

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

September 22 1999

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES), UNITS 1 AND 2 -
 ISSUANCE OF AMENDMENTS RE: CPSES, UNIT 1 REVISION TO STEAM
 GENERATOR PLUGGING CRITERIA - F* (TAC NOS. MA3747 AND MA3748)

Dear Mr. Terry:

The Commission has issued the enclosed Amendment No. 71 to Facility Operating License No. NPF-87 and Amendment No. 71 to Facility Operating License No. NPF-89 for CPSES, Units 1 and 2, respectively. The amendments consist of changes to the Technical Specifications (TSs) in response to your application dated October 2, 1998, as supplemented by letters dated July 27 and August 26, 1999.

The amendments revise the TSs, for CPSES, Unit 1, to define the F* steam generator tube plugging criteria in TS 5.5.9, "Steam Generator (SG) Tube Surveillance Program," and associated reporting requirements in TS 5.6.10, "Steam Generator Tube Inspection Report."

Your August 26, 1999, supplement to the October 2, 1998, application established a commitment to describe the nondestructive examination uncertainty methodology, associated with F*, in the CPSES Final Safety Analysis Report. The NRC staff finds that reasonable controls for the implementation and for subsequent evaluation of proposed changes pertaining to the above regulatory commitment is best provided by your administrative processes, including your commitment management program. The above regulatory commitment does not warrant the creation of a regulatory requirement (an item requiring prior NRC approval of subsequent changes).

A copy of our related Safety Evaluation is enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

ORIGINAL SIGNED BY

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

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Docket Nos. 50-445 and 50-446

Enclosures:

1. Amendment No. 71 to NPF-87
2. Amendment No. 71 to NPF-89
3. Safety Evaluation

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Comanche Peak Steam Electric Station

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

TXU ELECTRIC COMPANY

COMANCHE PEAK STEAM ELECTRIC STATION, UNIT NO. 1

DOCKET NO. 50-445

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 71
License No. NPF-87

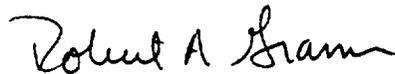
1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by TXU Electric Company (TXU Electric) dated October 2, 1998, as supplemented by letters dated July 27 and August 26, 1999, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, as amended, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this license amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Facility Operating License No. NPF-87 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 71, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the license. TXU Electric shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. The license amendment is effective as of its date of issuance and shall be implemented within 30 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Robert A. Gramm, Chief, Section 1
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical
Specifications

Date of Issuance: September 22, 1999



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

TXU ELECTRIC COMPANY

COMANCHE PEAK STEAM ELECTRIC STATION, UNIT NO. 2

DOCKET NO. 50-446

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 71
License No. NPF-89

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by TXU Electric Company (TXU Electric) dated October 2, 1998, as supplemented by letters dated July 27 and August 26, 1999, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, as amended, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this license amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Facility Operating License No. NPF-89 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 71, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated into this license. TXU Electric shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Robert A. Gramm, Chief, Section 1
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical
Specifications

Date of Issuance: September 22, 1999

ATTACHMENT TO LICENSE AMENDMENT NO. 71

TO FACILITY OPERATING LICENSE NO. NPF-87

AND AMENDMENT NO. 71

FACILITY OPERATING LICENSE NO. NPF-89

DOCKET NOS. 50-445 AND 50-446

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

| <u>Remove</u> | <u>Insert</u> |
|---------------|---------------|
| 5.0-13 | 5.0-13 |
| 5.0-14 | 5.0-14 |
| 5.0-15 | 5.0-15 |
| ---- | 5.0-15a |
| 5.0-16 | 5.0-16 |
| ---- | 5.0-16a |
| 5.0-17 | 5.0-17 |
| 5.0-36 | 5.0-36 |

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Tube Surveillance Program

Each steam generator shall be demonstrated OPERABLE by performance of the following augmented inservice inspection program.

The provisions of SR 3.0.2 are applicable to the SG Surveillance Program test frequencies.

- a. Steam Generator Sample Selection and Inspection - Each steam generator shall be determined OPERABLE during shutdown by selecting and inspecting at least the minimum number of steam generators specified in Table 5.5-1.

