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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 73 TO

FACILITY OPERATING LICENSE NO. NPF-87

AND AMENDMENT NO. 73 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 February 27, 1998, as supplemented by letters dated June 10, 1998, and October 22, 1999, TXU Electric Company (the licensee), requested changes to the Technical Specifications (TS) for the Comanche Peak Steam Electric Station (CPSES), Units 1 and 2. The proposed changes would change the refueling water storage tank (RWST) low-low level setpoints in TS Table 3.3.2-1, "Engineered Safety Feature Actuation System Instrumentation," to increase the volume of water available to containment spray pumps (CSP) when the containment spray system (CSS) switches to the recirculation mode of operation. The October 22, 1999, supplement only provided clarifying information that did not change the NRC staff's initial proposed no significant hazards consideration determination and did not expand the application beyond the scope described in the original notice.

2.0 BACKGROUND

During a loss-of-coolant accident (LOCA) in a pressurized water reactor (PWR), water discharged from the break will collect on the containment floor and within the emergency sump. The PWR emergency core cooling system (ECCS) pumps and the CSP initially draw water from the RWST. Switchover of these pumps to the emergency sump initiates the long-term cooling (LTC) circulation.

In the CPSES plant, the RWST low-low level setpoints specified in TS Table 3.3.2-1 automatically initiate opening of the residual heat removal (RHR) emergency sump isolation valves. The operator, upon receipt of the RWST low-low level signal, is required to immediately follow the instructions in the LTC circulation switchover procedure. The procedure requires the operator to initiate ECCS pump switchover. After completion of ECCS pump switchover, the operator then initiates the CSP switchover. Sufficient water inventory in the RWST should be available to CSP during the switchover to avoid pump cavitation.

During an engineering review conducted in March 1997, the licensee identified that the completion time for the CSP switchover was longer than the time assumed in the original calculation used to support the switchover procedure. The licensee showed that, with the correct CSP switchover time, the water inventory in the RWST corresponding to the current TS low-low level setpoints was insufficient for the operator to complete both ECCS pump and CSP switchover without stopping the CSP to prevent cavitation. The licensee assessed the adequacy of the option that allowed the operator to stop the CSP and then restart them after the valves used for the CSP operation were aligned. The licensee concluded that the option was inconsistent with the assumptions used in the CPSES design basis analyses, which included the containment heat removal (for LOCA and main steam line break) and the offsite radiological dose calculations. In addition, stopping the CSP for switchover would increase the likelihood of their malfunction through a subsequent failure to restart. To ensure sufficient water in the RWST to support operation of both ECCS pumps and CSP throughout the switchover, the licensee proposed TS changes to increase the RWST low-low level setpoint from "≥40 percent"[1] to "≥45 percent"[2] of the RWST level instrument span for CPSES, Units 1 and 2. The proposed TS changes will increase the available water volume in the RWST for the operator to complete the switchover procedure. In support of the proposed TS changes, the licensee provided support analyses in the February 27, 1998, application, and in the October 22, 1999, response to the NRC staff's request for additional information (RAI).

3.0 EVALUATION

The staff evaluated the adequacy of the licensee's supporting analysis and determined the acceptability of the proposed TS. The evaluation includes the staff's review of the analysis supporting the LTC circulation switchover procedure. The staff also reviewed the licensee's conclusions concerning the adequacy of the net-positive suction head (NPSH) calculations for the RHR pumps and the CSP.

3.1 Supporting Analysis for the LTC Circulation Switchover Procedure

In the CPSES plant, the LTC circulation switchover is accomplished semiautomatically. Following the RWST low-low level actuation signal, the RHR emergency sump isolation valves automatically open. Upon receipt of the RWST low-low level signal, the operator is required to immediately follow the instructions in the LTC circulation switchover procedure. The procedure instructs the operator to align the suction of the RHR pumps to the emergency sump by closing the isolation valves to the RWST and to align the suction of the charging and safety injection pumps to the discharge side of the RHR pumps, thereby assuring an available suction source for all ECCS pumps. After completion of the ECCS pumps switchover, the operator is required to initiate switchover of the CSP from the RWST to the containment sump and complete the switchover before the RWST level reaches six percent of instrument span. The licensee's procedures require stopping the CSP at six percent of RWST level instrument span.

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[1] The actual, current, TS setpoints are 38.9 percent for CPSES, Unit 1 and 39.1 percent for CPSES, Unit 2 to reflect various uncertainties.

[2] The actual, proposed, TS setpoints are 43.9 percent for CPSES, Unit 1 and 44.1 percent for CPSES Unit, 2 to reflect various uncertainties.

The licensee performed RWST level setpoint calculations to show that the RWST volume between the proposed RWST low-low level setpoints and the six percent level was sufficient to complete the RWST to sump switchover without stopping the CSP. In the analysis, the licensee assumed the same values for the important plant parameters (such as initial RWST water inventory, injection flow rates of the RHR pumps and CSP, and ECCS valve operating times) used in the original design basis calculations and followed the steps specified in the existing switchover procedure. The licensee also made the following assumptions:

- The RWST low-low level setpoints were changed from 40 percent to 45 percent of the RWST level instrumentation span to reflect the proposed TS values.

