

VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

September 4, 2018

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

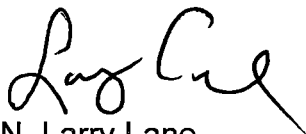
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VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION)
NORTH ANNA POWER STATION UNIT 1
STEAM GENERATOR TUBE INSPECTION REPORT

Pursuant to Technical Specification 5.6.7 for North Anna Power Station Unit 1, Dominion is required to submit a 180-day steam generator tube inspection report. The attachment to this letter provides the steam generator tube inspection report for the North Anna Unit 1 Spring 2018 outage.

Should you have any questions or require additional information, please contact Mr. Daniel P. McGinnis at (540) 894-2487.

Very truly yours,



N. Larry Lane
Site Vice President

Attachment

Commitments made in this letter: None

A047
NRR

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Attachment

North Anna Power Station Unit 1

End of Cycle 26 Steam Generator Tube Inspection Report

**VIRGINIA ELECTRIC AND POWER COMPANY
(DOMINION ENERGY)**

End of Cycle 26 Steam Generator Tube Inspection Report

In accordance with North Anna Power Station Unit 1 (NAPS1) Technical Specification (TS) 5.6.7, Virginia Electric And Power Company (Dominion Energy) is submitting this 180-day report which describes the results of the recently completed NAPS1 steam generator (SG) examinations. Based upon entry into Mode 4 on April 13, 2018, this report is required to be submitted by October 10, 2018.

The North Anna Unit 1 Steam Generators have accrued approximately 22.7 Effective Full Power Years (EFPY) of operation as of the End of Cycle 26 (March 2018). Since the first sequential period begins after the first inservice inspection, programmatically the North Anna Unit 1 Steam Generators have accrued 21.3 EFPY.

See Attachment 1, "Acronyms," for explanation of acronyms.

Report:

TS 5.6.7 reporting requirements (in bold text) are provided below, followed by Dominion Energy's response:

A report shall be submitted within 180 days after the initial entry into MODE 4 following completion of an inspection performed in accordance with TS 5.5.8, Steam Generator (SG) Program. The report shall include:

a. The scope of inspections performed on each SG,

The NAPS SG eddy current testing (ECT), conducted during Cycle 26 was completed on March 30, 2018. The examinations, personnel, and equipment conformed to the requirements of NEI 97-06, Rev. 3, Steam Generator Program Guidelines; EPRI Pressurized Water Reactor Steam Generator Examination Guidelines, Rev. 8; and North Anna Unit 1 Technical Specifications.

The 1R26 ECT inspection is summarized in Table 1. All operational tubes in all three steam generators (a total of 10,774 tubes), were inspected full length with bobbin probes. An augmented sample of 5,195 tube locations was inspected with rotating coil probes.

The rotating probe examination in each SG included a 50% sample of the outer five rows of the hot and cold leg periphery and open tube lane at the top of tubesheet. The primary purpose of this examination was the detection of foreign objects or foreign object wear in the most susceptible regions of the SG's. In addition, the rotating probe examinations included both a pre-planned scope, and 1R26 special interest emergent scope. The pre-planned scope included a 50% sample of tubes in the sludge pile region, historical locations of interest, dents or dings (DNT or DNG), overexpansions or bulges (OXP or BLG), percent through wall indications (%TW), and a sample of non-quantifiable historical indications (NQH). The emergent scope included 1R26 bobbin coil special interest (SI) locations such as non-quantifiable indications (NQI) and various hot leg and cold leg RPC bounding locations.

During 1R26 each primary channel head in all three SGs was visually examined prior to the installation of eddy current probe manipulators. This examination revealed no evidence of degradation and no evidence of plug leakage. The proper tube number and plug position were verified for all four previously installed plugs (two tubes, both in SG C).

Secondary-side visual examinations were performed in all three steam generators. These examinations included:

- Post-sludge lancing visual examination of top-of-tubesheet annulus and no-tube lane to assess as-left material condition and cleanliness, and to identify and remove any retrievable foreign objects (FOSAR).
- Steam drum visual inspections to evaluate the material condition and cleanliness of key components such as moisture separators, drain systems, and interior surfaces.

The results of all secondary-side visual examinations performed were satisfactory, with no degradation detected.

Table 1: North Anna 1R26 ECT Summary

| +Point Probe Exams: | | SG A | SG B | SG C |
|----------------------------|--|-------------|-------------|-------------|
| 1 | TSH±3" (50% of sludge region) | 214 | 215 | 214 |
| 2 | TSH±3" (approx. 50% of 5 tube periphery) | 570 | 570 | 567 |
| 3 | TSH±3" (bundle interior beyond the sludge region) | 209 | 209 | 209 |
| 4 | Row 1 Ubends (100%) | 98 | 98 | 98 |
| 5 | TSC±3" Periphery Exams (approx. 50% of 5 tube periphery) | 570 | 570 | 570 |
| 6 | Special Interest* (Total HL + CL) | 78 | 77 | 59 |

| Bobbin Probe Exams: | | SG A | SG B | SG C |
|----------------------------|--|-------------|-------------|-------------|
| 7 | Full Length from Cold Leg (rows >3) | 3298 | 3298 | 3296 |
| 8 | Hot Leg Candy Canes (rows 2 and 3) | 196 | 196 | 196 |
| 9 | Hot Leg Straights (row 1) | 98 | 98 | 98 |
| 10 | Cold Leg Straights (row 1 through 3) | 294 | 294 | 294 |

b. Degradation mechanisms found,

The only degradation mechanism found during the 1R26 tube examinations was Tube Support Plate (TSP) wear. The indications were caused by shallow volumetric tube degradation at TSP land contact points and are characteristic of tube vibrations at the tube support plates resulting in wear. All had been reported previously and have exhibited little to no growth since the 2013 inspection. The maximum indicated growth was 0.33%TW/cycle and the largest depth was 15%TW. None of the affected tubes were plugged.

