

December 11, 2007

Mr. David A. Christian  
President and Chief Nuclear Officer  
Virginia Electric and Power Company  
Innsbrook Technical Center  
5000 Dominion Boulevard  
Glen Allen, VA 23060-6711

SUBJECT: SURRY NUCLEAR POWER STATION, UNIT 1, 2007 STEAM GENERATOR  
TUBE INSPECTIONS (TAC NO. MD7236)

Dear Mr. Christian:

On November 1 and 3, 2007, the Nuclear Regulatory Commission (NRC) staff participated in conference calls with Surry Nuclear Power Station, Unit No. 1 representatives regarding their 2007 steam generator tube inspections. Enclosed is a summary of those conference calls.

If you have any questions regarding this summary, please contact me at 301-415-1564.

Sincerely,

**/RA/**

Siva P. Lingam, Project Manager  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-280

Enclosure:  
Summary of Conference Calls

cc w/encl: See next page

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SUMMARY OF CONFERENCE CALLS  
STEAM GENERATOR TUBE INSPECTIONS  
SURRY NUCLEAR POWER STATION, UNIT NO. 1  
DOCKET NO. 50-280

On November 1 and 3, 2007, the Nuclear Regulatory Commission (NRC) staff participated in conference calls with Surry Nuclear Power Station, Unit No. 1 (Surry 1) representatives (the licensee) regarding their 2007 steam generator (SG) tube inspections. A summary of the information discussed follows.

Surry 1 has three Westinghouse model 51F steam generators (A, B and C) that were replaced in 1981. Each steam generator nominally contains 3,342 thermally treated Alloy 600 tubes. Each tube has a nominal outside diameter of 0.875 inch and a nominal wall thickness of 0.050 inch. The tubes were hydraulically expanded at both ends for the full length of the tubesheet and are supported by a number of stainless steel tube support plates. The U-bends of the tubes installed in rows 1 through 8 were thermally stress-relieved after bending.

Prior to the call, the licensee was provided with discussion points to help facilitate the phone conference.

The licensee was performing eddy current inspections in only SG B during this fall 2007 refueling outage (RFO). The other two SGs were inspected during the 2006 RFO. The last eddy current inspection of SG B was performed in 2003. At the time of the call on November 1, 2007, the SG inspections in SG B were approximately 73% complete.

The approximate status of the inspection was as follows:

- a) 94% complete with bobbin exams
- b) 86% complete with a 20% +Point™ sample of the hot leg top of tubesheet (TTS) area. The extent of the exam is from 3 inches above to 3 inches below the TTS.
- c) 100% complete with the +Point™ examinations of the U-bend region of the row 1 tubes.

No unusual degradation or unexpected conditions were detected during the inspections so far.

Primary-to-secondary leakage for the last operating cycle was less than 1 gallon per day.

There were no secondary side pressure tests performed during this RFO.

There were no exceptions taken to the industry guidelines.

The scope of the steam generator tube inspections was as follows:

- a) Full length bobbin of 100% of tubes.
- b) Rotating probe inspection from 3 inches above to 3 inches below the TTS of 20% of the tubes on both the hot leg (HL) and cold leg (CL) side of the SG. The exams on the cold leg side were focused on areas where loose parts may be found (e.g. periphery).
- c) Rotating probe inspection of 20% of the dents. The 20% sample was skewed to the dents with higher voltages. The threshold for reporting dents is 2 volts which is more restrictive than what was used in prior inspections. Approximately 400 dents exceeding this threshold were identified. The population of dents is stable.
- d) Rotating probe inspection of 50% of the over-expansions (OXPs) in the HL tubesheet region. An automated method based on voltage and phase angle was used to detect OXPs. Approximately 800 OXP indications in the HL and CL tubesheet were identified. The sample focused on the OXPs in the HL.

At the time of the call, two volumetric pit-like indications were identified. A review of previous (1998) eddy current data at these locations indicated that the two indications were present then. They had been classified as single axial anomalies in 1998. A comparison of the 1998 and 2007 data for these indications indicated that they did not change. The indications are in the periphery and located slightly above the tubesheet. They measured 0.27 volts and 0.28 volts. The indications are not near the area where the sludge pile height is a maximum.

At the time of the call, approximately 13 indications of wear at antivibration bars (AVBs) were detected. AVB wear is relatively stable and there was little growth of these indications since the last inspection. The maximum depth of any of the reported wear indications is approximately 21% through-wall.

There have been no crack-like indications identified.

At the time of the call, no tubes were identified that required plugging, and no tubes were identified that required in-situ testing.

The licensee was not planning to pull any tubes this outage.

All three SGs are scheduled for an upper bundle flush, sludge lancing, and a foreign object search and retrieval (FOSAR). This will be the second time the SGs received an upper bundle flush. The previous upper bundle flush was during the 2006 RFO. The SGs had been chemically cleaned in 1994, and the bundle flushing is a preventative measure to limit the build-up of deposits in the SGs. The deposit build-up is monitored with eddy current examinations. Sludge lancing is performed with high pressure, 3000 pound per square inch (psi), water. This often flushes out any small particles/objects.

