November 26, 2002

Mr. C. Lance Terry
Senior Vice President &
Principal Nuclear Officer
TXU Energy
Attn: Regulatory Affairs Department
P. O. Box 1002
Glen Rose, TX 76043

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION, UNIT 1 - STEAM GENERATOR TUBE INSERVICE INSPECTION TELEPHONE CONFERENCES (TAC NO. MB6270)

Dear Mr. Terry:

By letter dated September 12, 2002, the NRC staff informed TXU Energy that a telephone conference would be held with TXU Energy to discuss the ongoing results of the steam generator (SG) tube inspections to be conducted during the October 2002, Comanche Peak Steam Electric Station (CPSES), Unit 1 refueling outage. The letter instructed that the telephone conference would be scheduled after the majority of the tubes had been inspected, but before the SG inspection activities had been completed. The letter also indicated NRC staff plans to document the telephone conference, as well as any material that TXU Energy may provide to the NRC staff in support of the telephone call via a brief summary.

The enclosure represents a summary of the telephone conferences held on October 10, October 11, and October 14, 2002, in which ongoing results of the SG tube inspections conducted during the October 2002, CPSES, Unit 1 refueling outage were discussed. No material was received from TXU Energy prior to these telephone conferences.

Sincerely,

/RA/
David H. Jaffe, Senior Project Manager, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-445

Enclosure: As stated

cc w/encl: See next page

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SUMMARY OF TELEPHONE CONFERENCE CALLS

REGARDING THE OCTOBER 2002 STEAM GENERATOR INSPECTION RESULTS

TXU GENERATION COMPANY, LP

COMANCHE PEAK STEAM ELECTRIC STATION, UNIT 1

DOCKET NO. 50-445

1.0 BACKGROUND

Comanche Peak Steam Electric Station (CPSES), Unit 1 is a four-loop Westinghouse Electric Company (Westinghouse) pressurized water reactor with four Westinghouse Model D4 recirculating steam generators. Each steam generator contains 4,578 mill annealed Alloy 600 tubes, which are nominally 0.750 inches in diameter and have a nominal wall thickness of 0.043 inches. Approximately 90% of the tubes are hardroll expanded for the full depth of the tubesheet at each end, and the remaining 10% of the tubes were explosively expanded (with the WEXTEX process) for the full depth of the tubesheet at each end. The tubes are supported by a number of carbon steel tube support plates with circular shaped holes and V-shaped chrome plated Alloy 600 anti-vibration bars (AVBs).

TXU Generation Company, LP (the licensee) is authorized to implement the voltage-based tube repair criteria for degradation at the tube support plates (as discussed in Generic Letter (GL) 95-05), and the licensee is authorized to implement an F-star (F*) tube repair criteria for degradation observed below the expansion transition.

On October 9, 2002, members of the U.S. Nuclear Regulatory Commission (NRC) staff held a conference call with representatives of the licensee to discuss their steam generator tube inspection activities at CPSES, Unit 1 during their October 2002 refueling outage. Topics discussed during the conference call included those provided to the licensee by letter dated September 12, 2002 (Agencywide Documents Access and Management System (ADAMS) Accession Number ML022460135) and consisted of: background, leakage history, inspection scope and results, and repair/plugging plans. At the time of the call, the licensee was over 75% complete with their inspections.

2.0 PRIMARY-TO-SECONDARY LEAKAGE

CPSES, Unit 1 was shut down approximately one week prior to their scheduled refueling outage as a result of a primary-to-secondary leak. A 5 to 15 gallon per day (gpd) leak was first observed in steam generator 2 on September 26, 2002. Over the next two days, the leakage spiked to higher values several times. At 1:00 a.m. on September 28, 2002, after a leakage spike to 52 gpd, the licensee elected to shut down the plant.

Upon entry into the primary side of steam generator 2 (water at atmospheric pressure was on the secondary side of the steam generator), the licensee noticed water dripping from the cold leg of the tube in Row 41 Column 71 (R41C71). The leak rate was approximately 3 drops per minute under these static head conditions. This was the only tube observed to be leaking in this steam generator. Static head pressure tests in the other three steam generators were performed for approximately 8 hours with no evidence of leakage.

3.0 INSPECTION SCOPE

The licensee's inspection scope as of October 9, 2002, was as follows:

Full length bobbin examination of 100% of the in-service/active tubes with the exception of the U-bend region of the tubes in rows 1 and 2.

Rotating probe (equipped with a plus-point coil) examination of 100% of the hardroll expanded tubes from 3-inches above to 3-inches below the top of the hot-leg tubesheet. This examination would include the expansion transition.

Rotating probe (equipped with a plus-point coil) examination of 100% of the WEXTEX expanded tubes from 3-inches above the top of the hot-leg tubesheet to the hot-leg tube end. This examination would include the expansion transition.

