April 12, 2001

MEMORANDUM TO: Robert A. Gramm, Chief, Section 1
Project Directorate IV & Decommissioning
Division of Licensing Project Management

FROM: David H. Jaffe, Senior Project Manager, Section 1 /RA/
Project Directorate IV & Decommissioning
Division of Licensing Project Management

SUBJECT: DISCUSSION BETWEEN TXU ELECTRIC AND THE U. S. NUCLEAR REGULATORY COMMISSION (NRC) STAFF CONCERNING THE COMANCHE PEAK STEAM ELECTRIC STATION (CPSES), UNIT 1, STEAM GENERATOR TUBE INSPECTION

The NRC staff has had a discussion with TXU Electric (the licensee) concerning the CPSES, Unit 1, steam generator inspection in a telephone conference on April 5, 2001. In order to facilitate this discussion, the attached, draft information was provided by the licensee. This information was not used in rendering any regulatory decisions.

The purpose of this memorandum is to place the attachment in the Public Document Room.

Docket No. 50-445

Attachment: As stated

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

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# NRC Questions for the CPSES 1RF08 Outage Phone Call (4/4/01)

1. Primary to secondary leakage prior to shutdown?
   Zero leakage – less than detectable

2. Results of secondary side hydrostatic testing?
   Not planned

3. For each SG, a general description of areas examined; include expansion criteria and specify type of probe used in each area?

| Summary of SG Tube Degradation Mechanisms and Inspection Requirements: CPSES 1RF08 | | | | |
|---|---|---|---|---|
| **Degradation Mechanism** | **Location** | **Probe Type** | **Detection Inspection/Expansion Plan** | |
| | | | **Inspection Sample Plan** | **Expansion Plan** |
| **Active Degradation Mechanisms** | | | | |
| Axial ODSCC | TSP intersection | Bobbin | 100% full length except Rows 1 and 2 U-bends | None, 100% inspection performed initially |
| Axial ODSCC | dented TSP intersections ≥ 5 volts | Plus Point | 100% TSP intersections with dents ≥ 5 volts | None, 100% inspection performed initially |
| Axial and Circ. ODSCC | Hot leg TTS transition | Plus Point | 100% hot leg TTS from 3" above to 3" below TTS | Hardrolled tubes: None<br>WEXTEX tubes: Expand to 6" below TTS if circ. indications are detected below BWT<br>Expand to 20% of cold legs for C-3 in affected SGs. |
| **Resolution for Classification of Indications** | | | | |
| Potential MBMs | All | Bobbin | 100% full length, all SGs | Historical review; RPC if no history or changed |

| Summary of SG Tube Degradation Mechanisms and Inspection Requirements: CPSES 1RF08 | | | | |
|---|---|---|---|---|
| **Degradation Mechanism** | **Location** | **Probe Type** | **Detection Inspection/Expansion Plan** | |
| | | | **Inspection Sample Plan** | **Expansion Plan** |
| **Relevant Degradation Mechanisms** | | | | |
| Tube Wear | AVBs, non-expanded preheater baffle plates | Bobbin | 100% full length tubes contacting AVBs, non-expanded baffles likely to experience wear | None, 100% inspection performed as part of initial inspection. |
| Axial PWSCC | Row 1 and 2 U-bends | Plus Point (mid-range) | 100% Rows 1 and 2 U-bends | 40% of Row 3 if Row 2 indications observed in the affected SGs |
| | Row 1 U-bends | Plus Point (high frequency) | 20% Row 1 | 100% of Rows 1 and 2 if Row 1 indications detected by high freq. coil not detected by mid-range coil |
| Axial ODSCC | Freespan | Bobbin | 100% full length except Rows 1 and 2 U-bends | None, 100% inspection performed initially |
| | Freespan dings $\leq$ 5 V | Bobbin | 100% full length except Rows 1 and 2 U-bends | None, 100% inspection performed initially |
| | Freespan dings > 5 V | Plus Point | 20% of dings > 5 volts in straight legs up to adjacent AVB | 100% freespan dings > 5 volts in leg of respective SG with indications |
| Circ. ODSCC | "Paired" Dings | Plus Point | 20% of "paired" dings between H10 and H11, C10 and C11 | 100% of "paired" dings between H10 and H11, C10 and C11, 20% of all remaining lower paired dings |
| Axial PWSCC | TTS transition | Plus Point | 100% hot leg TTS from TTS +3", -3" | Expand to 20% of cold legs for C-3 in affected SGs. |
| **Potential Degradation Mechanisms and Special Interest RPC** | | | | |
| Axial PWSCC | Within Tubesheet | Bobbin | 100% full length bobbin all SGs | None, 100% inspection performed initially |
| Axial PWSCC | HL, U-bend dings > 5 volts | Plus Point | 100% dents > 2 volts at H3, 20% HL dings > 2 volts between TTS and H3 TSP<br>20% of dings from TTS H/L to AVB-1<br>20% of dings from TTS C/L to AVB-4 | 100% HL dings $\geq$ 2 volt from TTS to H3, 20% dings $\geq$2 volts between H3 and H5 in the affeccted SGs |
| Axial ODSCC | Expanded preheater baffles | Plus Point | 20% expanded baffles at B and D plates | 100% expanded baffles in SGs with indications |