c. Nondestructive examination techniques utilized for each degradation mechanism,

As stated in b. above, the only degradation mechanism found during the 1R26 tube examinations was TSP wear. The maximum depth of TSP wear identified during 1R26 and returned to service was 15%TW; sized with +Point technique ETSS 96910.1. Conservatively accounting for NDE depth sizing uncertainty, the upper bound returned-to-service depth is 29.8%TW.

d. Location, orientation (if linear), and measured sizes (if applicable) of service induced indications,

A complete listing of tube degradation identified during the 1R26 examination is provided in Table 2.

Table 2: Tube Degradation Summary

| SG | Row | Col | Location | ETSS | Max Depth (%TW) |
|----|-----|-----|----------|---------|-----------------|
| A | 1 | 54 | 6H-0.87" | 96910.1 | 9 |
| A | 2 | 25 | 6C-0.86" | 96910.1 | 15 |
| A | 2 | 66 | 6C-0.87" | 96910.1 | 12 |
| | | | 6C-0.82" | 96910.1 | 5 |
| A | 2 | 91 | 4C-0.82" | 96910.1 | 10 |
| A | 15 | 9 | 3H+0.37" | 96910.1 | 11 |
| B | 1 | 98 | 5C-0.84" | 96910.1 | 12 |
| | | | 5C-0.39" | 96910.1 | 6 |
| B | 12 | 96 | 5C-0.82" | 96910.1 | 9 |
| B | 13 | 96 | 5C+0.22" | 96910.1 | 4 |
| | | | 5C-0.85" | 96910.1 | 4 |
| B | 14 | 96 | 5C-0.91" | 96910.1 | 10 |
| C | 3 | 79 | 4C-0.17" | 96910.1 | 8 |
| | | | 5C-0.67" | 96910.1 | 6 |
| | | | 5C-0.61" | 96910.1 | 4 |
| | | | 5C-0.38" | 96910.1 | 11 |

e. Number of tubes plugged during the inspection outage for each degradation mechanism,

No tubes were removed from service during 1R26.

- f. **The number and percentage of tubes plugged to date, and the effective plugging percentage in each steam generator,**

Table 3 provides the total number of tubes plugged to date and the effective plugging percentage in each SG.

Table 3

Number of Tubes Plugged To Date

| | SG A | SG B | SG C |
|--------------------|------|------|------|
| Prior to 1R26 | 0 | 0 | 2 |
| During 1R26 | 0 | 0 | 0 |
| Total After 1R26 | 0 | 0 | 2 |
| Percentage | 0 | 0 | 0.06 |
| Overall Percentage | 0.02 | | |

- g. **The results of condition monitoring, including the results of tube pulls and in-situ testing.**

The Condition Monitoring Evaluation was completed and SGs A, B and C did not exceed any performance criteria during the cycles since the fall 2013 inspections in SG A, B and C. No findings from the spring 2018 inspection invalidated the previous operational assessment for any steam generator. Condition monitoring requirements were met. Therefore, tube pulls and in-situ pressure testing were not necessary.

Attachment 1
Acronyms

| | |
|-------|---|
| BLG | Bulge |
| CHN | Channel |
| CL | Cold Leg |
| CM | Condition Monitoring |
| CMOA | Condition Monitoring and Operational Assessment |
| COL | Column |
| DEG | Degrees |
| DEP | Deposit |
| DNG | Ding |
| DNT | Dent |
| ECT | Eddy Current Testing |
| EPFY | Effective Full Power Years |
| EPRI | Electric Power Research Institute |
| ETSS | Examination Technique Specification Sheet |
| F/L | Full Length |
| FOSAR | Foreign Object Search and Retrieval |
| HL | Hot Leg |
| IDC | Inner Diameter Chatter |
| LPI | Loose Part Indication |
| MBH | Manufacturing Burnish Mark Historical |
| MBM | Manufacturing Burnish Mark |
| NAPS | North Anna Power Station |
| NDE | Non-Destructive Examination |
| NQH | Non-Quantifiable Historical Indication |
| NQI | Non-Quantifiable Indication |
| NTE | No Tube Expansion |
| EXP | Over Expansion |
| OVR | Over Rolled |
| PCT | Percent Through-Wall |
| PLP | Possible Loose Part |
| PTE | Partial Tubesheet Expansion |
| PVN | Permeability Variation |
| %TW | Percent Through Wall |
| RPC | Rotating Pancake Coil |
| SG | Steam Generator |
| SI | Special Interest |
| SLG | Sludge |
| SSI | Secondary Side Inspection |
| TSC | Tube Sheet Cold |
| TSH | Tube Sheet Hot |
| TSP | Tube Support Plate |