

February 5, 2002

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

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION, UNIT 2: RE REQUEST TO  
REVISE REACTOR PRESSURE VESSEL MATERIAL SURVEILLANCE  
PROGRAM SCHEDULE (TAC NO. MB2761)

Dear Mr. Terry:

By letter dated August 16, 2001, TXU Electric (subsequently renamed TXU Generation Company LP, the licensee) submitted its revised reactor vessel material surveillance program withdrawal schedule for Comanche Peak Steam Electric Station (CPSES), Unit 2, which is based on the American Society for Testing and Materials (ASTM) E 185-70 recommendations. The change requested was a delay in withdrawing the surveillance capsule (located in the reactor pressure vessel), for CPSES, Unit 2. No changes were requested for the CPSES, Unit 1, capsule withdrawal schedule. The specific change for the CPSES, Unit 2, was to change the withdrawal time for Capsule X from eight effective full power years (EFPY) to nine EFPY.

The U.S. Nuclear Regulator Commission (NRC) staff has completed its review of the licensee's submittal and noted that the proposed withdrawal and testing schedule of this capsule is in accordance with the recommendations of the ASTM E 185-70 Code. The NRC staff has independently verified that the proposed withdrawal schedule for the CPSES reactor pressure vessel surveillance program capsule complies with the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix H. The NRC staff's safety evaluation is enclosed.

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 and 50-446

cc: See next page

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Comanche Peak Steam Electric Station

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST TO REVISE THE REACTOR PRESSURE VESSEL

MATERIAL SURVEILLANCE CAPSULE WITHDRAWAL SCHEDULE

FACILITY OPERATING LICENSE NPF-89

TXU GENERATION COMPANY LP

COMANCHE PEAK STEAM ELECTRIC STATION, UNIT 2

DOCKET NO. 50-446

1.0 INTRODUCTION

By letter dated August 16, 2001, TXU Electric (subsequently renamed TXU Generation Company LP, the licensee) submitted its revised reactor pressure vessel (RPV) material surveillance program withdrawal schedule for Comanche Peak Steam Electric Station (CPSES), Unit 2, which is based on the American Society for Testing and Materials (ASTM) E 185-70 recommendations. The change requested was a delay in withdrawing the surveillance capsule (located in the RPV), for CPSES, Unit 2. No changes were requested for the CPSES, Unit 1, capsule withdrawal schedule. The specific change for the CPSES, Unit 2, was to change the withdrawal time for Capsule X from eight effective full power years (EFPY) to nine EFPY.

2.0 BACKGROUND

Appendix H of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50 requires a material surveillance program to monitor changes in the fracture toughness properties of ferritic materials in the RPV beltline region which result from exposure of these materials to neutron irradiation and the thermal environment. Under this program, fracture toughness test data is obtained and analyzed from material specimens exposed in surveillance capsules which are withdrawn periodically from the RPV. Test results must be reported to the U. S. Nuclear Regulatory Commission (NRC) within one year of the date of capsule withdrawal. Also, Section III.B.3 of Appendix H of 10 CFR Part 50 requires the capsule withdrawal schedule to be approved by the NRC prior to implementation.

The design of the surveillance program and the withdrawal schedule must meet the requirements of the edition of ASTM E 185 that is current on the issue date of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) to which the RPV was purchased. The RPV surveillance programs for the CPSES units were initially established in accordance with ASTM E 185-70. This edition of the ASTM standard was in effect on the issue date of Section III of the ASME Code (1971) to which the CPSES, Units 1 and 2, RPVs were fabricated.

The surveillance capsule withdrawal schedule and testing criteria for ASTM E 185-70 recommends that sets of specimens be withdrawn at three or more separate times. It specifically recommends that one of the data points obtained shall correspond to the neutron exposure of the RPV at no greater than 30 percent of its design life. There is no specific requirement for when the data point shall be obtained for the second capsule; the third data point obtained shall correspond to the neutron exposure of the RPV near the end of its design life.

### 3.0 EVALUATION

Prior to initial licensing of CPSES, the licensee and Westinghouse Electric Company developed an overall plan for the withdrawal and analysis of the RPV material surveillance capsule at CPSES. The first surveillance capsules for Units 1 and 2 (Capsule U) were withdrawn and post-irradiation embrittlement tests were performed. Results from the embrittlement tests and capsule dosimeters suggested that RPV beltline material Adjusted Reference Temperature - Nil-ductility Temperature ( $ART_{NDT}$ ) values would remain below 100 °F at end-of license (EOL) neutron exposure, and the limiting material in both the units would not be highly susceptible to irradiation damage. Results from evaluation of the second capsule removed from Unit 1 (Capsule Y) confirmed these findings.

In light of the favorable embrittlement test results obtained from the analysis of the withdrawn capsules, the licensee requested the NRC to allow revising the original capsule withdrawal schedule for CPSES, Units 1 and 2, and to remove only three capsules over the life of each RPV. The request was granted by the NRC by letter dated August 9, 2000. The revised capsule withdrawal schedule is shown in the Pressure and Temperature Limits Report (PTLR) for the respective CPSES units. The revised withdrawal schedule did not impact the pressure and temperature limit curves located in the PTLRs. These limit curves satisfy the requirements of 10 CFR Part 50, Appendix G, and remain applicable up to 16 EFPY for both CPSES units.