4. For analyzed EC results, describe bobbin indications (those not examined with rotating pancake coil (RPC)) and RPC/Plus Point/Cecco indications. Include the following information: location, number, degradation mode, disposition, and voltages/depths/lengths of the most significant indications?

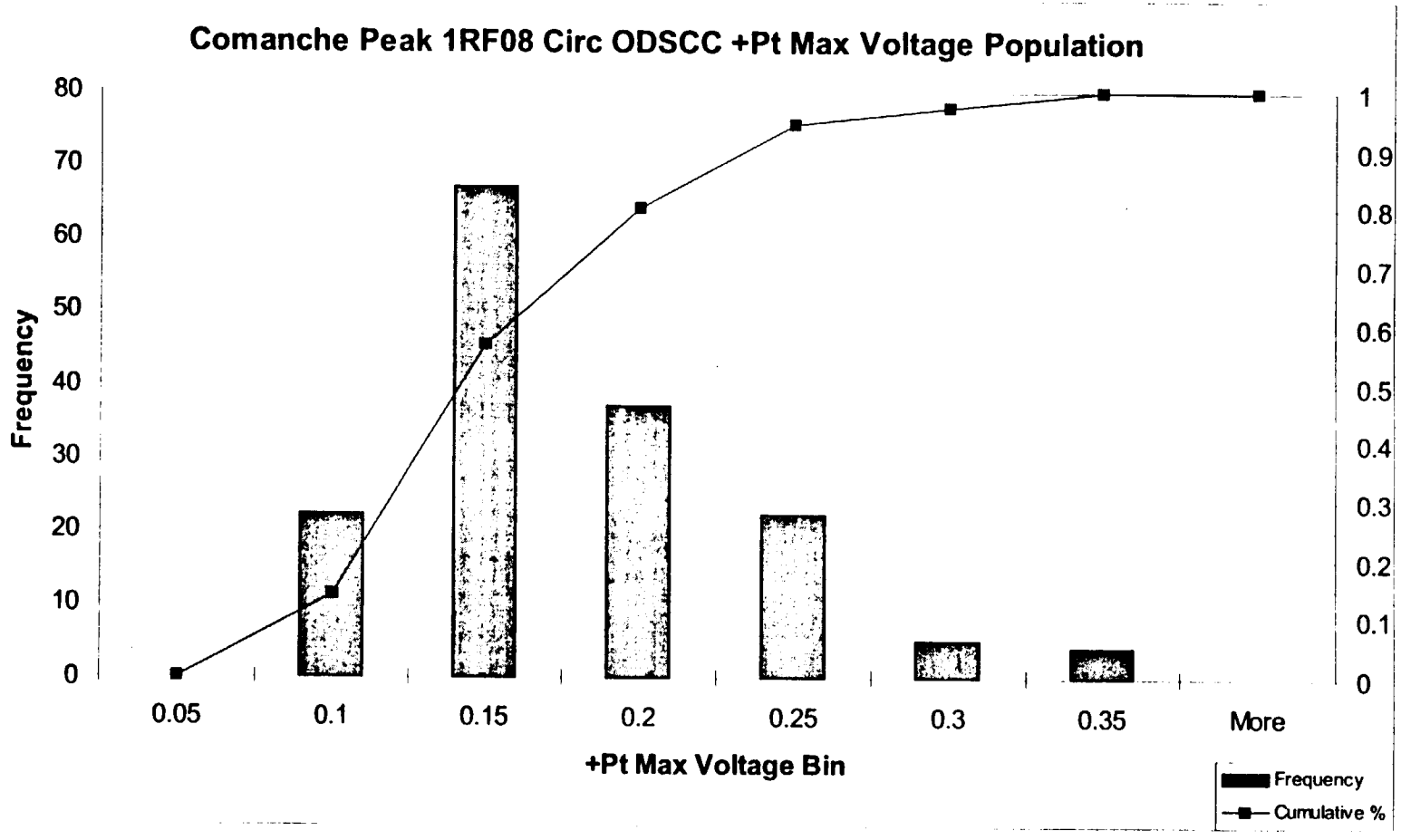
| S/G Number | Location | Damage Mechanism | Quantity |
|---|---|---|---|
| 1 | HTS | SCI | 2 |
| 1 | HTS | Loose Part Wear | 2 |
| 2 | HTS | SCI | 37 |
| 2 | C10 | Loose Part Wear | 3 |
| 2 | HTS | SVI | 2 |
| 3 | HTS | SAI | 2 |
| 3 | HTS | SCI | 69 |
| 3 | C3 | Preheater Wear | 2 |
| 4 | HTS | SCI | 49 |
| | | Total Plugable Indications | 168 |