- b. Steam Generator Tube Sample Selection and Inspection - The steam generator tube minimum sample size, inspection result classification, and the corresponding action required shall be as specified in Table 5.5-2. The inservice inspection of steam generator tubes shall be performed at the frequencies specified in Specification 5.5.9d., and the inspected tubes shall be verified acceptable per the acceptance criteria of Specification 5.5.9e. The tubes selected for each inservice inspection shall include at least 3% of all the expanded tubes and at least 3% of the remaining number of tubes in all steam generators; the tubes selected for these inspections shall be selected on a random basis except:
 1. Where experience in similar plants with similar water chemistry indicates critical areas to be inspected, then at least 50% of the tubes inspected shall be from these critical areas;
 2. The first sample of tubes selected for each inservice inspection (subsequent to the preservice inspection) of each steam generator shall include:
 - a) All nonplugged tubes that previously had detectable wall penetrations (greater than 20%),
 - b) Tubes in those areas where experience has indicated potential problems,

(continued)

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Tube Surveillance Program (continued)

- c) A tube inspection (pursuant to Specification 5.5.9e.1.h) shall be performed on each selected tube. If any selected tube does not permit the passage of the eddy current probe for a tube inspection, this shall be recorded and an adjacent tube shall be selected and subjected to a tube inspection, and
 - d) Indications left in service as a result of the application of the tube support plate voltage repair criteria shall be inspected by bobbin probe during all future refueling outages.
3. The tubes selected as the second and third samples (if required by Table 5.5.9-2 during each inservice inspection may be subjected to a partial tube inspection provided:
- a) The tubes selected for these samples include the tubes from those areas of the tube sheet array where tubes with imperfections were previously found, and
 - b) The inspections include those portions of the tubes where imperfections were previously found.
4. Implementation of the steam generator tube/tube support plate repair criteria requires a 100% bobbin coil inspection for hot-leg and cold-leg tube support plate intersections down to the lowest cold-leg support with known outside diameter stress corrosion cracking (ODSCC) indications. The Determination of the lowest cold leg tube support plate intersections having ODSCC indications shall be based on the performance of at least a 20% random sampling of the tubes inspected over their full length.

The results of each sample inspection shall be classified into one of the following three categories:

| <u>Category</u> | <u>Inspection Results</u> |
|-----------------|---|
| C-1 | Less than 5% of the total tubes inspected are degraded tubes and none of the inspected tubes are defective. |

(continued)

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Tube Surveillance Program (continued)

- C-2 One or more tubes, but not more than 1% of the total tubes inspected are defective, or between 5% and 10% of the total tubes inspected are degraded tubes.
- C-3 More than 10% of the total tubes inspected are degraded tubes or more than 1% of the inspected tubes are defective.

Note: In all inspections, previously degraded tubes must exhibit significant (greater than 10%) further wall penetrations to be included in the above percentage calculations.

- c. Steam Generator F* Tube Inspection (Unit 1 only) - In addition to the minimum sample size as determined by Specification 5.5.9b., all F* tubes will be inspected within the tubesheet region. The results of the inspections of F* tubes identified in previous inspections will not be a cause for additional inspections per Tables 5.5-1 and 5.5-2.
- d. Inspection Frequencies - The above required inservice inspections of steam generator tubes shall be performed at the following frequencies:
 - 1. The first inservice inspection shall be performed after 6 Effective Full Power Months (EFPM) and before 12 EFPM and shall include a special inspection of all expanded tubes in all steam generators. Subsequent inservice inspections shall be performed at intervals of not less than 12 nor more than 24 calendar months after the previous inspection. If two consecutive inspections, not including the preservice inspection, result in all inspection results falling into the C-1 category or if two consecutive inspections demonstrate that previously observed degradation has not continued and no additional degradation has occurred, the inspection interval may be extended to a maximum of once per 40 months;
 - 2. If the results of the inservice inspection of a steam generator conducted in accordance with Table 5.5-2 at 40-month intervals fall in Category C-3, the inspection frequency shall be increased to at least once per 20 months. The increase in inspection frequency shall apply until the subsequent inspections satisfy the criteria of Specification 5.5.9d.1.; the interval may then be extended to a maximum of once per 40 months; and

(continued)

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Tube Surveillance Program (continued)