The first capsules (both designated Capsule U) for both CPSES units were withdrawn at 0.9 EFPY, thus satisfying the ASTM E 185-70 recommendation to obtain one data point corresponding to the neutron exposure of the RPV at no greater than 30% of its design life. The capsule neutron fluence for CPSES, Unit 1, was  $3.70 \times 10^{18}$  neutrons per centimeter squared ( $n/cm^2$ ), and the capsule neutron fluence for CPSES, Unit 2, was  $3.28 \times 10^{18} n/cm^2$ . The second capsule for Unit 1 (Capsule Y) was withdrawn at 6.25 EFPY, and that for Unit 2 (Capsule X) is scheduled for withdrawal at 8 EFPY. This schedule would meet the ASTM E 185-70 recommendation for the second capsule to be withdrawn and tested (note that ASTM E 185-70 does not outline any specific requirement for when the data point shall be obtained for the second capsule). The third capsules for Unit 1 (Capsule X) and Unit 2 (Capsule W) are scheduled to be withdrawn and tested at 13 EFPY and 14 EFPY, respectively. The recommendation of ASTM E 185-70 for the third capsule is that the third data point obtained shall correspond to the neutron exposure of the RPV near the end of its design life.

Accumulated radiation damage is reflected as an upward shift in the  $ART_{NDT}$ . Under the rules of 10 CFR 50.61, the pressurized thermal shock (PTS) screening criteria for plate material, reference temperature ( $RT_{PTS}$ ) is 270 °F at EOL. Before vessel-specific data was available,  $ART_{NDTs}$  were forecast using the methodology of 10 CFR 50.61 and Regulatory Guide 1.99, Revision 2. In 1992, the EOL  $RT_{PTS}$  for the Unit 1 vessel was forecast to be 100 °F; three years later the EOL  $RT_{PTS}$  for the Unit 2 vessel was forecast to be 94 °F. The corresponding shifts in reference temperature ( $\Delta RT_{PTS}$ ) were forecast to be 66 °F for the Unit 1 vessel and 50 °F for

the Unit 2 vessel. The forecast  $\Delta RT_{PTS}$  show both the CPSES Unit 1 and Unit 2 RPVs have very substantial margins against PTS (based on the 270 °F screening criteria), which translates into substantial fracture toughness margins.

Analysis of material in surveillance capsules adds assurance that the forecast  $\Delta RT_{PTS}$  are an "upper-bound" for the vessel-specific reference temperatures. Changes in the CPSES fuel management strategies and core designs have tended to lower the neutron exposure in the RPV beltline region. Results from the surveillance capsule dosimetry show the rate at which fluence is accumulating in the RPV beltline region is at or possibly below initial projections.

With the implementation of 18-month fuel cycles and shorter refueling outages, the capacity factor at CPSES has increased to approximately 93%. This increased capacity factor is considerably higher than the 80% capacity factor utilized in determining the present capsule withdrawal schedule for CPSES. The capacity factor of 93% for the CPSES units places EOL at 37.2 EFPY, based on the current plant license of 40 years (40 years x 0.93). With the present capsule withdrawal schedule for CPSES, Unit 2, the post-irradiation tests of Capsule X (scheduled for withdrawal at 8 EFPY) will provide embrittlement and dosimetry results that would be projected to 32.8 EFPY [8 EFPY x Capsule X Lead Factor (4.10)]. The heatup and cooldown curves in the current PTLR are intended to be replaced at 16 EFPY, and replacement curves would be needed for both units before the end of this period. In order to cover the current estimated EOL of about 37 EFPY, a delay in the withdrawal of the second Unit 2 surveillance capsule until 9.1 EFPY is proposed. This delay in the withdrawal will allow the licensee to use RPV specimens that have been exposed to a more representative fluence to generate replacement cooldown and heatup curves.

The scheduled withdrawal of the third capsules from Units 1 and 2 at 13 EFPY and 14 EFPY, respectively, will provide the necessary data needed to generate heatup and cooldown curves beyond 37 EFPY, in the event a plant life extension is pursued for CPSES in the future. In addition, there are three standby capsules in the RPV of each unit that could be used to supplement the scheduled capsule withdrawals, if necessary.

The NRC staff independently verified that the proposed capsule withdrawal and testing schedule for the capsules of the CPSES, Unit 2, RPV surveillance program are in accordance with the recommendations of ASTM E 185-70. The NRC staff has independently verified that the proposed withdrawal schedule for the capsules for the CPSES, Unit 2, RPV surveillance program complies with the requirements of 10 CFR Part 50, Appendix H.

#### 4.0 CONCLUSION

Based on the NRC staff's review of the licensee's August 16, 2001, submittal, the NRC staff found that the revised withdrawal schedule for the CPSES, Unit 2, RPV material surveillance program capsule satisfies the requirements of Appendix H to 10 CFR Part 50 and is, therefore, acceptable.

Principal Contributor: E. Andruszkiewicz

Date: February 5, 2002