UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 18, 2012

Mr. Joseph W. Shea
Manager, Corporate Nuclear Licensing
Tennessee Valley Authority
3R Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: SEQUOYAH NUCLEAR PLANT, UNIT 2 – REVIEW OF THE 2011 REFUELING OUTAGE STEAM GENERATOR TUBE INSERVICE INSPECTION REPORTS (TAC NO. ME7705)

Dear Mr. Shea:

By letters dated September 16, and December 13, 2011, Tennessee Valley Authority (the licensee) submitted 90-day and 180-day steam generator (SG) tube inspection reports, respectively, for the Cycle 17 refueling outage (spring 2011) in accordance with Technical Specification (TS) Section 6.9.1.16.2 for Sequoyah Nuclear Plant (SQN), Unit 2. The licensee provided additional information by letter dated June 21, 2012. In addition to these reports, the U.S. Nuclear Regulatory Commission (NRC) staff summarized additional information concerning the 2011 SG tube inspections at SQN, Unit 2 in a letter dated August 16, 2011.

The NRC staff has completed its review of these reports and concludes that the licensee provided the information required by their TSs and that no additional followup is required at this time. The NRC staff's review of the reports is enclosed.

Sincerely,

Siva P. Lingam

Siva P. Lingam, Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-328

Enclosure:
Inspection Summary Report

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OFFICE OF NUCLEAR REACTOR REGULATION

REVIEW OF THE 2011 REFUELING OUTAGE

STEAM GENERATOR TUBE INSPECTION REPORTS

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT, UNIT 2

DOCKET NO. 50-328

By letters dated September 16, and December 13, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML112660570, and ML113500496, respectively), Tennessee Valley Authority (the licensee) submitted the Cycle 17 refueling outage (spring 2011) 90-day and 180-day steam generator (SG) tube inspection reports, respectively, per Technical Specification (TS) Section 6.9.1.16.2 for Sequoyah Nuclear Plant (SQN), Unit 2. The licensee provided additional information by letter dated June 21, 2012 (ADAMS Accession No. ML12177A312). In addition to these reports, the U.S. Nuclear Regulatory Commission (NRC) staff summarized additional information concerning the 2011 SG tube inspections at SQN, Unit 2 in a letter dated August 16, 2011 (ADAMS Accession No. ML11208C216).

The SGs at SQN, Unit 2 are Westinghouse model 51. Each SG contains 3388 mill annealed Alloy 600 tubes. Each tube has a nominal outside diameter (OD) of 0.875 inches and a nominal wall thickness of 0.050 inches. The tubes are supported by a number of carbon steel tube support plates and Alloy 600 anti-vibration bars. The tubes were explosively expanded into the tubesheet at both ends for the full length of the tubesheet. The U-bend region of the small radius tubes (i.e., rows 1 and 2) were in situ stress relieved following Cycle 6 (the row 1 tubes were plugged following Cycle 3 and were unplugged, inspected, and stress relieved following Cycle 6).

In addition to the depth-based tube repair criteria, the licensee is also authorized to apply a voltage-based tube repair criteria for predominantly axially oriented OD stress-corrosion cracking (ODSCC) at the tube support plate elevations. The licensee is also authorized to leave flaws within the tubesheet region in service, provided they satisfy the W* repair criterion.

The licensee provided the scope, extent, methods, and results of their SG tube inspection reports in the documents referenced above. In addition, the licensee described corrective actions (e.g., tube plugging) taken in response to the inspection findings.

Based on its review of the reports submitted, the NRC staff has the following observations and comments:

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- The licensee is planning to replace its SGs in the fall of 2012.

- Negative growth rates were calculated for a number of indications for the 2009 – 2011 operating interval. These negative growth rates were attributed to using a probe designed (and possibly manufactured) by a different vendor during the two (2009 and 2011) SG tube inspections. Although the probes used during the last several inspections (Westinghouse (720LLMC) and Zetec (Echoram EC720BPRMS)) were used in the development of the tube repair criteria, they appear to have different voltage responses and different detection capabilities. The licensee assessed the difference in probe performance (detection and sizing) in its condition monitoring and operational assessments. On July 20, 2012, the licensee clarified that the cause for the difference in voltage response between the two probe designs was being investigated.

- On July 20, 2012, the licensee clarified that freespan axial ODSCC indications that are greater than or equal to 0.6 inches in length, with a maximum voltage greater than 0.4 volts, satisfy the in situ screening criteria (additional analysis is necessary since the indications may not satisfy the performance criteria).

- In implementing the W* repair criterion, the licensee assigned a leak rate to the indications detected within the top 8 inches of the tubesheet even though the indications were not expected to leak. The NRC staff did not review the appropriateness of assigning the specific leak rate to these indications (i.e., those in the top 8 inches of the tubesheet) since such indications are not expected to leak (given a plug-on-detection approach and past operating experience with inspections in the tubesheet region).

- In determining the number of indications that could exist in the cold-leg region from 10.5 inches to 12 inches below the top of the tubesheet (TTS), the licensee assumed zero indications even though they determined 0.4 indications per SG may exist. Although this is a non-conservative assumption, it does not appear to the NRC staff that it would change the overall result (i.e., the performance criteria would still be satisfied).

- Nineteen indications (in six tubes) of axial ODSCC in the freespan were detected during the 2011 outage.

- Three circumferential ODSCC indications were detected at the 7th tube support plate during the 2011 outage. The indications were in adjacent tubes (Row 12 Column 3 (R12C3), R13C3, and R14C4).

- Two indications of axial ODSCC were detected in the U-bend region of a row 12 tube. Both indications were detected with the bobbin coil probe.

- One indication of circumferential primary water stress corrosion cracking was detected in the U-bend region of a row 6 tube.

Based on a review of the information provided, the NRC staff concludes that the licensee provided the information required by their TSs. In addition, the NRC staff concludes that there are no technical issues that warrant followup action at this time (except for possibly the generic implications associated with the differences in the performance of the bobbin probes) since the inspections appear to be consistent with the objective of detecting potential tube degradation and the inspection results appear to be consistent with industry operating experience at similarly designed and operated units.

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