

May 9, 2003

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

SUBJECT: REVIEW OF SURRY POWER STATION UNIT 1 RE: STEAM GENERATOR TUBE  
INSPECTION REPORT (TAC NO. MB6491)

Dear Mr. Christian:

By letters dated November 5, 2001, and February 28, 2002, as supplemented by a letter dated January 30, 2003, Virginia Electric and Power Company (Dominion), the licensee, submitted the results of the steam generator tube inspection conducted during the 2001 Surry Power Station Unit 1 refueling outage. The U. S. Nuclear Regulatory Commission (NRC) staff reviewed the results of the inspection to determine whether additional followup activities were warranted.

Based on a review of the material provided by the licensee, the NRC staff concludes that the licensee provided sufficient information to determine that there are not any issues that warrant additional followup at this time. The NRC staff's review of the licensee's report is enclosed.

Sincerely,

**/RA/**

Christopher Gratton, Senior Project Manager, Section 1  
Project Directorate II  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket No. 50-280

Enclosure: As stated

cc: See next page

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REVIEW OF SURRY POWER STATION UNIT 1  
STEAM GENERATOR TUBE INSPECTION REPORT  
DOCKET NO. 50-280

By letters dated November 5, 2001, and February 28, 2002, Virginia Electric and Power Company (Dominion), the licensee, submitted the steam generator (SG) tube inspection report for the 2001 outage of Surry Power Station Unit 1 (Surry Unit 1). A conference call was held with Dominion and members of the U.S. Nuclear Regulatory Commission (NRC) staff on January 9, 2003, to discuss several questions provided by the staff. At the conclusion of the call, it was agreed that Dominion would provide a written response to the NRC questions on the docket. Dominion provided its written response in a letter dated January 30, 2003. A summary of the NRC's evaluation of the inspection results is provided below.

The licensee performed full length bobbin coil inspection of 100 percent of the inservice tubes in the "A" SG (3331 tubes). In addition to bobbin coil inspections, focused rotating probe inspections with a +Point™ coil of the hot leg top of tubesheet area were performed on 20 percent of the "A" SG tubes (667 tubes). The U-bend region was inspected for 100 percent of the row 1 tubes (91 tubes) using a rotating coil probe with a +Point™ coil. Lastly, a subset of the signals identified during the bobbin coil inspection were further characterized through a supplemental rotating probe examination.

As a result of these inspections, five tubes were plugged. None of the indications exceeded the 40 percent through-wall plugging limit. One tube was preventively plugged based on the projected growth rate of an anti-vibrational bar (AVB) wear indication. Another tube was plugged due to a wear indication that was attributed to contact with the tip of an AVB. The three remaining tubes had wear indications caused by a sludge lance monorail device that was used during the Spring 2000 outage. The sludge lance monorail induced wear scars are not related to operation, and the device that caused the scars is no longer in the SG. Based on Westinghouse testing of similar wear scars and sludge lance monorail experience at another plant, an extension of the inspection to the "B" and "C" SGs at Surry Unit 1 was not deemed necessary during this outage.

The licensee indicated that when eddy current signals are identified based on the bobbin coil data, a determination must be made as to whether the signal can be dispositioned based on the bobbin coil data or whether a supplemental rotating probe examination is required per plant specific procedures. The licensee typically reviews historical bobbin coil data to compare the signal and determines whether there has been a significant change (e.g., voltage or phase angle change) in the data. If there has been a significant change, then a rotating probe examination is required. Otherwise, the signal can be dispositioned based on the historical data review. The licensee stated that a number of tubes required a supplemental rotating probe examination (i.e., +Point™) because there were no historical bobbin coil data for these tubes from which a signal comparison could be made. In response to an NRC question, the licensee clarified the following:

- "No historical data" means that signal data was not available in a readable format such that an acceptable history review and disposition of the indication could be made (the results from two previous outage inspections of the same tube are required per licensee procedures).

ENCLOSURE

- The resolution threshold for reporting indications (i.e., signals) was lowered from 5.0 volts to 3.0 volts for this inspection. Dents were reported down to 2.0 volts in an effort to increase the historical information on the SG tubes. Based on the additional information provided in this clarification, the NRC staff believes the reporting threshold (greater than 3.0 volts) is used for all bobbin signals (except for dents for which the threshold is 2.0 volts). The licensee did not discuss the basis for the use of this threshold.
- The reported signals were typically dents, manufacturing buff marks and local geometric variations. The majority of the dents were present in the previous (i.e., 1997) inspection, however, the licensee did not have readily available data from the inspection before that for the required comparison. (Per plant specific procedures, the signals on the bobbin data must be present and available for comparison from two previous outage inspections). Because the second set of data was unavailable, a rotating probe inspection was performed.
- The licensee has identified a voltage increase in a number of dents located at tube-to-tube support plate intersections as compared to previous inspections. The licensee provided the bases for its conclusion that the denting is of mechanical origin, and further stated that the denting will be tracked over time.

Also, identified during the inspection was a localized volumetric indication located less than one inch above the hot leg top of tubesheet, that was sized at 15 percent through-wall. The licensee concluded that the indication was wear caused by a foreign object. The licensee stated that the indication did not exhibit the specific characteristics and morphology of corrosion-related degradation based on the inspection performed with a rotating probe. (Volumetric Indications in Surry Unit 2 were previously plugged because the licensee concluded that they may have been corrosion related). Bobbin coil eddy current data as well as rotating probe data from the immediate area confirmed that no foreign object remained in the area. The licensee left the tube in-service because the depth of the indication was significantly less than the plugging limit, and because the licensee assumed the indication would not grow since the foreign object had been removed. The NRC staff had the following observations regarding the volumetric indication in question that licensee may want to consider next time the volumetric indication in question is inspected and if similar indications are identified during future steam generator inspections:

- The NRC staff understands that an ultrasonic examination was performed of the volumetric indications previously plugged at Surry Unit 2, but could not determine if the Surry Unit 2 indications had been characterized as corrosion-related based on the ultrasonic examination or based on the original eddy current examination. It is the NRC staff's understanding that the volumetric indication that was left in-service at Surry Unit 1 was determined not to be corrosion related based only on an eddy current examination. The licensee did not discuss whether inspections with supplementary inspection methods (e.g., ultrasonic examination) would provide additional insights on the nature of the indication at Surry Unit 1.
- The licensee stated that corrosion-induced pits usually occur at the edge of the sludge/scale interface in the tube freespan and that the indication in Surry Unit 1 was not at this location. This was part of the licensee's basis for the conclusion that the indication in Surry Unit 1 was not corrosion-related. The NRC staff did not have detailed

information such that it could determine whether the height of the sludge/scale interface has remained consistent over time at Surry Unit 1. If the height of the sludge/scale interface does not remain consistent, it is possible that corrosion-induced pits could occur at different locations along the tube. In addition, since the volumetric indication was located below the current sludge/scale interface, it is not clear how a loose part could become buried in the sludge pile, cause wear near the top of the tubesheet and then not be present at the location during the tube inspection.

Based on our review of the information provided by the licensee, the NRC staff concludes that the information was sufficient and that no additional follow-up is required at this time. However, the NRC staff made observations above within this report that the licensee may want to consider during future steam generator inspections, regarding: 1) the volumetric indication at the top-of-the-tubesheet, and 2) the technical basis for the reporting threshold for bobbin signals (3 volts) that require further evaluation and/or inspection.

Mr. David A. Christian  
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Surry Power Station  
Units 1 and 2

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