



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

August 16, 2011

Mr. Rodney M. Krich
Vice President, Nuclear Licensing
Tennessee Valley Authority
3R Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: SEQUOYAH NUCLEAR PLANT, UNIT 2 – SPRING 2011 REFUELING OUTAGE
STEAM GENERATOR TUBE INSERVICE INSPECTION CONFERENCE CALL
SUMMARY (TAC NO. ME5977)

Dear Mr. Krich

On June 6, 2011, the Nuclear Regulatory Commission staff participated in a conference call with Sequoyah Nuclear Plant, Unit 2 (SQN) representatives regarding SQN's spring 2011 refueling outage steam generator tube inspections. Enclosed is a summary of that conference call.

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

Sincerely,

A handwritten signature in black ink, reading "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: Conference Call Summary

cc w/encl: Distribution via Listserv

SUMMARY OF CONFERENCE CALL WITH
SEQUOYAH NUCLEAR PLANT, UNIT 2 REGARDING
SPRING 2011 STEAM GENERATOR TUBE INSPECTION RESULTS
TENNESSEE VALLEY AUTHORITY
DOCKET NO. 50-328

On June 6, 2011, the Nuclear Regulatory Commission (NRC) staff participated in conference call with Tennessee Valley Authority (TVA, the licensee) representatives associated with the Sequoyah Nuclear Plant, Unit 2 (SQN 2) spring 2011 refueling outage steam generator (SG) tube inspections.

The four SGs at SQN 2 are Westinghouse model 51 SGs. Each SG contains 3,388 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 by heat treating 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 a depth-based tube repair criteria, the licensee is authorized to apply the voltage-based tube repair criteria to predominantly axially-oriented outside diameter stress corrosion cracking (ODSCC) indications 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.

Information provided by the licensee is summarized below:

- There was no detectable primary-to-secondary leakage during the operating cycle preceding the 2011 refueling outage.
- No secondary side pressure tests were performed.
- No exceptions were taken to the industry SG guidelines.
- A full length bobbin probe inspection was performed on 100 percent of non-plugged tubes, except for the U-bend region of the tubes in rows 1-10.
- A magnetically biased +Point probe will be used to inspect the U-bend region of the tubes in rows 1-4. An array probe will be used to inspect the U-bend region of the tubes in rows 5-10.
- In the U-bend region, if a circumferential indication is detected in rows 9 or 10, the U-bend region of 100 percent of the tubes in rows 11-20 will be inspected in the affected SG. If a

Enclosure

crack-like indication is detected in rows 15-20, then the U-bend region of 100 percent of the tubes will be inspected in the affected SG.

- If an axial crack-like indication is detected in rows 3-8, then the U-bend region of 100 percent of the tubes in rows 9-16, 50 percent of the tubes in row 17, and 20 percent of the tubes in row 18 will be inspected in the affected SG. This latter sample may be expanded to include 100 percent of the tubes in rows 11-25 if additional crack-like indications are detected.
- At the time of the conference call, an axial crack-like indication had been detected in the U-bend region of a row 1 tube. This tube was being evaluated to determine if in-situ pressure testing was required.
- 100 percent of the dents in the U-bend will be inspected with a +Point probe.
- 100 percent of the dings at the anti-vibration bars will be inspected with a +Point probe.
- 100 percent of dings at manufacturing burnishing marks will be inspected with a +Point probe.
- All cold-leg and hot-leg tube support elevations were inspected with a bobbin probe.
- A +Point probe will be used to inspect all distorted support indication with a bobbin voltage amplitude of 1 volt or greater.
- A +Point probe will be used to inspect 100 percent of the tubes from 2 inches above to 8 inches below the top of the tubesheet on the hot-leg side of the SG.
- A +Point probe will be used to inspect 20 percent of the tubes from 2 inches above to 10.5 inches below the top of the tubesheet on the cold-leg side of the SG. If a crack-like indication is detected in this sample, 100 percent of the tubes will be inspected from 2 inches above to 10.5 inches below the top of the tubesheet on the cold-leg side in the affected SG. If additional indications are found in this sample, 100 percent of the tubes in all SGs will be inspected from 2 inches above to 10.5 inches below the top of the tubesheet on the cold-leg side. No cracking had been detected on the cold-leg at the time of the conference call.
- Freespan dents greater than or equal to 2 volts on the hot-leg from the top of the tubesheet to the seventh hot-leg support will be inspected with a +Point probe.
- The guidance regarding rotating probe examinations in Generic Letter 95-05 will be used to inspect tube support plate intersections.
- 100 percent of the dents from the first hot-leg tube support plate to the sixth cold-leg tube support plate with bobbin voltage amplitudes greater than or equal to 2 volts will be inspected with a +Point probe. This sample will be expanded to include lower tube support plates on the cold-leg side if indications are detected at the next higher tube support plate.