- The time of 170 seconds (changed from 60 seconds in the existing calculation) was assumed to complete the switchover of the containment spray from the RWST to the containment sump. This switchover time reflects 50 seconds required to open the valves between the emergency sump and the CSP and 120 seconds required to close the valves between the RWST and the CSP.

- The switchover of the CSP was initiated after completion of the ECCS pump switchover and at the RWST level of 24 percent of the RWST level instrument span (as opposed to "after the RWST empty alarm" specified in the current switchover procedure.)

- The worst single failure is that one of the RWST to RHR pump isolation valves fails to close on demand.

The licensee presented the analytical results in the October 22, 1999, response to the staff RAI. The information includes: (1) the time of initiation and completion of each automatic or operator action relevant to switchover following a LOCA, (2) a description of automatic or operator action and the reason for the action, and (3) water level and volume in the RWST and the emergency sump at each specified time. Since the licensee's analysis shows that with the proposed RWST low-low level setpoints, the LTC circulation switchover can be completed before the RWST reaches the six percent level without stopping the CSP, the staff concludes that the analysis is acceptable.

The CPSES Updated Final Safety Analyses Report (UFSAR) specifies that before the operator's actions, the ECCS injection should be maintained for at least 10 minutes. Changing the RWST low-low level setpoints from 40 percent to 45 percent results in a reduced ECCS injection water volume prior to switchover. The licensee's analysis shows that by raising the RWST low-low level setpoints by 5 percent (from 40 percent to 45 percent), the available ECCS injection water is reduced by 25,000 gallons. With an assumption of the reduced ECCS injection water, the licensee showed that the ECCS injection would continue for at least 10 minutes before the water level in the RWST decreases to the low-low level setpoints and the operator begins to perform the switchover procedure. Therefore, the staff concludes that the proposed TS changes do not affect the required ECCS injection time.

3.2 Available NPSH for RHR and CSP

The licencee evaluated the effect of the proposed TS changes on the available NPSH for the RHR pumps. Changing the RWST low-low level setpoints from 40 percent to 45 percent causes an earlier ECCS circulation switchover. As a result, the calculated minimum water level

in the containment at the time of switchover is reduced by 6 inches. The licensee stated, and the staff concluded, that the calculated, available, NPSH is greater than the required NPSH for the RHR pumps because: (1) the calculated minimum water level is above the containment floor elevation, and (2) the original NPSH analysis shows that for the case with the water level at the containment floor elevation and the RHR flow at runout, the calculated available NPSH is 5 feet greater than the required NPSH. The staff therefore concludes that the available NPSH is sufficient for safe operation of the RHR pumps without pump cavitation.

The licensee also assessed the potential for RHR pump damage due to vortexing. In the CPSES plant, each RHR and CSP suction pipe has a conical intake to prevent cavitation and is covered by a grating cage to protect against vortexing. The licensee applied the results of previously-performed testing to show that the containment water level at the time of the RHR switchover is sufficiently high that vortexing will not occur. The testing used a full scale model and was performed in 1981 by the licensee to show the effectiveness of the grating cage, an anti-vortex device, for the CPSES sump design. The results of the testing showed that, for flow rates of up to 8858 gpm, through a single suction line, the water level was reduced by approximately 3.2 inches. Since the maximum RHR runout flow of 4900 gpm is less than the testing flow rate of 8858 gpm, and the calculated minimum water level of 8 feet 3 inches above the sump is much greater than the observed water level drop of approximately 3.2 inches, vortexing will not occur at the sump elevation. Therefore, the staff concludes that the RHR pumps can operate safely without cavitation caused by vortexing.

In the licensee's October 22, 1999, response to the staff's RAI, the licensee stated that the available NPSH for the CSP is calculated from the sparger in the RWST. Using this elevation, the required NPSH is less than the available NPSH over the whole operating range of the CSP operation. The licensee also stated that the available NPSH is greater than the required NPSH for suction from the sump prior to switchover to the sump. This is shown in Figure 6.2.2-2 of the CPSES UFSAR. The licensee also stated in the October 22, 1999, response to the staff's RAI that the 1981 flow tests also confirmed the antivortexing design of the CSP.

3.3 Proposed Changes to the TSs

Based on its review, the staff concludes that the licensee's analyses are adequate to support the proposed changes that increase the setpoints for RWST low-low level setpoints from 40 percent (or 38.9 percent for Unit 1 and 39.1 percent for Unit 2 with uncertainties) to 45 percent (or 43.9 percent for Unit 1 and 44.1 percent for Unit 2 with uncertainties) of the RWST level instrument span specified in TS Table 3.3.2-1. The supporting analyses have provided reasonable assurance that: (1) the water supply corresponding to the RWST low-low level setpoint is sufficient for the operator to complete both ECCS pump and CSP switchover without turning off the CSP, (2) the ECCS injection will continue for at least 10 minutes before the operator initiates the LTC circulation switchover, and (3) the RHR pumps and CSP will operate with adequate available NPSH to avoid pump cavitation. Therefore, the staff concludes that the proposed changes to TS Table 3.3.2-1, with respect to the RWST low-low level setpoints, are acceptable.

4.0 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.

5.0 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 (63 FR 38205 dated July 15, 1998). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). 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.

6.0 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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