3. Additional, unscheduled inservice inspections shall be performed on each steam generator in accordance with the first sample inspection specified in Table 5.5-2 during the shutdown subsequent to any of the following conditions:
 - a) Primary-to secondary tube leaks (not including leaks originating from tube-to-tube sheet welds) in excess of the limits of Specification 3.4.5.2, or
 - b) A seismic occurrence greater than the Operating Basis Earthquake, or
 - c) A loss-of-coolant accident requiring actuation of the Engineered Safety Features, or
 - d) A main steam line or feedwater line break.
- e. Acceptance Criteria
 1. As used in this specification:
 - a) Imperfection means an exception to the dimensions, finish, or contour of a tube from that required by fabrication drawings or specifications. Eddy-current testing indications below 20% of the nominal tube wall thickness, if detectable, may be considered as imperfections;
 - b) Degradation means a service-induced cracking, wastage, wear, or general corrosion occurring on either inside or outside of a tube;
 - c) Degraded Tube means a tube containing imperfections greater than or equal to 20% of the nominal wall thickness caused by degradation;
 - d) % Degradation means the percentage of the tube wall thickness affected or removed by degradation;
 - e) Defect means an imperfection of such severity that it exceeds the plugging limit. A tube containing a defect is defective;

(continued)

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Tube Surveillance Program (continued)

- f) Plugging Limit means the imperfection depth at or beyond which the tube shall be removed from service and is equal to 40% of the nominal tube wall thickness. This definition does not apply to that portion of the Unit 1 tubing that meets the definition of an F* tube. This definition does not apply to tube support plate intersections for which the voltage-based plugging criteria are being applied. Refer to 5.5.9e.1m) for the repair limit applicable to these intersections;
- g) Unserviceable describes the condition of a tube if it leaks or contains a defect large enough to affect its structural integrity in the event of an Operating Basis Earthquake, a loss-of-coolant accident, or a steam line or feedwater line break as specified in Specification 5.5.9d.3., above;
- h) Tube Inspection means an inspection of the steam generator tube from the tube end (hot leg side) completely around the U-bend to the top support of the cold leg;
- i) Preservice Inspection means an inspection of the full length of each tube in each steam generator performed by eddy current techniques prior to service to establish a baseline condition of the tubing. This inspection shall be performed prior to initial POWER OPERATION using the equipment and techniques expected to be used during subsequent inservice inspections;
- j) F* Distance (Unit 1 only) is the distance of the hardroll expanded portion of a tube which provides a sufficient length of non-degraded tube expansion to resist pullout of the tube from the tubesheet. The F* distance is equal to 1.13 inches, plus an allowance for eddy current measurement uncertainty, and is measured down from the top of the tubesheet, or the bottom of the roll transition, whichever is lower in elevation;
- k) F* Tube (Unit 1 only) is that portion of the tubing in the area of the tubesheet region below the F* distance with a) degradation below the F* distance equal to or greater than 40%, b) which has no indication of degradation within the F* distance, and c) that remains inservice;

(continued)

5.5 Programs and Manuals

- l) Hard Roll Expansion (Unit 1 only) is that portion of a tube which has been increased in diameter by a rolling process such that no crevice exists between the outside diameter of the tube and the hole in the tubesheet; and

- m) For Unit 1 only, the Tube Support Plate Plugging Limit is used for the disposition of alloy 600 steam generator tubes for continued service that are experiencing predominantly axially oriented outside diameter stress corrosion cracking confined within the thickness of the tube support plates and flow distribution baffle (FDB). At tube support plate intersections (and FDB), the plugging limit is based on maintaining steam generator tube serviceability as described below:
 - 1. Steam generator tubes, whose degradation is attributed to outside diameter stress corrosion cracking within the bounds of the tube support plate with bobbin voltages less than or equal to the lower voltage repair limit [1.0 volt], will be allowed to remain in service.

 - 2. Steam generator tubes, whose degradation is attributed to outside diameter stress corrosion cracking within the bounds of the tube support plate with the bobbin voltage greater than the lower voltage repair limit [1.0 volt], will be repaired, except as noted in 5.5.9e.1.m)3. below.