At the time of the call, a cursory visual inspection of the secondary side had been performed in SGs A and C. Those inspections did not reveal any deterioration. Based on these visual inspections (performed prior to the upper bundle flushing), there was minor deposit build-up in the quatrefoil shaped holes of the top tube support plate.

This inspection was performed by lowering a camera through the swirl vanes of the primary moisture separator.

At the time of the call, FOSAR was complete in SG A. One weld wire was identified and removed from the SG. No loose parts were left in the SG except for possible sludge rocks. Approximately 200 pounds of sludge were removed during the sludge lancing which followed the upper bundle flush.

Four or five possible loose parts were identified in SG B during the eddy current inspections. Verification by visual inspection has not been completed yet. If a loose part can not be removed, then an engineering evaluation is performed to determine the acceptability of leaving the part in service.

To locate possible loose parts near the top of the tubesheet, a turbo mix is applied to the bobbin coil data. Also, to aid in the detection of potential loose parts in this region, a 20% sampling, rotating probe exam is performed. The rotating probe inspection on the CL side of the SGs was added to the inspection scope for this outage based on the spring 2006 inspection.

The NRC staff asked the licensee to provide its basis for not plugging the two pit-like indications it had detected during the outage. The NRC staff specifically asked what additional information was available concerning the nature of the degradation (since the NRC staff concluded in an August 23, 1999, letter that there was an inadequate technical basis for assuming the suspected pit indications were representative of actual pitting and therefore applying a sizing technique to estimate the depth of these indications was inappropriate). In response, the licensee indicated that no tubes were removed for destructive examination in order to confirm/characterize the types of indications being observed at Surry 1. However, they indicated that they were evaluating whether the area could be examined visually. They also indicated that they are using a technique that was developed for sizing pitting and wear indications. The licensee also added that these indications are near the periphery (an area located outside of region where sludge tends to accumulate).

The NRC staff also asked the licensee for the basis for the scope of examinations in the tubesheet. The NRC staff noted that no examinations were being performed at Surry 1 in the tack expansion region, which is near the tube end. Crack-like indications had been observed in this region at another plant with similar tube material. In response, it was indicated that the hot leg temperature at Surry 1 was much less than the hot leg temperature at these other facilities. The NRC staff then highlighted that crack-like indications had recently (within a couple of weeks of the start of the Surry 1 RFO) been detected on the CL side of a similar SG (which presumably is at a lower temperature than the hot-leg at Surry 1). As a result, the NRC staff questioned how this information was factored into the inspection plan. The licensee stated that they evaluated the safety significance of the cracking at this location and they concluded they do not need to adjust their inspection scope during this RFO. The NRC staff questioned this since the technical specifications require inspections be performed with the objective of detecting flaws that may exceed the tube repair criteria.

In light of the two issues discussed above (i.e., leaving the pit-like indications in service and the scope of examinations in the tubesheet region), the NRC staff asked for a follow-up call prior to completing the SG tube inspection activities.

A follow-up conference call was held on November 3, 2007. Inspections were 98% complete at the time of the call. A summary of the information discussed during the call is provided below.

No pluggable indications were detected during this RFO.

The two pit-like indications discussed during the November 1, 2007, conference call were inspected on the secondary side and have been reclassified as volumetric indications (attributed to wear). Three loose parts were removed from the area, including one loose part that was leaning against the tubes where the "pit-like" indications were detected. The indications are in the periphery of the tube bundle, approximately 0.25 inch above the tubesheet on the HL side of the SG. The indications were estimated to be 36% to 37% through-wall using the most conservative depth sizing technique. The tubes were left in service since they were attributed to wear.

The overexpanded locations within the tubesheet were inspected, and no crack-like indications were identified. Other inspections completed in the tubesheet were: 50% sampling of all OXPs on the HL side. All OXPs 42 volts or greater and 32 OXPs less than 42 volts were inspected on the CL side. With this inspection scope, the licensee believes they have inspected the high stress areas in both the HL and CL and have adequately bounded the concern of potential cracking of tubes in the tubesheet region. They do not believe it is necessary to revise the inspection plan to specifically include the bottom 2 inches of the tubes in the tubesheet. In response to this issue, the NRC staff noted that it did not see an immediate safety concern (given past approvals to limit the scope of examination in this area); however, it could not comment on the adequacy of the technical basis since it was not aware of the data supporting the conclusion that cracking would occur in overexpansions before it would occur in other regions of the tubesheet (e.g., the tack expansion).

The NRC staff did not identify any safety concerns that required follow-up action at this time. The NRC staff did ask to be notified in the event that any unusual conditions were detected during the remainder of the RFO and indicated that it may want to understand the technical basis for concluding that cracking would occur in the overexpansions before it would occur in the other regions of the tubesheet.

Surry Power Station, Units 1 & 2

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