- 100 percent of the dents from the first cold-leg tube support plate to the fifth cold-leg tube support plate with bobbin voltage amplitudes greater than or equal to 5 volts will be inspected with a +Point probe. If crack-like indications are detected in this sample, 100 percent of the dents from the fifth cold-leg tube support plate to the support plate below the support plate where the indication was detected with bobbin voltage amplitudes greater than or equal to 2 volts will be inspected with a +Point probe.
- 100 percent of the freespan paired dents/dings will be inspected with a +Point probe. Paired dents/dings are those that are within approximately $\frac{3}{4}$ of an inch of each other along the length of the tube.

At the time of the conference call, the licensee had reported the following number of indications in the table below. The inspections were approximately 95 percent complete. The following abbreviations are used in the table:

- AVB – anti-vibration bar
- Circ – circumferential
- TSP – tube support plate
- TTS – top of tubesheet
- PWSCC – Primary water stress corrosion cracking
- ODSCC – Outer diameter stress corrosion cracking

Degradation Type	SG 1	SG 2	SG 3	SG 4	Notes
AVB Wear	13	39	19	17	None greater than 40% through wall
Cold-Leg Thinning	44	99	48	47	3 of these indications will need to be plugged
Freespan ODSCC	0	2	0	0	The two indications are in one tube (see below bullet)
Loose Parts Wear	0	0	0	0	Possible loose parts detected, but no wear.
Cracking in Sludge Pile	0	1	0	0	

Degradation Type	SG 1	SG 2	SG 3	SG 4	Notes
Axial ODSCC at TSPs	613	550	782	1472	11 tubes will be plugged
Volumetric indication with a circ component	0	0	1	0	Cellular intergranular attack
Axial ODSCC at TTS	0	2	2	1	4 tubes will be plugged (2 indications in one tube)
Circ ODSCC at TTS	0	4	0	6	9 tubes will be plugged (2 indications in one tube) and stabilized
Circ ODSCC in U-bend	0	0	0	0	
Axial PWSCC at TSPs	0	0	0	0	May be one indication
Circ PWSCC at TSPs	0	0	0	0	
Axial PWSCC at TTS	0	0	1	0	Will plug
Circ PWSCC at TTS	0	1	0	0	Will plug
Axial PWSCC in U-bend	0	1	0	0	Will plug
Circ PWSCC in U-bend	0	0	0	0	

- The freespan ODSCC indications were detected by the bobbin coil. The voltages associated with the indications were 0.43 and 0.53 volts. The indications extended from approximately 3 to 4 inches below the third cold-leg tube support up to the third cold-leg tube support. Minimum traces of scale were identified on the tubes and there was no ready explanation for why this tube cracked.
- No tubes are planned to be pulled this outage.
- For the detection of loose parts, both eddy current and visual inspections are performed. The inspection of the top of tubesheet region on the cold-leg was focused on peripheral tubes. Foreign object search and retrieval (FOSAR) had not yet been performed. Roughly 20 loose parts were previously identified during previous outages in the Unit 2 SGs.

- Any possible loose part indications that are not visually inspected or any loose part that is not removed by FOSAR will be evaluated to ensure the loose part/possible loose part may be left in service.
- All tubes with crack like indications will be plugged with mechanical plugs. Tubes with circumferential crack-like indications will be stabilized. Mechanical plugs will be used in all tubes that are plugged.
- No sludge lancing is scheduled to be performed this outage.
- There have been no unexpected results during the outage.
- The licensee stated that this outage is the last scheduled inspection of these SGs since they will be replaced during the next refueling outage.

The NRC staff did not identify any issues that required follow-up action at this time; however, the NRC staff asked to be notified in the event that any unusual conditions were detected during the remainder of the outage or if a tube fails an in-situ pressure test.

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