 - 3. Steam generator tubes with indications of potential degradation attributed to outside diameter stress corrosion cracking within the bounds of the tube support plate with a bobbin voltage greater than the lower voltage repair limit [1.0 volt] but less than or equal to the upper voltage repair limit*, may remain in service if a rotating pancake coil inspection does not detect degradation. Steam generator tubes, with indications of outside diameter stress corrosion cracking degradation with a bobbin voltage greater than the upper repair limit** will be plugged or repaired.

(continued)

* The upper voltage repair limit is calculated according to the methodology in GL 95-05 as supplemented.

** V_{URL} will differ at the TSPs and flow distribution baffle.

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Tube Surveillance Program (continued)

4. Certain intersections as identified in WPT-15949 will be excluded from application of the voltage-based repair criteria as it is determined that these intersections may collapse or deform following a postulated LOCA + SSE event.
5. If an unscheduled mid-cycle inspection is performed, the following mid-cycle repair limits apply instead of the limits identified in 5.5.9e.1.m)1., 5.5.9e.1.m)2., and 5.5.9e.1.m)3. The midcycle repair limits are determined from the following equations:

$$V_{MURL} = \frac{V_{SL}}{1.0 + NDE + Gr \frac{[CL - \Delta t]}{CL}}$$

$$V_{MLRL} = V_{MURL} - (V_{URL} - V_{LRL}) \frac{[CL - \Delta t]}{CL}$$

where:

- V_{URL} = upper voltage repair limit
- V_{LRL} = lower voltage repair limit
- V_{MURL} = mid-cycle upper voltage limit based on time into cycle
- V_{MLRL} = mid-cycle lower voltage repair limit based on V_{MLRL} and time into cycle
- Δt = length of time since last scheduled inspection during which V_{URL} and V_{LRL} were implemented
- CL = cycle length (the time between two scheduled steam generator inspections)
- V_{SL} = structural limit voltage
- Gr = average growth per cycle
- NDE = 95-percent cumulative probability allowance for nondestructive examination uncertainty (i.e., a value of 20-percent has been approved by the NRC)

Implementation of these mid-cycle repair limits should follow the same approach as in TS 5.5.9e.1.m)1., 5.5.9e.1.m)2., and 5.5.9e.1.m)3.

2. The steam generator shall be determined OPERABLE after completing the corresponding actions (plug all tubes exceeding the plugging limit and all tubes containing through-wall cracks) required by Table 5.5-2.

(continued)

5.6 Reporting Requirements (continued)

5.6.7 Not used

5.6.8 PAM Report

When a report is required by the required actions of LCO 3.3.3, "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

5.6.9 Not used

5.6.10 Steam Generator Tube Inspection Report

- a. Within 15 days following the completion of each inservice inspection of steam generator tubes, the number of tubes plugged or designated as an F* tube in each steam generator shall be reported to the Commission;
- b. The complete results of the steam generator tube inservice inspection shall be submitted to the Commission in a report within 12 months following the completion of the inspection. This report shall include:
 - 1) Number and extent of tubes inspected,
 - 2) Location and percent of wall-thickness penetration for each indication of an imperfection, and
 - 3) Identification of tubes plugged.
- c. Results of steam generator tube inspections which fall into Category C-3 shall be reported to the Commission pursuant to 10 CFR 50.72(b)(2) within four hours of initial discovery, and in a report within 30 days and prior to resumption of plant operation. This report shall provide a description of investigations conducted to determine cause of the tube degradation and corrective measures taken to prevent recurrence.

(continued)



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 71 TO

FACILITY OPERATING LICENSE NO. NPF-87

AND AMENDMENT NO. 71 TO

FACILITY OPERATING LICENSE NO. NPF-89

TXU ELECTRIC COMPANY

COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2

DOCKET NOS. 50-445 AND 50-446

1.0 INTRODUCTION

By application dated October 2, 1998, as supplemented by letters dated July 27 and August 26, 1999, TXU Electric Company (the licensee) requested changes to the Technical Specifications (TSs) for the Comanche Peak Steam Electric Station (CPSES), Units 1 and 2. The proposed changes would revise the TSs, for CPSES, Unit 1, to define the F* steam generator (SG) tube plugging criteria in TS 5.5.9, "Steam Generator (SG) Tube Surveillance Program," and associated reporting requirements in TS 5.6.10, "Steam Generator Tube Inspection Report."

