45	380	335	0.4	0.8	0.2
P7	64	380	316	0.4	0.8	0.2
P8	54	380	326	0.4	0.8	0.2

References:

[A-1] Kinectrics Memo, “Flaw Probability in the Region of Interest for Pickering B Units 5-8 and Darlington Units 1 & 4 Pressure Tubes”, OPG CD# N-CORR-31100-0953933, September 27, 2021