Sleeving ?

Profiling of ODSCC circ flaws has not been performed. Conservative estimation of limiting PDA suggests a burst pressure of 6414 psi with material properties and sizing uncertainty modeled at 90% probability, 50% confidence levels.

The single axial PWSCC flaw at TTS was profiled. Using the as-reported profile, the burst pressure is estimated to be 8548 psi using LTL material properties. Using flaw adjustments consistent with dented TSP ARC, burst pressure is estimated to be 9074 psi using LTL material properties.

The single axial ODSCC flaw at TTS was profiled. Using the as-reported profile, the burst pressure is estimated to be 10304 psi using LTL material properties.


Comanche Peak 1RF08 Circ ODSCC +Pt Max Voltage Population
Frequency
80
70
60
50
40
30
20
10
0
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
More
+Pt Max Voltage Bin
Frequency
Cumulative %

5. Description of repair/plugging plans?

   Will plug all crack-like indications (except those acceptable in accordance with GL 95-05 and F*), sizable wear 40% and greater, and any wear associated with loose parts.

6. Discussion of previous history; "look backs" performed; consideration of similar plants' experiences?

   We perform history look ups on all preheater wear, MBM, and FSD calls. This is done by the resolution analyst. Previous history is used on all preheater wear calls.
   The degradation assessment is based upon CPSES history, similar plants, and similar tubing materials.

   In addition, all crack-like indications are reviewed following the outage to determine growth rates.

7. Discussion of new inspection findings, including loose parts indications?

   There are some PLP calls. We are just now beginning our secondary side visual inspection program and will include those in our plans.

   One axial PWSCC at TTS

8. Description of in-situ pressure test plans and results; include tube selection criteria, test pressure plans, test configuration?

   We have the equipment and personnel on-site to support in-situ pressure testing if required. Our in-situ pressure test selection criteria is based upon the methodology found in EPRI TR-107620-R1 "Steam Generator In Situ Pressure Test Guidelines".

   For circumferential ODSCC, leakage screening values are, in the following order:

   Peak to peak +Pt volts $\geq$ 1.0
   Maximum depth $\geq$ 75%
   Length at maximum depth > 30° arc

   Proof screening values are, in the following order:

   Arc length >187°
   Voltage integral > 0.35
   PDA > 42% for hardroll ODSCC
   PDA >54% for WEXTEX ODSCC

   The in situ tooling used has the capability to provide axial end cap loading for testing of circumferential indications. Leakage capacity is approximately 2.7 gpm at SLB conditions.

9. Describe tube pull plans and preliminary results; include tube selection criteria and evaluation plans?

   We have no plans to pull tubes this outage.

10. Assessment of tube integrity for the previous operating cycle?

Tube integrity at 1RF07 was based on in situ pressure testing of circumferential indications. Based on PDA, tube R22 C89 in SG 4 (limiting indication) exceeded the in situ screening criteria. No leakage or burst was reported. R22 C89 was subsequently pulled. Burst pressure was greater than 10,000 psi, and burst occurred in the non-degraded freespan region. The flaw morphology was highly segmented, which increases the burst capability. Additionally, the cold working introduced by hardroll expansion increases the material properties of the tubes. PDA sizing and maximum depth sizing was found to be conservative compared to the pulled tube results. Burst pressures were also estimated based on the PDA sizing results.