The supplemental information provided in letters dated July 27 and August 26, 1999, was clarifying in nature and did not change the scope of the October 2, 1998, application and the initial proposed no significant hazards consideration determination.

2.0 BACKGROUND

General Design Criterion (GDC) 14, "Reactor Coolant Pressure Boundary," and GDC 31, "Fracture Prevention of Reactor Coolant Pressure Boundary," of Appendix A to Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR) state requirements applicable to maintaining adequate structural and leakage integrity for SG tubes. Regulatory Guide (RG) 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes," August 1976 (for Comment), provides guidance on acceptable minimum structural safety margins. The surveillance requirements in the CPSES, Units 1 and 2, TSs require periodic inspection of the SG tubes. If a tube is found to be defective (indications in excess of 40 percent through-wall), it is required to be removed from service.

SG tubes comprise a significant portion of the reactor coolant pressure boundary. Maintenance of this barrier is provided by the integrity of the SG tube wall and the tube-to-tubesheet connection. The connection between the tube and the tubesheet is an interference fit made by hard roll expanding or explosively expanding the tube into a bore through the tubesheet. The inelastically deformed SG tubes are held in place by the elastic springback of the tubesheet.

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Undegraded, the tube-to-tubesheet joint provides sufficient strength to maintain adequate structural and leakage integrity.

Industry experience has shown that defects have been developed in the tube-to-tubesheet joints. The NRC staff believes that hard rolled tubes having degradation in the joint may remain in service provided that the degradation is below a specified distance from the top of the tubesheet or the roll transition, whichever is lower, and that the undegraded portion of the SG tube in the joint can maintain adequate structural and leakage integrity under loadings from normal operation, anticipated operational transients, and postulated accident conditions.

The licensee's proposed amendment would allow the use of alternate repair criteria called F*, for tubes that were hard roll expanded into the tubesheet at CPSES, Unit 1, by specifying an F* distance within the tubesheet, below which indications of degradation would not affect the structural and leakage integrity of the SG tubes. As a result, hard roll expanded tubes with known degradation below the F* distance in the tubesheet would not require plugging or repair. The licensee supported its request with a Westinghouse report, WCAP-15004, "F* Tube Plugging Criterion for Tubes with Degradation in the Tubesheet Region of the Comanche Peak Unit 1 Steam Generators," December 1997. The licensee stated that the proposed changes will provide adequate assurance of SG tube integrity because the presence of the tubesheet in conjunction with the hard roll process significantly minimizes the potential for tube structural failure and primary-to-secondary leakage.

CPSES, Unit 1, is a Westinghouse four-loop pressurized water reactor with Model D4 SGs. Each SG contains 4578 mill-annealed, Inconel 600 tubes. The SGs at CPSES, Unit 1, were fabricated with most of the tubes receiving a full depth hard roll expansion in the tubesheet. Eddy current data from plants similar to CPSES, Unit 1, have shown a potential for primary water stress corrosion cracking (PWSCC) within the roll expansion portion of the tube in the tubesheet. Using the existing TS tube plugging limit for the length of the tube within the tubesheet may result in many of the tubes being plugged unnecessarily. The F* criteria does not apply to those SG tubes at CPSES, Unit 1, that have been full-depth expanded in the tubesheet using the Westinghouse explosive tube expansion process.

3.0 DISCUSSION

In order to demonstrate adequate structural margin for degraded SG tubes, the bases for the proposed SG tube repair criterion must address the limiting conditions during normal operation, anticipated operational occurrences, and postulated accident conditions. The margin of failure under normal operating conditions as recommended in RG 1.121 should not be less than three at any tube location. Under postulated accident conditions the margin to failure should not be less than 1.4 percent.

Structural loads imposed on the SG tube-to-tubesheet connections result primarily from the differential pressure between the primary and secondary sides of the tubes and the tubesheet. The peak postulated loading occurs during a steamline break due to a lowering of the secondary side pressure. However, normal operating loads, including cyclic joint loading from major plant transients (i.e., startup/shutdown) and potential thermal expansion loads, can also be significant. The analysis (WCAP-15004) supporting the licensee's proposed amendment addressed the limiting conditions necessary to maintain adequate SG tube integrity. Specifically, the tube must not experience excessive displacement relative to the tubesheet.

