

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

July 24, 2000

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES), UNIT 1 -
NUCLEAR REGULATORY COMMISSION BULLETIN 88-02, "RAPIDLY
PROPAGATING FATIGUE CRACKS IN STEAM GENERATOR TUBES" (TAC
NO. MA6181)

Dear Mr. Terry:

By letter dated March 23, 1988, TXU Electric (the licensee) responded to Nuclear Regulatory Commission (NRC) Bulletin 88-02, "Rapidly Propagating Fatigue Cracks in Steam Generator Tubes." The bulletin requested licensees (including CPSES, Unit 1) of plants with Westinghouse steam generators employing carbon steel support plates to take certain actions (specified in the bulletin) to minimize the potential for a steam generator tube rupture event caused by a rapidly propagating fatigue crack such as that which occurred at North Anna Unit 1 on July 15, 1987. Your response states that, "Should evidence of denting be found, the requirements of Bulletin Item C will be implemented." Bulletin Item C provides, in part, for the reporting of the assessment analyses of stability ratios for the most limiting tube locations which are comparable to that for the tube which ruptured at North Anna.

By letters dated July 21, 1999, and February 15, 2000, the licensee provided a supplemental response to Bulletin 88-02. The supplemental response provides a Westinghouse evaluation, WCAP-15009, Revision 0, of potential for high cycle fatigue rupture of a steam generator tube at CPSES, Unit 1 which is similar to that which occurred at North Anna Unit 1.

The NRC staff has evaluated the supplemental response and has concluded that the actions taken by the licensee fully resolve the issues identified in NRC Bulletin 88-02. The NRC staff's safety evaluation is enclosed.

Sincerely,

/RA/

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

Docket Nos. 50-445 and 50-446

Enclosure: Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO NRC BULLETIN 88-02,

"RAPIDLY PROPAGATING FATIGUE CRACKS IN STEAM GENERATOR TUBES,"

FOR FACILITY OPERATING LICENSE NO. NPF-89

TXU ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION, UNIT 1

DOCKET NO. 50-445

1.0 INTRODUCTION

By letter dated March 23, 1988, TXU Electric (the licensee) responded to Nuclear Regulatory Commission (NRC) Bulletin 88-02, "Rapidly Propagating Fatigue Cracks in Steam Generator Tubes." The bulletin requested licensees (including Comanche Peak Steam Electric Station (CPSES), Unit 1 of plants with certain Westinghouse steam generators employing carbon steel support plates to take specific actions to minimize the potential for a steam generator tube rupture event caused by a rapidly propagating fatigue crack such as that which occurred at North Anna Unit 1 on July 15, 1987. The response for CPSES, Unit 1, indicated that the baseline eddy current test performed in 1982 found no denting in the upper tube support region. In addition, the response stated that future eddy current test results would be examined for denting and that, "Should evidence of denting be found, the requirements of Bulletin Item C will be implemented." Bulletin Item C provides, in part, for the reporting of the assessment analyses of stability ratios for the most limiting tube locations which are comparable to that for the tube which ruptured at North Anna. In addition, the analyses would include an assessment of the depth of penetration of each anti-vibration bar (AVB) to establish which tubes are not supported by AVBs and to permit an assessment of flow peaking factors. Flow peaking factors are factors applied to stability ratios (the measure of potential for flow-induced tube vibration during service) and incorporate the effects of local flow velocity, density and void fraction due to non-uniform AVB insertion depths.

By letter dated July 21, 1999, the licensee provided a supplemental response to Bulletin 88-02. The supplemental response provides a Westinghouse evaluation, WCAP-15009, Revision 0, of potential for high cycle fatigue rupture of a steam generator tube at CPSES, Unit 1, which is similar to that which occurred at North Anna Unit 1 and states in part:

An evaluation of the potential for high cycle fatigue rupture of a steam generator [S/G] tube, similar to that which occurred at North Anna Unit 1, has been performed for Comanche Peak Unit 1 [CPSES Unit 2 steam generators are [Model] D5, and were not included in this evaluation]. Consistent with the requirements of NRC Bulletin 88-02, the anti-vibration bar configuration of the ruptured tube in North Anna, R9C51 S/G C, is used as the reference case for the tube fatigue usage calculations for Comanche Peak

