July 20, 2004

Mr. M. R. Blevins
Senior Vice President
& Principal Nuclear Officer
TXU Energy
ATTN: Regulatory Affairs
P. O. Box 1002
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SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES) UNIT 1-SUMMARY OF CONFERENCE CALLS WITH TXU ENERGY TO DISCUSS THE 2004 STEAM GENERATOR TUBE INSPECTIONS (TAC NO. MC2564)

Dear Mr. Blevins:

On April 14 and April 23, 2004, the staff of the Nuclear Regulatory Commission (NRC), participated in conference calls with TXU Generation Company LP to discuss the steam generator (SG) inspection activities which took place at Comanche Peak Steam Electric Station (CPSES), Unit 1.

The NRC staff's summary of the conference calls is enclosed. Please note that our summary references two transmittals that were provided by your staff to support the calls. Those transmittals are attached to the summary.

The NRC staff will review the CPSES, Unit 1 SG inspection summary reports when submitted according to the Technical Specification requirements.

Sincerely,

/RA/

Mohan C. Thadani, Senior Project Manager, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No.: 50-445

Enclosure: As stated

cc w/encl: See next page

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CONFERENCE CALL SUMMARY

2004 STEAM GENERATOR INSPECTIONS

TXU GENERATION COMPANY LP

COMANCHE PEAK STEAM ELECTRIC STATION, UNIT 1

DOCKET NO. 50-445

On April 14 and April 23, 2004, the Nuclear Regulatory Commission (NRC) staff participated in conference calls with TXU Generation Company LP (the licensee) to discuss the steam generator (SG) inspection activities taking place at Comanche Peak Steam Electric Station (CPSES), Unit 1 during refueling outage 1RF10. The discussion topics included the SG tube inspection scope, inspection results, and other related SG inspection activities. The initial call was conducted in response to an NRC letter to the licensee dated April 9, 2004 (ML041000562). The purpose of the second call was for the licensee to update the NRC staff on additional inspection results and analysis. The licensee provided supporting documents which are attached to this summary. The plant has four Westinghouse Model D4 SGs with mill-annealed Alloy 600 tubing.

The planned scope of the inspection included testing with a bobbin coil eddy current probe from tube-end to tube-end in all of the tubes in Rows 3 and higher in all four SGs, bobbin coil testing of the straight portions of all tubes in Rows 1 and 2 in all four SGs, and rotating probe (+Point™) eddy current testing of the U-bend section of all tubes in Rows 1 through 10 in all four SGs. Rotating probes were also used to examine additional U-bend sections, tubes at the top of the tubesheet (TTS), tube dents and dings, tubes selected for sleeve installation, installed sleeves, and bobbin probe signals requiring further characterization. Video inspection was performed on the primary side to examine all tube plugs and on the secondary side for tube examination near the TTS and foreign object detection. The attached documents provide the full details of the inspection scope.

Two forms of tube degradation were detected for the first time during this inspection: circumferential primary water stress corrosion cracking (PWSCC) in hardroll expansion transitions at the TTS and circumferential PWSCC in the U-bend section of tubes in Rows 3 and higher. As a result of finding PWSCC in the U-bend region of the tube bundle, the U-bend section of every tube in Rows 11 through 21 in each SG was tested with a +Point™ probe. The number of tubes with new TTS circumferential indications decreased sharply compared to the previous outage.

April 14, 2004, Conference Call

At the time of the call, inspection with the bobbin coil eddy current probes was complete. The following inspections were continuing with +Point™probes: U-bend tube regions, reinspection of tubes being repaired with sleeves, and other tests of special interest based on bobbin probe testing. The licensee estimated that eddy current testing was about 95% complete, and that cleaning and inspection activities on the secondary side were complete. In-situ pressure testing

ENCLOSURE

was planned but had not yet been performed. The licensee's detailed responses to the staff's 17 questions are included in the attached supporting documents. The following clarifying information was provided by TXU during the call.

No primary to secondary leakage was attributed to tube degradation. The licensee explained that the amount of leakage indicated by the instrumentation (0.09 gallons per day) was equivalent to the lowest possible reading, and therefore not a reliable indication of leakage. The NRC staff asked the licensee to clarify some aspects of the basic inspection scope listed in the supporting document. The licensee explained that the TTS inspections in the hard rolled tubes were stopped at 3" below the TTS due to an F* alternate repair criterion (ARC). Flaws located at a distance greater than the F* distance below the TTS are allowed to remain in service because this length of sound tubing has been shown to be sufficient to prevent tube pull-out. (The F* distance for CPSES, Unit 1 is 1.13"). In response to a NRC staff question about rotating probe testing at freespan dings, the licensee explained that the amount of testing was greatest between the hot-leg tubesheet (TSH) and the third tube support plate (H3) because this was determined to be the hottest region. Tubes from which previously installed plugs were removed (deplugged tubes) were subjected to the same testing as other inservice tubes.

A detailed summary of the number, location, and characteristics of degradation was provided before the call in a supporting document. At the time of the call, with the data analysis about 99% complete, 288 tubes with circumferential outside diameter stress corrosion cracking (ODSCC) had been identified at the hot-leg TTS. About 15% of these tubes were in Steam Generator 1 (SG1), and the remaining 85% were divided about evenly between SG2, SG3, and SG4. The largest +Point™ amplitude for these indications was 0.43 V, the maximum arc length was 318°, and the maximum calculated percent degraded area was 55%. There were significantly fewer tubes with TTS ODSCC than expected based on the past four inspections (88 tubes in 1RF06, 96 tubes in 1RF07, 178 tubes in 1RF08, and 667 tubes in 1RF09).

