

March 17, 2003

Mr. David A. Christian
Senior Vice President - Nuclear
Virginia Electric and Power Company
5000 Dominion Blvd.
Glen Allen, Virginia 23060

SUBJECT: NORTH ANNA POWER STATION, UNITS 1 AND 2 - REVIEW OF STEAM
GENERATOR TUBE INSERVICE INSPECTION REPORTS FOR THE 2001
REFUELING OUTAGES (TAC NOS. MB4593 AND MB4594)

Dear Mr. Christian:

By letter dated February 28, 2002, as supplemented by letter dated October 16, 2002, Virginia Electric and Power Company (VEPCO) submitted the steam generator tube inservice inspection reports for the North Anna Power Station, Units 1 and 2. These reports presented the results of VEPCO's steam generator tube inspections that were performed during the 2001 refueling outages.

The NRC staff's review of this submittal is enclosed. As documented in the enclosed evaluation, the NRC staff has concluded that no additional follow-up is required at this time.

Sincerely,

/RA/

Stephen R. Monarque, Project Manager, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-338 and 50-339

Enclosure: Evaluation

cc w/encl: See next page

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EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
STEAM GENERATOR INSERVICE INSPECTION SUMMARY REPORT FOR 2001 OUTAGES
NORTH ANNA POWER STATION, UNITS 1 AND 2
VIRGINIA ELECTRIC AND POWER COMPANY
DOCKET NUMBERS 50-338 AND 50-339

By letter dated February 28, 2002, as supplemented by letter dated October 16, 2002, the Virginia Electric and Power Company (the licensee) submitted reports summarizing the steam generator tube inspections performed during the 2001 refueling outages at the North Anna Power Station (North Anna), Units 1 and 2. By letter dated October 4, 2002, the U. S. Nuclear Regulatory Commission (NRC) staff requested additional information pertaining to the steam generator inspection findings. The licensee provided its response to these questions on October 16, 2002. A summary of the NRC staff's evaluation of the inspection results is provided below.

The licensee replaced the original steam generators at North Anna, Units 1 and 2, during 1993 and 1995, respectively. North Anna, Units 1 and 2, utilize six Westinghouse Model 54F steam generators, with each steam generator consisting of 3592 thermally treated Alloy 690 tubes. These Alloy 690 tubes have an outside diameter of 7/8 inch, a wall thickness of 0.050 inch, and are supported by seven stainless steel tube support plates along with a baffle plate. Most of the tube support plate holes are quatrefoil shaped. The U-bend region of the tubes in rows 1 through 8 were stress relieved after bending.

During the 2001 steam generator tube inspections at North Anna, Unit 1, the licensee performed a full-length inspection of approximately 60 percent of the tubes in steam generator A using a bobbin coil (except for row 1 tubes that were only examined in the straight portion of the tubing). In addition to these bobbin coil inspections, a rotating probe equipped with a plus point coil was used to inspect the hot-leg expansion transition region of 20 percent of the tubes and the U-bend region of 100 percent of the row 1 tubes (98 tubes) in this steam generator. There was no primary-to-secondary leakage at the time the 2001 refueling outage was entered (end of cycle 6 for the replacement steam generators). As a result of the inspections, the licensee did not plug any steam generator tubes. In addition, there were no anti-vibration bar (AVB) wear indications identified; however, 78 tubes with dent signals and 19 tubes with manufacturing buff marks (MBMs) were reported. The licensee compared the eddy current signals from the dents and MBMs to the 1992 baseline data and found there was no change in the signals.

Only one tube has been plugged in the three North Anna, Unit 1, steam generators since they were placed in service in 1993. This plugged tube had a small volumetric, non-cracklike indication that the licensee classified as a pit based on rotating probe data. The indication was approximately 10 inches above the top of the tubesheet on the hot-leg side of the steam generator (TSH + 10").

During the 2001 steam generator tube inspections at North Anna, Unit 2, the licensee conducted a full-length inspection of approximately 60 percent of the tubes in steam generator C using a bobbin coil. In addition to these bobbin coil inspections, a rotating probe equipped with a plus point coil was used to inspect the hot-leg expansion transition region of 20 percent of the tubes and the U-bend region of 100 percent of the row 1 tubes (98 tubes) in this steam generator. There was no primary-to-secondary leakage at the time the 2001 refueling outage was entered (end of cycle 4 for the replacement steam generators).

As a result of the inspection, the licensee plugged one steam generator tube. This tube (located in Row 43 Column 56) was identified during the bobbin coil examination as having a 1.6 volt indication near the upper edge of the 5th cold-leg tube support. The previous bobbin data for this tube (1995 baseline data) revealed no indication at this location. A rotating probe examination of this indication revealed a volumetric indication with no crack-like features that coincided with one of the lands on the quatrefoil tube support plate. The indication was confined to within the tube support thickness. This indication was sized using techniques qualified for both wear and pitting. The maximum depth estimate was 30 percent through-wall. Based upon the location of the indication and its eddy current characteristics, the licensee concluded it was mechanically induced (i.e., wear). There was no evidence of a dent or anomalous condition associated with the indication. There was no evidence of a foreign object near this tube or the tubes surrounding this location. The licensee postulated that the indication was caused by a burr or some other small discrete particle located at the edge of the quatrefoil-shaped land.

No AVB wear indications were identified during the North Anna, Unit 2, inspection; however, seven dent signals and nine MBMs were reported. The licensee's submittal dated February 28, 2002, indicated that the eddy current signals from the dents and MBMs were resolved by comparing them with the baseline data. Based on the North Anna, Unit 1, inspection summary, the NRC staff assumed this meant there were no significant changes between the 2001 eddy current signals and the baseline eddy current signals.

Based on review of the information provided by the licensee, the NRC staff concludes that no additional follow-up is required at this time; however, the NRC staff notes that the licensee's explanations for the indications in the tubes that the licensee plugged are plausible, but not definitive. If similar "unexpected" indications are found in future outages, the licensee may want to consider performing additional diagnostic examinations to investigate the cause and severity of the indications. For example, in-situ pressure testing may provide additional confidence in the integrity of the tube given the uncertainty in the degradation mechanism and therefore the size estimates. Similarly, destructive examination of the tube may provide additional insights on not only the severity of the indication, but also the cause of the indication.

Mr. David A. Christian
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Units 1 and 2

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