Unit 1. The acceptability of unsupported tubes in the steam generators is based on tube specific analysis relative to the North Anna Unit 1 R9C51 tube, including the relative flow peaking factors. This evaluation was documented in WCAP-15009, Revision 0, "Comanche Peak Unit 1 Evaluation for Tube Vibration Induced Fatigue". Based upon the results of the fatigue analysis, all steam generator tubes except for two tubes in steam generator 3 are shown by calculation not to have the potential to experience high cycle fatigue failure similar to that which occurred at North Anna Unit 1. Those two tubes, R10C109 and R11C109, had cable dampers and plugs installed during the last refueling outage, which was the sixth refueling outage (1RF06). As a result of installing these cable dampers and plugs, no additional action is required for these tubes. This completes all the actions required by TXU Electric for the steam generators in CPSES Unit 1 as required by reference 1 [NRC Bulletin 88-02].

2.0 EVALUATION

The licensee reported that the evaluation of fall 1996 Eddy Current tapes showed minimal "corrosion with magnetite" with only small amounts of magnetite being identified in two steam generators, and none in the other two. No tubes were recommended for corrective actions based on this data. In response to the evidence of minor denting, the licensee performed an evaluation of the potential for high cycle fatigue similar to that which occurred at North Anna Unit 1. For conservatism in the evaluation, all of the tubes were postulated to be dented. The overall conclusion of the analysis was that two tubes were recommended for preventive action: SG-3 R10C109 and SG-3 R11C109. Both tubes had cable dampers and plugs installed during the last refueling outage (1RF06).

The evaluation is described in Westinghouse Reports WCAP-15009, Revision 0, (Proprietary Version) and WCAP-15010, (Non-proprietary version) which were submitted with the licensee's letter dated July 21, 1999. Based on a review of these documents, the staff concluded that these reports implement the Westinghouse generic program and methodology previously reviewed by the NRC staff. These reports provided analyses which included an assessment of stability ratios (the measure of potential for flow-induced tube vibration during service) for the most limiting tube locations comparable to the tube which ruptured at North Anna and an assessment of the depth of penetration of each AVB.

The NRC staff documented its evaluation of the Westinghouse generic program and methodology in a Safety Evaluation (SE), "Evaluation of Westinghouse Methodology to Address Item C.2 of NRC Bulletin 88-02," transmitted to Westinghouse by letter dated October 2, 1988. In this SE, the NRC staff concluded that this program and methodology are an acceptable approach for resolving Item C.2 of the bulletin. In the event of denting, Bulletin Item C.2 provides for the reporting of the assessment analyses of stability ratios for the most limiting tube locations which are comparable to that for the tube which ruptured at North Anna. The staff further concluded that the program, if properly implemented, will provide reasonable assurance against further failures of the kind which occurred at North Anna Unit 1. Consistent with the recommendations in the NRC staff's SE, the licensee informed the NRC, by letter dated February 15, 2000, that administrative controls currently exist to ensure that updated stress ratio and fatigue usage calculations are performed in the event of any significant changes to the steam generator operating parameters (e.g., steam flow and pressure, circulation ratio) relative to the reference parameters assumed in WCAP-15009 analyses. This SE incorporates the NRC staff's generic evaluation by reference.

3.0 CONCLUSIONS

Based on its evaluation, the NRC staff concludes that the evaluation provided by the licensee to resolve the issues identified in Bulletin 88-02 is acceptable. The analyses indicate that there is reasonable assurance that rapidly propagating fatigue cracks of the type which occurred at North Anna Unit 1 should not occur at CPSES, Unit 1. In the event of any significant changes to the steam generator operating parameters (e.g., steam flow and pressure, circulation ratio) relative to the reference parameters assumed in the WCAP-15009 analysis, administrative controls by the licensee will ensure that updated stress ratio and fatigue usage calculations are performed and appropriate corrective actions implemented.

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Date: July 24, 2000

Comanche Peak Steam Electric Station

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