3.1 Testing to Determine F* Distance

The F* criteria provide for sufficient engagement of the tube-to-tubesheet hardroll such that forces that could be developed during normal or accident conditions would be successfully resisted by the elastic preload between the tube and the tubesheet. Below the F* distance, no significant axial SG tube forces will be transmitted further down the tube. Thus, the F* distance will be sufficient to anchor the tube in the tubesheet. The analysis in WCAP-15004 determined a distance, designated F* (which is measured from the secondary face of the tubesheet or the bottom of the hardroll, whichever is lower), below which tube degradation of any extent does not necessitate a repair of the affected hard rolled SG tube at CPSES, Unit 1.

In order to evaluate the applicability of any developed criterion for indications within the tubesheet, some postulated type of degradation must be considered. For this evaluation, it was conservatively postulated that a circumferential severance of the SG tube could occur at the F* location. This was accomplished by taking no credit for the undegraded SG tubing located below the F* distance. Implicit in the assumption of a circumferential tube severance is the consideration that degradation of any extent could be demonstrated to be tolerable below the F* location.

The assessment in WCAP-15004 determined the limiting axial tube loads under normal operating and accident conditions. In addition, the analysis determined the resistive capability of the hardroll interference fit to axial pullout as a function of the length of hardroll. The F* distance was determined by equating this to the maximum postulated loads with the appropriate safety factors applied. F* was determined to be equal to 1.13 inches. Verification that this value is significantly conservative was demonstrated by both pullout and hydraulic proof testing of tubes in tubesheet simulating collars.

The licensee's proposed TS changes designate a portion of the tube for which tube degradation in that region does not necessitate remedial action. The area subject to this change is the area below the F* distance. The licensee has proposed an F* distance of 1.13 inches plus an allowance for eddy current measurement uncertainty. The licensee stated that a sound roll expansion of 1.13 inches will ensure safety margins in the tubesheet region of the tube commensurate with that afforded by RG 1.121 for degradation located outside the tubesheet region.

3.2 Limitation of Primary-to-Secondary Leakage

The elastic preload between the tube and tubesheet not only prevents pullout of the tube from the tubesheet, but also provides a leak-tight barrier minimizing the potential for primary-to-secondary coolant leakage. With a sufficient length of hardroll, the tube-to-tubesheet connection will not allow any leakage under normal and faulted conditions. Therefore, an acceptable F* distance must be such that leakage integrity is not jeopardized during all analyzed conditions. Leakage through SG tubes is limited in the plant TSs.

An assessment of the primary-to-secondary leakage is included in WCAP-15004. The licensee evaluated the leakage effects of the F* criteria at operating conditions, postulated accident conditions, and postulated limiting conditions. The licensee concluded that through-wall degradation located below the F* distance is not expected to contribute to leakage due to the absence of a leak path as demonstrated by the hydraulic proof testing.

3.3 Inspection of F* Tubes

The F* distance determined in WCAP-15004 is the length of roll expanded tubing necessary to ensure adequate structural and leakage integrity. For field application of the proposed criteria, it is necessary to measure the F* distance using nondestructive examination (NDE) techniques and to verify the absence of detectable indication within this distance. The licensee proposes to inspect tubes utilizing the F* criteria using eddy current methods. A measurement error is introduced and consequently, the F* distance measurements will need to account for the NDE measurement error uncertainty. The NDE error is a function of the entire test system and data analysis. The licensee's methodology for determining the NDE measurement error uncertainty will include testing a representative sample of flawed SG tubes and determining the frequency distribution of the NDE measurement error. The allowance for the NDE measurement error will be based upon a 95 percent confidence value of the 95 percent tolerance limit of the aforementioned frequency distribution. The licensee stated that the acquisition techniques and data analysis guidelines used in the qualification will be equivalent to those used in the outage inspection. Consistent outage performance of the analysts will be accomplished by training the analyst in the methodology to be applied and by demonstrating that the performance of the analyst lies within the range of uncertainty to be applied to the F* distance measurement. The licensee has committed to describe this NDE uncertainty methodology in the Final Safety Analysis Report. The commitment is contained in the August 26, 1999, supplement to the October 2, 1998, application. The NRC staff finds that reasonable controls for the implementation and for subsequent evaluation of proposed changes pertaining to the above regulatory commitment are best provided by the licensee's administrative processes, including the commitment management program. The above regulatory commitment does not warrant the creation of a regulatory requirement (an item requiring prior NRC approval of subsequent changes).