Two tubes were reported with circumferential PWSCC at the TTS on the hot leg, the largest having a +Point™ amplitude of 1.29 V and an arc length of 106°. Indications of axial ODSCC, axial PWSCC, and volumetric degradation were detailed in the supporting document. (During the call, the licensee noted that the supporting document should indicate two tubes with axial PWSCC, rather than three tubes.)

Westinghouse leak-limiting Alloy 800 sleeves were being installed in tubes with crack-like and volumetric indications at the TTS according to a technical specification amendment issued in March 2004 (ML040840801). The licensee explained that prior to sleeve installation the lower (mechanical) and upper (hydraulic) expansion regions were being tested with +Point™ eddy current probes, and a video recording was made of the inside of each tube between the tube conditioning and sleeve insertion steps. Following sleeve installation, the sleeve and parent tube were to be tested over the full length of the sleeve with the +Point™ probe.

Eddy current testing in the U-bend sections of the tubes detected circumferential PWSCC on the flanks of tubes in Rows 4, 5, 6, and 10, with a maximum +Point™ amplitude of 2.2 V and arc lengths from 50° to 60°. One potential axial flaw signal was still being analyzed. (The licensee noted that on further review they concluded that there was no PWSCC indication on a tube in Row 18, as was originally stated in their supporting document). This was the first time that PWSCC was detected in the U-bends at CPSES, Unit 1. In response to this finding, the

licensee was expanding the rotating probe eddy current testing to include the U-bend sections in all of the tubes through Row 20 in each SG.

In the freespan sections of tubing, one indication of axial ODSCC had been found that was not associated with a ding. The indication was found initially with the bobbin probe and confirmed with +Point™ probe (0.2 V, 0.56" length). During the last inspection in 2002, no detectable discontinuity (NDD) was found at this location in the bobbin probe signal response. Five tubes were reported with ODSCC associated with dings. Two of these indications were in U-bend tube sections, two were in U-bend tangent sections, and one was in a straight section.

The licensee planned to perform in-situ pressure testing on two tubes based on their screening criteria for leakage testing. One of the tubes contained circumferential indications of PWSCC at the TTS, and the other tube contained circumferential indications of PWSCC in the U-bend section. The NRC staff asked that the licensee also consider for in-situ pressure testing the freespan axial flaw not associated with a ding. All of the detected loose parts were removed from the SGs. The only damage attributed to loose parts was a ding on a plugged tube.

The NRC staff requested a follow-up call to discuss the results of the testing and analysis in the U-bend tube sections, the other remaining special interest eddy current testing and analysis, in-situ pressure testing, and sleeve testing and installation.

April 23, 2004, Conference Call

At the time of the second call, eddy current testing and analysis was complete except for that related to installation of new sleeves and evaluation of previously installed sleeves. In-situ pressure testing was also complete. The licensee provided written supporting material, which is attached to this summary. The following clarifying information was provided by TXU.

Circumferential PWSCC, qualitatively similar to that found at Diablo Canyon Nuclear Power Plant, Unit 2 in 2002, was found in a total of eight U-bend tubes, all of which were repaired by plugging. The cracking was in all cases located on the tube flanks. Some tubes contained single cracks, while others contained multiple cracks (to a maximum of 10). The row with the highest bend radius in which a crack was found in the U-bend was Row 13. U-bend +Point™ testing was performed on every tube in every SG out to Row 21.

Four tubes were in-situ pressure tested, with no resulting leakage or burst. Details of the tubes and test results are provided in the licensee's supporting document. The tests included one tube with a circumferential PWSCC indication in the U-bend region (2.2 volts +Point™, a tube with a circumferential PWSCC indication in the hardroll expansion transition region (1.29 V +Point™), the tube with a free span axial ODSCC indication (0.5 volts +Point™), and a tube with an ODSCC axial indication in a ding (1.11 volts +Point™ flaw, 5.8 volts bobbin ding).

A total of approximately 560 Alloy 800 sleeves were being installed at the top of the tubesheet in the four SGs, including about 280 in tubes with new TTS indications and about 280 tubes with plugs removed. An eddy current test of the full length of each sleeve and corresponding length of parent tube was being performed with the +Point™ probe after installation as a baseline for future inspections. Eddy current was attempted with a +Point™ probe in each of the 736 tubes with welded sleeves installed in the previous outage (Fall 2002). In 36 of these tubes, the sleeve prevented passage of the 0.5" diameter probe. In an additional 22 tubes, the

tests indicated ovalization of the sleeve, but no degradation of the tube or sleeve. All of these 58 tubes were plugged. The licensee considered leakage at the lower sleeve joint the most likely cause of the ovalization, although the investigation was not complete. At the time of the call, no differences in sleeve installation parameters or procedures had been identified that would explain why certain sleeves may have leaked. This finding is qualitatively similar to San Onofre Nuclear Generating Station, Unit 2 in March 2004, where 10 out of 118 welded sleeves became partially obstructed during the first operating cycle following installation.

Attachment: Licensee supporting documents

Comanche Peak Steam Electric Station

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