11. Assessment of tube integrity for the next operating cycle?

Currently, no tubes are believed to exceed the PDA threshold limits for in situ testing. PDA sizing has not yet been performed. Burst capabilities of profiled indications will be estimated, using allowances for PDA uncertainty at probability and confidence levels consistent with the EPRI Tube Integrity Guidelines. Operational assessment will include a growth allowance to estimate burst capabilities at EOC-9, and will include PDA uncertainty allowances consistent with the EPRI Tube Integrity Guidelines.

12. Provide a schedule for SG-related activities during remainder of the current outage.

We are approximately 80% complete with the eddy current program. The hot leg TTS Plus Point program is 95% complete. The bobbin program is 82% complete. The u-bend program is 50% complete. The baffle plate program is 50% complete. The special interest program is ongoing.

On the secondary side we are going to sludge lance all four S/G's, perform FOSAR and TTS visuals on all four S/G's, and perform a full bundle visual on S/G 3.

We are scheduled to remove nozzle dams and install manways on April 13th.

13. Discuss what steps have been taken, or will be taken, in response to the lessons learned from the IP2 tube failure. In addition, please be prepared to discuss the following:

a) the actions that are taken in response to identifying a new degradation mechanism

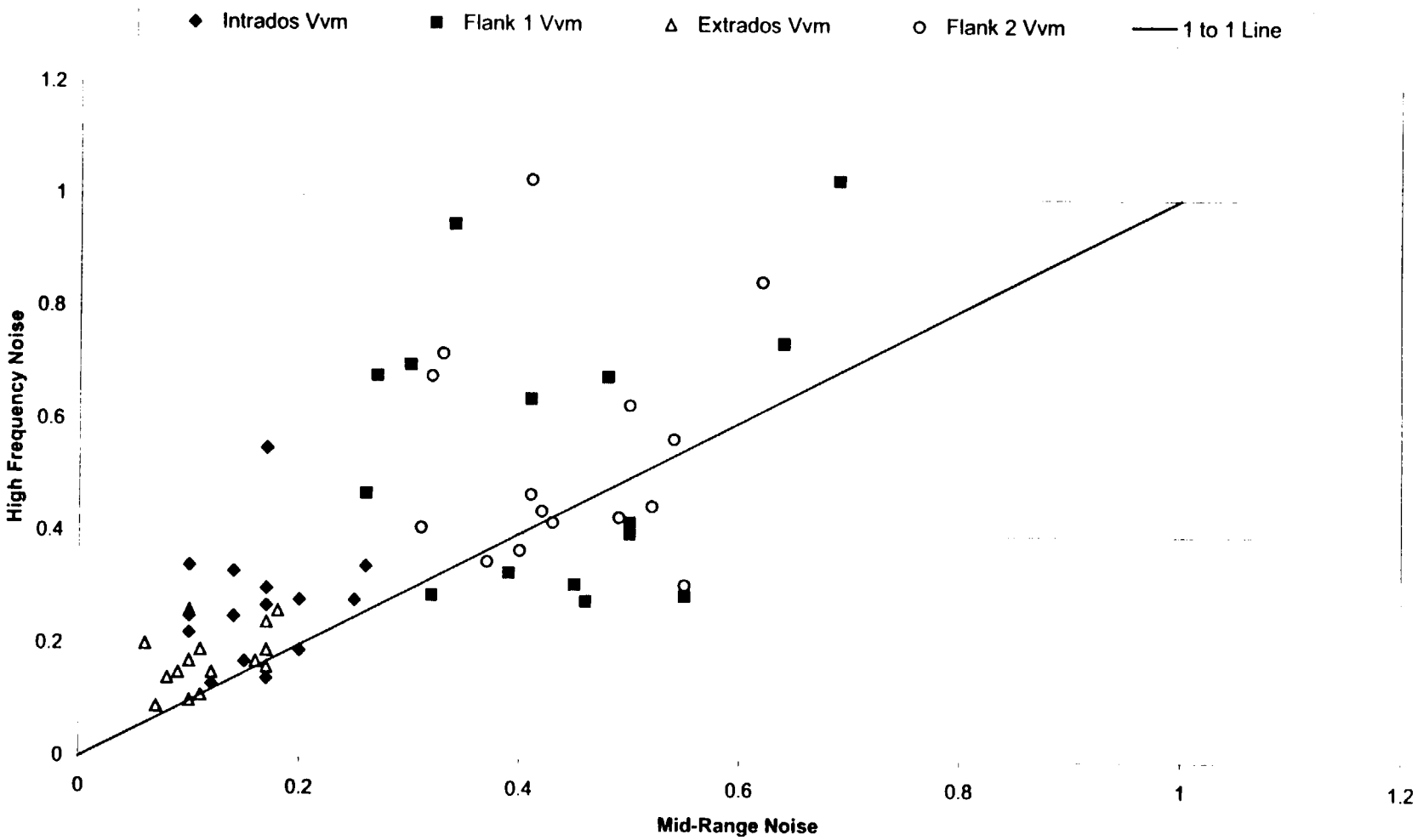
We verify the NDE results, determine if the mechanism has been found at other plants, perform additional NDE methods if necessary, assess the need for a tube pull, perform insitu screening, evaluate the need for scope expansion, and evaluate repair options.

