

March 5, 2003

Mr. Garry L. Randolph  
Vice President and Chief Nuclear Officer  
Union Electric Company  
P.O. Box 620  
Fulton, MO 65251

SUBJECT: CALLAWAY PLANT - SUMMARY OF CONFERENCE CALL WITH UNION  
ELECTRIC COMPANY REGARDING THE 2002 STEAM GENERATOR  
INSPECTIONS (TAC NO. MB6643)

Dear Mr. Randolph:

In a call with your staff before Refueling Outage 12, I identified the importance of inservice inspections of steam generator (SG) tubes in assuring the integrity of the tubes, and requested that a teleconference be held with your staff to discuss the results of the SG tube inspections, that would be conducted during the October 2002 refueling outage of the Callaway Plant, after about 75 percent of the tubes had been inspected.

The discussion with your staff on the SG tube inspection results was to allow the NRC staff to collect information on any SG tube degradation found earlier than would be typically reported within 12 months of the inspection, in accordance with Technical Specification (TS) 5.6.8, "Steam Generator Tube Inspection Report." The teleconference is not part of any licensing action and the subject TAC is not fee billable to the Callaway license.

On November 5, 2002, a teleconference on the results of the SG tube inspection being then conducted at Callaway was held between your staff and the NRC staff. Enclosed is a summary of the information provided by your staff. The summary has been reviewed by your staff for technical accuracy and their comments were incorporated in the enclosed summary. This closes out the subject TAC. If you have any questions, please contact me at 301-415-1307, or through the Internet at [jnd@nrc.gov](mailto:jnd@nrc.gov).

Sincerely,

/RA/

Jack Donohew, Senior Project Manager, Section 2  
Project Directorate IV  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket No. 50-483

Enclosure: Summary of Teleconferences  
Held on November 5 and 15, 2002

cc w/encl: See next page

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DOCUMENT NAME:G:\PDIV-2\Callaway\Letter-SummaryofSGtubeInspectionCall-2002.cw.wpd  
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SUMMARY OF TELECONFERENCES HELD ON NOVEMBER 5 AND 15, 2002

REGARDING STEAM GENERATOR TUBE INSPECTION RESULTS

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT 1

DOCKET NO. 50-483

On November 5, 2002, the NRC staff participated in a conference call with Union Electric Company (the licensee) representatives regarding the then ongoing steam generator (SG) tube inspection activities at Callaway. The activities were during Refueling Outage 12. At the time of the call, the licensee had completed approximately 70 percent of the eddy current data analysis, and the information provided was subject to change. On November 5, 2002, the licensee provided the following information regarding the ongoing steam generator inspection activities:

- The licensee stated that primary-to-secondary leakage did not exist prior to the refueling outage, and, therefore, it did not conduct any secondary side pressure tests.
- The licensee stated that the SG inspection scope consisted of:
  - Full length bobbin examination of 100 percent of the inservice tubes in SGs A and D.
  - Rotating probe (equipped with a plus-point coil) examination of 100 percent of the tubes from 2-inches above to "X"-inches below the top of the hot-leg tubesheet in all four steam generators. The distance "X" is variable depending on the tube's radial location within the steam generator. This examination would include the expansion transition.
  - Rotating probe (equipped with a high frequency plus-point coil) examination of the U-bend region of 100 percent of the Row 1 and 2 tubes in SG C. Rows 1 through 10 are Alloy 600 thermally treated tubing. Rows 11 and higher are Alloy 600 mill-annealed tubing.
  - Ultrasonic testing of 100 percent of the Electrosleeves in SG A.
  - Rotating probe examination of 100 percent of the laser welded sleeves in SG C.
  - Rotating probe (equipped with a plus-point coil) examination of 20 percent of the dings greater than 2 volts (as measured by the bobbin probe).

The staff noted that the licensee's practice of performing bobbin inspection of only two-out-of-the-four SGs each outage is different than that which is performed by other licensees with Alloy 600 mill-annealed SG tubing. The licensee indicated that their inspection plan is based on their operating experience (i.e., the types of degradation they have observed at specific locations along the length of the tube). The licensee indicated that wear has been identified at tube-to-antivibration bar intersections and wear has been identified at various locations due to loose parts. These wear indications were identified with the bobbin probe and the licensee's condition monitoring and operational assessment supports their inspection scheme. The licensee's inspection scope complies with the technical specification requirements.

- The licensee stated that the SG tube degradation that had been identified at the time of the call was:
  - Antivibration Bar Wear (AVB) - Three (3) tubes in SG A and one (1) tube in SG D contain AVB wear that exceeds 40 percent through wall. The tube with the deepest AVB wear scar was 52 percent through wall, which was a 14 percent through wall increase since the last inspection of that tube (2 cycles of operation). These four (4) tubes will be plugged.
  - Axial, circumferential and volumetric indications were identified near the top-of-tubesheet on the hot leg side of the SG. The majority of the indications were determined to have initiated from the inside surface of the tube (primary water stress corrosion cracking [PWSCC]), with only a handful initiating from the tube outside.
  - Approximately 35 axial indications were identified near the expansion transition region. The voltage distributions were similar to those identified during the previous inspection of the SGs. Sizing of the flaws had not been completed at the time of the call, however, the licensee indicated that the flaws appeared to be very small. All tubes with axial flaws will be plugged.
  - Approximately 26 circumferential indications were identified in the expansion transition region and approximately 12 were identified below the expansion transition region. The maximum distance a circumferential flaw was found below the top of the tubesheet was approximately 11 inches. Sizing of the flaws had not been completed at the time of the call, however, the licensee indicated that the majority of the flaws extended 110 to 120 degrees circumferentially. One flaw, located within the tubesheet region, appeared to extend 360 degrees circumferentially. All tubes with circumferential flaws will be plugged.
  - Several volumetric flaws were identified near the top of the tubesheet. Three very low voltage (approximately 0.2 volts) volumetric indications were adjacent to one another, and the licensee speculated they could potentially be from wear due to loose parts. One volumetric indication was identified in a Row 9 tube (a thermally treated tube) which was 0.14 volts. The licensee did not see any sign of loose parts near these indications based on the eddy current data. The licensee plugs-on-detection all volumetric indications identified near the top of the tubesheet.