Rotating probe (equipped with a plus-point coil) examination of the U-bend region of 100% of the tubes in Rows 1 and 2.

Rotating probe (equipped with a plus-point coil) examination of the expanded region of 25% of the tubes which had been expanded into tube supports in the preheater region.

Rotating probe (equipped with a plus-point coil) examination of dents/dings at the following locations:

First hot-leg tube support: 100% of dented intersections with bobbin voltages greater than 5 volts.

All tube supports (other than first hot-leg tube support): 100% of dented intersections with bobbin voltages greater than 5 volts (consistent with the criteria specified in GL 95-05).

In the free span between the top of the tubesheet on the hot-leg and first hot-leg tube support: 20% of dents/dings with bobbin voltages greater than 2 volts.

In the free span between the top of the tubesheet on the hot-leg and second anti-vibration bar (AVB): 100% of dents/dings with bobbin voltages greater than 5 volts.

In the free span between the top of the cold-leg tubesheet and the eighth cold-leg tube support (the eleventh tube support is the uppermost): 100% of dents/dings with bobbin voltages greater than 5 volts.

Free span paired dents/dings near the top two tube support plates (hot-leg and cold-leg): 20% of all paired dings.

4.0 INSPECTION RESULTS

At the time of the October 9, 2002, conference call, the licensee was finishing the top of the tubesheet and bobbin examinations and was in the process of performing the rotating probe examinations of the dents/dings. Based on these examinations, the following results were obtained:

Steam Generator 1: 31 circumferential indications at the hot-leg expansion transition and 28 distorted indications at the support plates

Steam Generator 2: 168 circumferential indications at the hot-leg expansion transition and 32 distorted indications at the support plates

Steam Generator 3: 178 circumferential indications at the hot-leg expansion transition, 3 single axial indications at the expansion transition, and 31 distorted indications at the support plates

Steam Generator 4: 186 circumferential indications at the hot-leg expansion transition, 4 single axial indications at the expansion transition, and 289 distorted indications at the support plates

In addition to the above, one tube was identified to have preheater wear that exceeded the plugging limit. The depth of the degradation was estimated to be 41% through-wall.

All of the circumferential indications were at the expansion transition. None were located below the expansion transition. The distorted indications at the tube supports are small (typically less than 1 volt) and none of the indications challenged tube integrity. Most will remain in service as a result of implementing the GL 95-05 tube repair criteria.

In steam generator 2, the circumferential extent of the largest (top 10) circumferential indications ranged from 211° to 352°. The non-destructive examination (NDE) adjusted percent degraded area (PDA) evaluated at the 90% confidence/50% probability level (i.e., NDE adjusted 90/50 PDA) ranged from 29% to 56%. These values were not based on detailed profiling of the flaws and are considered by the licensee to be very conservative.

In steam generator 4, the circumferential extent of the largest (top 10) circumferential indications ranged from 231° to 355°. The NDE adjusted 90/50 PDA of these indications ranged to 68%.

The 300 kHz voltages for the circumferential indications are typically between .07 volts and 0.16 volts with the maximum observed being 0.56 volts. The indications are believed to be highly segmented (i.e., multiple circumferential indications) based on previous tube pulls at CPSES, Unit 1. The detection threshold is estimated to be at 0.06 to 0.07 volts.

5.0 LEAKING TUBE

The indication in the U-bend in tube R41C71 (i.e., the leaking tube) was estimated to be 6 volts and 96% throughwall on the bobbin probe's 550 kHz channel. The indication is 0.8-inches long, axial in orientation, and between two anti-vibration bars. Although not near the tangent point of the tube (i.e., the point where the tube starts to bend in the U-bend region), it was rotated approximately 30° from it and located on the flank of the tube. The estimated burst pressure for this indication using mean material properties is 3,000 pounds per square inch (psi), which is below the structural performance criteria that the tube should meet. This tube is located on the boundary between the hardroll and WEXTEX-expanded tubes, leading the licensee to question whether the tube was scratched or gouged during the fabrication process in which some of the tubes were removed and reinstalled. The indication will be in-situ pressure tested with equipment that can deliver a maximum of 2.5 gallons per minute (gpm) at 3,000 psi.

In reviewing the prior history for this tube, the licensee stated that there was no indication (i.e., differential signal) at this location during the 1999 inspection. In the next inspection in 2001 (which was the previous inspection to the 2002 inspection), no indications were called at the location of this flaw; however, a review of the 2001 data during the present outage indicates there was a differential signal at this location. It was not identified as an indication during the 2001 outage because it did not meet the reporting criteria which required indications to have a percent throughwall confirmation on the 300 kHz and 130 kHz differential channels. The 300 kHz phase angle of this indication was at 125° in 2001. A review of the plus point data from 2002 indicated the possible presence of a ding at the crack entrance. A dent/ding can cause a flaw indication to rotate outside the normal flaw plane (i.e., outside 120°). This tube had a horizontal signal due to probe wobble.

