Dominion Energy Nuclear Connecticut, Inc.
Millstone Power Station
314 Rope Ferry Road, Waterford, CT 06385
DominionEnergy.com

Dominion Energy®

APR 20 2023

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Serial No.	23-051A
NSSL/JPP	R0
Docket No.	50-423
License No.	NPF-49

DOMINION ENERGY NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 3
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION FOR SPRING 2022 STEAM GENERATOR TUBE INSPECTION REPORT (EPID L-2022-LRO-0142)

By letter dated October 27, 2022, (Agencywide Documents Access and Management Systems (ADAMS) Accession No. ML22300A100), as supplemented by letter dated March 8, 2023, (ADAMS Accension No. ML23068A107), Dominion Energy Nuclear Connecticut, Inc. (DENC), submitted information to the Nuclear Regulatory Commission (NRC) summarizing the results of steam generator (SG) tube inspections performed at Millstone Power Station Unit 3 (MPS3). The inspections were performed as part of refueling outage 21 during the spring of 2022. Technical Specification (TS) Section 6.8.4. requires that a SG Program be established and implemented to ensure SG tube integrity is maintained. TS Section 6.9.1.7 requires that a report be submitted within 180 days after the initial entry into hot shutdown (MODE 4) following completion of an inspection of the SGs.

In an email dated March 13, 2023, the NRC issued a draft request for additional information (RAI) regarding the spring 2022 Steam Generator Tube Inspection Report (EPID L-2022-LRO-0142). A clarification call on the draft RAI was not necessary. On March 29, 2023, the NRC issued the final RAI. DENC agreed to respond to the RAI no later than May 15, 2023.

The attachment to this letter provides DENC's response to the RAI.

If you have any questions or require additional information, please contact Dean E. Rowe at (860) 444-5292.

Sincerely,

Michael J. O'Connor
Site Vice President – Millstone Power Station

Attachment:
Response to Request for Additional Information Regarding Spring 2022 Steam Generator Tube Inspection Report (EPID L-2022-LRO-0142)

Commitments made in this letter: None

cc: U.S. Nuclear Regulatory Commission
Region I
475 Allendale Rd, Suite 102
King of Prussia, PA 19406-1415

R. V. Guzman
Senior Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North, Mail Stop 08-C 2
11555 Rockville Pike
Rockville, MD 20852-2738

NRC Senior Resident Inspector
Millstone Power Station

ATTACHMENT

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING SPRING 2022 STEAM GENERATOR TUBE INSPECTION REPORT (EPID L-2022-LRO-0142)

MILLSTONE POWER STATION UNIT 3
DOMINION ENERGY NUCLEAR CONNECTICUT, INC. (DENC)

By letter dated October 27, 2022, (Agencywide Documents Access and Management Systems (ADAMS) Accession No. ML22300A100), as supplemented by letter dated March 8, 2023 (ADAMS Accession No. ML23068A107), Dominion Energy Nuclear Connecticut, Inc. (DENC), submitted information to the Nuclear Regulatory Commission (NRC) summarizing the results of steam generator (SG) tube inspections performed at Millstone Power Station No. 3 (MPS3). The inspections were performed as part of refueling outage 21 during the spring of 2022. Technical Specification (TS) Section 6.8.4. requires that a SG Program be established and implemented to ensure SG tube integrity is maintained. TS Section 6.9.1.7 requires that a report be submitted within 180 days after the initial entry into hot shutdown (MODE 4) following completion of an inspection of the SGs.

In an email dated March 13, 2023, the NRC issued a draft request for additional information (RAI) regarding the spring 2022 Steam Generator Tube Inspection Report (EPID L-2022-LRO-0142). A clarification call on the draft RAI was not necessary. On March 29, 2023, the NRC issued the final RAI. DENC agreed to respond to the RAI no later than May 15, 2023.

This attachment provides DENC's response to the RAI.