4.0 EVALUATION

The licensee proposed the following changes in the TS to implement the F* repair criteria. The following will be added to TS Section 5.5.9, "Steam Generator (SG) Tube Surveillance Program:"

- c. Steam Generator F* Tube Inspection (Unit 1 only) - In addition to the minimum sample size as determined by Specification 5.5.9.b., all F* tubes will be inspected within the tubesheet region. The results of inspections of F* tubes identified in previous inspections will not be a cause for additional inspections per Tables 5.5-1 and 5.5-2.

TS Section 5.5.9.e, "Acceptance Criteria" would be revised to read as follows:

- f) Plugging Limit means the imperfection depth at or beyond which the tube shall be removed from service and is equal to 40% of the nominal tube wall thickness. This definition does not apply to that portion of the Unit 1 tubing that meets the definition of an F* tube;

- j) F* distance (Unit 1 only) is the distance of the hardroll expanded portion of a tube which provides a sufficient length of non-degraded tube expansion to resist pullout of the tube from the tubesheet. The F* distance is equal to 1.13 inches, plus an allowance for eddy current measurement uncertainty, and is measured down from the top of the tubesheet, or the bottom of the roll transition, whichever is lower in elevation;
- k) F* Tube (Unit 1 only) is that portion of the tubing in the area of the tubesheet region below the F* distance with a) degradation below the F* distance equal to or greater than 40%, b) which has no indication of degradation within the F* distance, and c) that remains inservice; and
- l) Hard Roll Expansion (Unit 1 only) is that portion of a tube which has been increased in diameter by a rolling process such that no crevice exists between the outside diameter of the tube and the hole in the tubesheet.

Sections j), k), and l) would be new sections.

TS Section 5.6.10, "Steam Generator Tube Inspection Report," will be revised to read as follows:

- a. Within 15 days following the completion of each inservice inspection of steam generator tubes, the number of tubes plugged or designated as an F* tube in each steam generator shall be reported to the Commission;

This change will require the licensee to include in its 15-day report to the NRC, the number of tubes designated as F* tubes in each SG.

In addition to the above changes, minor administrative changes were proposed in the TSs to accommodate revised TS numbering.

Based on its review of the licensee's proposed license amendment, the NRC staff has determined that the proposed TS changes will provide adequate assurance of SG tube integrity in that (1) the presence of the tubesheet in conjunction with the hard roll process significantly reduces the potential for SG tube structural failure and primary-to-secondary leakage, (2) the presence of the tubesheet constrains the tube and complements the integrity of the tube by minimizing the amount of deformation a tube can undergo beyond its expanded outside diameter, and (3) the proximity of the tube and tubesheet, due to the hard roll expansion, precludes primary-to-secondary leakage. Therefore, the NRC staff concludes that SG tubes can be left in service with eddy current indications exceeding the depth-based, 40 percent through-wall plugging criteria that are below the F* distance provided the SG tube is not degraded within the F* distance.

In summary, the proposed F* criteria permit SG tubes to remain in service with degradation in excess of the current plugging limit provided the degradation exists below the F* distance. The

F* distance is measured from the secondary face of the tubesheet or the bottom of the hard roll, whichever is lower. The staff concludes that the proposed F* criteria is acceptable for CPSES, Unit 1, because the licensee has demonstrated, through an acceptable qualification test program, that the F* criteria satisfies GDC 14 and the guidance in RG 1.121. Accordingly, the NRC staff concludes that the TS changes will adequately incorporate the F* criteria into the CPSES, Unit 1, TSs and will provide adequate assurance of SG tube integrity. Therefore, the NRC staff finds the proposed TS changes acceptable.

5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Texas State official was notified of the proposed issuance of the amendments. The State official had no comments.

6.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (64 FR 59597 dated November 4, 1998). The amendments also relate to changes in recordkeeping, reporting, or administrative procedures or requirements. Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9) and (10). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

7.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

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Date: September 22, 1999