During the last outage (i.e., 2001), if a ding was identified with a bobbin coil, the eddy current data analysis guidelines required the previous inspection history at this location to be reviewed. If there was a change between the two prior inspections and the current (2001) inspection, a rotating probe inspection was performed. The licensee indicated that if the ding in the leaking tube had been identified by bobbin in 2001, this would have resulted in the tube being further inspected (e.g., plus-point) in 2001 (since there was a change in the 2001 data compared to the previous 1999 data). This additional inspection would have resulted in the identification of the flaw.

As a result of these findings, the licensee revised their analysis criteria during the 2002 outage. They changed the reporting criteria for calling indications to include all indications with a phase angle less than 160°. This change is based on qualification data from South Texas Project, which demonstrated that indications can reliably be detected with a bobbin probe if the dings are less than 5 volts and if the phase angle limit is set at 160°. In addition, the licensee is performing history reviews of all free span differential signals (with phase angles less than 160°), regardless of whether a ding is present. If changes are observed between the previous and current inspection, a rotating probe inspection will be performed.

In discussing this indication, the licensee indicated that the majority of the dings are in the U-bend region, with the most highly-dinged steam generator containing a few hundred dings. In addition, the licensee indicated that during the 2001 inspection, the first free span crack associated with a ding had been identified.

6.0 REPAIR, PLUGGING, AND IN-SITU TESTING

At the time of the October 9, 2002, conference call, the licensee was still inspecting dents/dings and was still evaluating/sizing some of the indications. As a result, plans for in-situ pressure testing were not available at this time. The list of candidates for in-situ pressure testing is scheduled to be developed over the next couple of days, and the list will be prepared using the industry guidelines. With respect to the indications at the top of the tubesheet (i.e., at or near the expansion transition), past in-situ pressure testing of similar indications have not resulted in any leakage.

The licensee plans to repair many of the tubes with indications at the top of tubesheet with Westinghouse Tungsten Inert Gas (TIG) welded sleeves. Approximately 650 tubes will be sleeved. Approximately 50 to 60 tubes that had been previously plugged for indications at the top of tubesheet will be deplugged, inspected, and sleeved. The sleeving operation is scheduled to begin on October 6, 2002.

7.0 OTHER

The licensee has not identified any new degradation during this inspection and is using conventional eddy current (bobbin, rotating probe) techniques to inspect the tubes. No tube pulls are planned for this outage. Based on the inspections performed to-date, and previous experience in-situ pressure testing the circumferential indications at the expansion transition, the licensee expects all tubes with the possible exception of the leaking tube will meet the performance criteria during the previous cycle. In addition, they believe they will be able to demonstrate that the performance criteria will be met over the course of the next operating cycle. The licensee indicated that the improved calling criteria for indications should prevent a tube similar to the leaking tube (i.e., one that possibly doesn't meet the performance criteria) from developing over the next operating cycle.

8.0 FUTURE ACTIVITIES

At the conclusion of the conference call, the NRC staff requested an additional call on October 14, 2002, in order to discuss the results of subsequent inspections, including the in-situ pressure test list, and to permit the staff time to review the information provided during this call.

Prior to the October 14, 2002, conference call, a conference call was held with the licensee on October 11, 2002, to discuss their inspection activities and to make them aware of two items that the staff considered high priority. These two items were: 1) the root cause and the adequacy of the corrective actions taken in response to the leaking tube, and 2) the method used to determine the severity of the circumferential indications being detected at the hot-leg expansion transition region.

During the call, the licensee indicated that they planned on in-situ pressure testing the three tubes with circumferential indications with the largest percent degraded area and the three tubes with circumferential indications with the largest voltages, regardless of whether the indications met their screening criteria for performing in-situ pressure testing. The licensee also indicated that there was no evidence of leakage coming from the indications at the top of the tubesheet and that the size distribution of the indications being detected was consistent with previous inspections (although more indications were being detected).

With respect to the scope of the inspection, the licensee indicated they were expanding the scope of their rotating probe inspections to include a 20% sample of the free span differential signals that had not exhibited a change since previous inspections, and a 20% sample of dents/dings greater than 2 volts from the uppermost cold-leg tube support to AVB2 on the hot-leg side of the steam generator.

During the week of October 14, 2002, an NRC Special Inspection related to steam generator tube integrity was chartered. Since a special inspection was to be conducted, the October 14, 2002, conference call was canceled.

cc:

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