- The Electrosleeves had not been inspected at the time of the call.
- The licensee plugs on detection all crack-like indications and all volumetric indications located near the top of the tubesheet. The licensee plans to stabilize and plug all circumferential indications. All AVB wear indications greater than or equal to 40 percent through wall will be plugged. The licensee does not plan to sleeve any tubes this outage.
- The licensee stated that it performs a lookback of previous inspection data under certain circumstances, and the lookback for this refueling outage was the following:
  - When a freespan signal is identified in the bobbin data, the licensee reviews previous inspection data to determine if that signal was previously reported at least 2 cycles before. If it was (i.e., the licensee previously identified the signal and determined it was not indicative of service-induced degradation), the licensee compares the current outage data to the previous outage data to determine if the signal has changed. If the signal has changed, that tube is further inspected with a rotating probe to determine if the signal is now indicative of service induced degradation. If the signal was not previously reported, the licensee reviews the inspection data from at least the 6<sup>th</sup> outage prior to the current outage to determine if the signal was present, but not identified, at that time. If the signal was not present or has changed, that tube is further inspected with a rotating probe to determine if the signal is indicative of service induced degradation.
  - The licensee reviews previous inspection data of all locations where service induced degradation is identified during the current outage. This effort is ongoing at Callaway.
- The licensee stated that there were no new degradation modes identified at Callaway this refueling outage.
- The licensee stated they were aware of the recent inspection findings (i.e., ODSCC in thermally treated steam generator tubing) at Seabrook. The licensee included Seabrook eddy current data in Callaway's site-specific performance demonstration database which is utilized for training eddy current analysts.
- The licensee explained that the only inspection techniques and probes that are utilized at Callaway are the eddy current bobbin probe, a rotating probe with a mid-frequency plus point coil, a rotating probe with a high frequency plus point coil, a rotating probe with a mag-bias plus point coil, and ultrasonic testing for Electrosleeves.
- The licensee stated that in-situ pressure testing had not been performed at the time of the call. The licensee stated they use both voltage and flaw sizes to determine whether in-situ pressure testing is required. The licensee had twelve potential candidates for in-situ pressure testing, however, many of them may be eliminated from the candidate list once flaw sizing has been completed.
- The licensee stated that it does not plan to pull any tubes.

- The licensee notified the staff that SG A entered a C-3 category (i.e., more than 10 percent of the total tubes inspected are degraded or more than 1 percent are defective) due to the number of indications identified at the top of the tubesheet. The licensee stated that it will follow the Callaway Technical Specifications for the C-3 category.
- The licensee stated that it expected to complete eddy current testing late on Thursday, November 7, 2002, and expected to complete in-situ pressure tests and tube plugging by Saturday, November 9, 2002.

The NRC staff did not identify any issues requiring followup, but requested that the licensee contact the NRC if the remaining inspections identified any of the following: (1) any significant degradation, (2) a degradation mode or location other than that discussed during the conference call, or (3) a failure of or an incomplete in-situ pressure test; or an Electrosleeve with service induced degradation. The licensee did not contact the NRC for any of these three items.

The status of its SG tube inspection in Refueling Outage 12 at the time of the call with the NRC staff was provided by the licensee in an e-mail to support the call, and is given in the attached table.

In a later call on November 15, 2002, the licensee notified the NRC of the final number of SG tubes plugged during the outage, which was greater than the number provided in the call on November 5, 2002. The total for each SG is as follows:

Steam Generator A - 91 tubes plugged  
Steam Generator B - 5 tubes plugged  
Steam Generator C - 19 tubes plugged  
Steam Generator D - 9 tubes plugged

Attachment: Table: Refuel 12 Steam Generator Maintenance

Principal Contributor: Cheryl Khan

Date: March 5, 2003

**[Table:] Refuel 12 Steam Generator Maintenance**

Steam Generator	Channel Head	Scope (# of tests)	Acquired	Analyzed	Percent Complete	Pluggable Indications*
Steam Generator A	Hot Leg RPC	5431	5316	4803	88.4	49
	Cold Leg Bobbin	5068	4109	3008	59.4	3
Steam Generator B	Hot Leg RPC	5568	4027	3816	68.5	2
Steam Generator C	Hot Leg RPC	5449	5430	3461	63.5	10
Steam Generator D	Hot Leg RPC	5528	5512	3581	64.8	2
	Cold Leg Bobbin	5164	4715	3313	64.2	5
	<b>Total</b>	32208	29109	21982	68.3	71

\* All indications have not necessarily been through the resolution process. Number of indications may actually decrease