NRC Request

To complete its review of the inspection report, the U.S. Nuclear Regulatory Commission (NRC) staff requests the following additional information:

1. *The table below lists volumetric indications in SG C from the 2017 End of Cycle 18 (EOC-18) (ML18114A105) and the 2022 (EOC-21) steam generator tube inspection (SGTI) reports. Based on location, these appear to be successive inspections of three indications classified as foreign object (FO) wear in 2017 and tube support plate (TSP) wear in 2022. For each indication, the maximum through-wall (TW) depth reported in 2022 is significantly lower than the TW depth reported in 2017.*

   Please describe the data acquisition and analysis factors that resulted in the changes in indication classification and sizing.

   The NRC staff recently asked licensees to consider including explanations in the inspection reports that may clarify information being reported, for example, such as reclassification of indications. (See NRC staff presentation to the industry Steam Generator Task Force (ML23052A123) on February 23, 2023).

Tube	***Reported Degradation and Location***	
	2017	***2022***
*SG C R13-C120**	*FO wear, 29% TW* *TSP 08C-0.8 inch*	*TSP wear, 18% TW* *TSP 08C-0.8 inch*
SG C R35-C78	*FO wear, 28% TW* *TSP 08C-0.94 inch*	*TSP wear, 16% TW* *TSP 08C-1.01 inch*
SG C R35-C110	*FO wear, 24% TW* *TSP 06C-1.25 inch*	*TSP wear, 12% TW* *TSP 06C-1.07 inch*

** R=row, C=column*

DENC Response to RAI-1

The acquisition of eddy current data during the 2022 inspection did not change appreciably from the acquisition of eddy current data in 2017. The acquisition instruments, probe types, and software platforms utilized for the acquisition process, during the inspections conducted in both outages, were products of the same type and from the same equipment manufacturer. The acquisition techniques including the speed of the probes traversing through the tubes and data digitizing rates did not change.

Analysis of the acquired eddy current data was performed by a different vendor using different analysis software in each of the two outages. However, these differences are not considered to have significantly affected the analysis results.

The change in classification from foreign object wear (2017) to tube support plate wear (2022) resulted in the use of two different sizing techniques between the 2017 and 2022 examinations, namely the use of Examination Technique Specification Sheet (ETSS) 27901.1 during 2017 and the use of ETSS 96910.1 during 2022. The change in ETSSs explains most of the difference between the 2017 and 2022 indication depths. The difference in depths is primarily attributed to the use of dissimilar examination frequencies and calibration curves, which can significantly affect the correlation between signal response and percent wall loss.

When eddy current signals indicative of volumetric wall loss are detected, the eddy current analysts determine the most likely cause of the indication based on location, operating history, and analyst experience. If an eddy current signal indicative of wear is detected adjacent to an Anti-Vibration Bar (AVB), it is classified as AVB wear and sized accordingly. Likewise, wear in contact with a Tube Support Plate (TSP) land is classified as TSP wear, and wear detected in the free span portion of the tube is typically classified as foreign object wear.

However, determining the cause of indications in close proximity to TSP land contact points, but not in direct contact, is not as straightforward. These indications could be caused by either foreign objects or interaction between the tube and the TSP. Also, the location of the TSP land contact point can vary by elevation and leg, due primarily to thermal expansion differences between operating and shut-down conditions. Typically, when the cause of the degradation mechanism is indeterminate, the more conservative sizing technique is applied.

The three indications cited above were present in the database prior to the 2017 examination. During the 2017 examination, an analyst reclassified two of the indications as foreign object wear with no part present, based on their locations relative to the land contact points. Since the reclassification of these indications resulted in a more conservative wall loss measurement which was still well below condition monitoring limits, and did not impact the operational assessment, they were not further scrutinized during the outage. The third indication had already been classified as foreign object wear with no part present, based on its location relative to the land contact point.

Since it is unlikely for foreign object wear indications to occur in these locations (on the underside of tube support plates, high in the bundle, and affecting solitary tubes), these indications received special attention during the 2022 examination. All three indications were analyzed in 2022 looking back over multiple outages. Since all three indications exhibited some form of indication growth between 2014 and 2022, coupled with the fact that no foreign object was present to cause the growth, the indications were reclassified as TSP wear instead of foreign object wear with no part present.