b) the actions taken to ensure that data noise levels are acceptable

Noise levels were evaluated prior to the outage using guidance developed by Westinghouse. This evaluation concluded that some high frequency +Pt examination should be conducted. The plant average peak to peak and vertical maximum values were slightly higher than the ETSS 96511 data. At 95% confidence, the plant data was slightly less than the ETSS 96511 data. The high frequency examinations were performed on those tubes with the largest noise components, up to a sampling level of 20%. For the conditions specific to Comanche Peak 1, the high frequency +Pt is not expected to produce a condition where PWSCC detection in the U-bend region is increased. This is based on the negligible OD deposit condition at CPSES 1, due to chemical cleaning at 1RF05 and application of scale conditioning agents at each outage. Further evaluation shows that for the area of the tubes most likely to develop PWSCC, namely the extrados region, the noise levels are substantially low that adequate detection capabilities are provided using the mid-range +Pt. For

the 1RF08 inspection, noise levels are slightly reduced compared to the 1RF07 data. Evaluation of high frequency +PT noise levels indicates that vertical maximum noise levels are increased for the high frequency coil compared to the mid-range.

## Mid-Range vs High Freq Noise Values: Tube by Tube Comparison
## 90° Analysis Window at Extrados, Intrados, and Flanks



Noise levels for the +Pt coil at the top of tubesheet region were also evaluated prior to the outage, and found to be acceptable for detection purposes. Again, the OD deposit condition at Comanche Peak Unit 1 is negligible based on the chemical cleaning performed at 1RF05. Average and 95% confidence noise levels were well below the ETSS 96404.3 noise levels.

c) data quality issues and the need for criteria to address data quality

Special attention for both bobbin and Plus Point is contained in the site specific eddy current analysis guidelines concerning data quality. These are in addition to probe wear checking as required by GL 95-05. The following tables contain the parameters included:

## Bobbin

| INDICATION | PARAMETER | ACCEPTANCE CRITERIA |
|---|---|---|
| 100% ASME Hole | Phase (Ch 1 & 3) | ≤ 5 degrees change from Beginning to End Cal. |
| 20% ASME FBH | Voltage (Ch 1 & 3) | ≤ 0.50 change from Beginning to End Cal. |
| NA | Probe Speed | < Maximum Specified in ACTS |
| Signal-to-Noise* | Electrical Noise | ≥ 10 |
| NA | Data Drop Out | None in Area of Interest |

## Plus Point

| INDICATION | PARAMETER | ACCEPTANCE CRITERIA |
|---|---|---|
| N/A | Probe translation speed | As specified on ACTS |
| N/A | Probe rotation speed | As specified on ACTS |
| N/A | Probe digitizing rate | As specified on ACTS |
| N/A | Probe sampling rate | As specified on ACTS |
| 40% Ax. ID notch | 300 kHz | ≤ 5 degrees change from Beginning to End Cal on raw reporting channel |
| 100% Ax. notch | 300 kHz | ≤ 2 Volts change from Beginning to End Cal on raw reporting channel |
| N/A | System Noise* | 300 kHz change in voltage ≥ 1.0V (P-to-P) and /or 0.2V (V-max) on reporting raw channel |
| N/A | Data Spike | ≤ 3 spikes per inch lined up axial or circumferential |

*Note: System noise not associated with conditions in the steam generator.