Table – 1

SG-C Tube #	Max Depth 2014	Max Depth 2017	Max Depth 2022
R13-C120	13	18	18
R35-C78	11	14	16
R35-C110	7	12	12

*The Max Depth wall loss values in Table-1 were determined using EPRI ETSS 96910.1

All three of the indications in the Table -1 above will be reevaluated again in the fall 2023 inspection.

2. *Table 3 of the 2022 (EOC-21) SGTI report includes three TSP wear indications in SG C with maximum depth 20 percent TW or more that were not in the previous inspection report for SG C in 2017 (ML18114A105). The indications were in tubes R17C70, R17C52, and R35C97, with TW depths of 45 percent, 33 percent, and 20 percent, respectively. Considering that the 2017 and 2022 reports include TW depth values as low as 9%, the staff requests the following information:*

   a. *Please discuss your understanding of why two of these indications were first detected at greater than 30 percent TW depths, or whether they are considered anomalies.*

   b. *Please describe if any of these indications were reportable based on lookback analysis to the 2017 inspection.*

DENC Response to RAI-2. a.

During the 2022 inspection, there were 22,315 steam generator tubes in service at MPS3. Excluding the Flow Distribution Baffle (FDB) and AVBs, each U-tube is in contact with 14 TSP locations (7 on each hot and cold straight leg). Therefore, since there was a total of 31 TSP wear indications detected out of the 312,410 tube-to-support plate intersections combined between all 4 steam generators (most of them repeat indications with little or no growth) it is highly unlikely that these indications are caused by a change in the thermal hydraulic conditions.

There are several more plausible explanations and one or more of those conditions could be responsible for the presumptively rapid wear rates.

- The detection and sizing of minor TSP wear indications can be heavily influenced by extraneous signals from the TSP, especially on the lower edge where deposits tend to accumulate and could result in a measurement anomaly.
- Initial wear depth growth could be rapid in locations particularly susceptible to wear such as broaches with sharp edges or burrs. Subsequent volumetric growth tends to slow with time as the surface area of interaction increases.
- The sizing technique could be overly conservative for some flaw shapes and could result in a measurement anomaly.

An eddy current examination is scheduled to be conducted on 100% of the in-service tubes in the fall 2023 outage and a reevaluation of all tube-to-TSP intersections will be performed during that outage.

DENC Response to RAI-2. b

The initial detection of TSP wear is accomplished with a bobbin probe. The bobbin probe technique for the detection of TSP wear utilizes a two-frequency mix combination for suppression of the support signal. The mix channel is sensitive to certain types of defects while suppressing signals from the support structure. However, the suppression of the support signal does not completely eliminate the support signal and a 'mix residual' signal remains. This mix residual signal could influence or mask the incipient TSP wear indication.

Mixing the two frequencies can be accomplished by mixing on the broached TSP artifact in the site calibration standard or performing an in-situ mix on a 'clean' broached TSP in the steam generator. Slight variations in the mix residual could explain the difference in whether an indication being reported or not, but TSP wear indications with wall losses of 10% or greater are routinely detected.

If any indication of degradation is detected during the bobbin examination, that location is added to the special interest scope and subjected to interrogation using diagnostic techniques with Rotating Probe Coils (RPC) to verify / characterize the indication.

None of the three indications mentioned above exhibited bobbin probe degradation signals that were detected by the analysts in 2017. Using the benefit of hindsight, the 2017 bobbin coil data was reevaluated for the three indications using the current vendor's analysis software, calibration, and mix. The result of that reevaluation is contained in Table-2 below along with the results from the 2022 inspection.

Table - 2

Tube #	2017 Bobbin	2017 RPC	2022 Bobbin	2022 RPC	Comments
SG-C R17-C52	0.18 Volts 04H-0.37	N/A	0.13 Volts 04H-0.37	33%	The 2017 bobbin signal is small and appeared more toward ID phase. In 2022, phase appeared in OD.
SG-C R17-C70	0.03 Volts 06H-0.58	N/A	0.52 Volts 06H-0.61	45%	No degradation visible in 2017 bobbin data. Bobbin indication first appears in 2022 data.
SG-C R35-C97	0.28 Volts 05H-0.68	N/A	0.35 Volts 05H-0.65	20%	Signal visible in 2017 bobbin data with current mix configuration.