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CP-200700156
Log # TXX-07172

Ref. # 10CFR50.90

December 5, 2007

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)
DOCKET NOS. 50-445 AND 50-446
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION RELATED TO LICENSE AMENDMENT REQUEST (LAR) 07-001 REVISION TO TECHNICAL REQUIREMENTS MANUAL 13.3.33 "TURBINE OVERSPEED PROTECTION" SURVEILLANCE REQUIREMENTS FOR THE TURBINE STOP AND CONTROL VALVES

REFERENCES:
1. TU Electric letter, logged TXX-92503, from William J. Cahill, Jr. (Luminant Power) to the U.S. NRC dated November 10, 1992
2. TXU Power letter, logged TXX-07081, from Mike Blevins (Luminant Power) to the U. S. NRC dated May 22, 2007
3. Letter from Balwant Singal (U. S. NRC) to Mike Blevins (Luminant Power) dated December 3, 2007

Dear Sir or Madam:

In Reference 1, Comanche Peak Steam Electric Station, herein referred to as Comanche Peak Nuclear Power Plant (CPNPP), requested to revise the frequency of turbine valve testing from every 14 days to every six weeks and was subsequently approved by the Nuclear Regulatory Commission (NRC).

In 1999, Luminant Power (formerly know as TXU Electric and later as TXU Power) adopted the Nuclear Regulatory Commission (NRC) recommendations of NUREG-1366 by pursuing quarterly Surveillances for the CPNPP Units 1 and 2 turbine valves. The NUREG was written to support the efforts of the Improved Standard Technical Specifications of which CPSES had implemented. As discussed in NUREG-1366, the NRC identified that turbine valve testing should be increased as much as from weekly to quarterly without prior staff approval resulting in a substantial safety benefit by trip reduction. Upon implementation of the Improved Standard Technical Specifications for CPNPP and the turbine valve surveillance, turbine testing requirements were relocated into the Technical Requirements Manual (TRM) and under the control of 10CFR50.59.

In Reference 2, CPNPP requested to revise the turbine valve surveillance testing from 12 weeks to 26 weeks. In Reference 3, the NRC requested additional information (RAIs) based on Reference 2 which is provided in the Attachment to this letter.

In accordance with 10CFR50.91, a copy of this submittal is being provided to the designated Texas State official.



A001
NRR

Should you have any questions, please contact Ms. Tamera J. Ervin-Walker at (254) 897-6902.

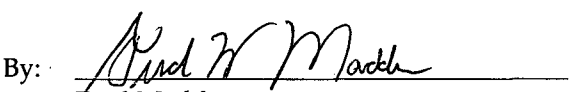
I state under penalty of perjury that the foregoing is true and correct.

Executed on December 5, 2007.

Sincerely,

Luminant Generation Company LLC

Mike Blevins

By: 

Fred Madden
Director, Oversight & Regulatory Affairs

Attachment

c - E. E. Collins, Region IV
B. K. Singal, NRR
Resident Inspectors, CPNPP

Ms. Alice Rogers
Environmental & Consumer Safety Section
Texas Department of State Health Services
1100 West 49th Street
Austin, Texas 78756-3189

ATTACHMENT TO TXX-07172

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION RELATED TO LICENSE AMENDMENT REQUEST (LAR) 07-001 REVISION TO TECHNICAL REQUIREMENTS MANUAL 13.3.33 "TURBINE OVERSPEED PROTECTION" SURVEILLANCE REQUIREMENTS FOR THE TURBINE STOP AND CONTROL VALVES

**NRC Question 1:**

**It was stated on Page 6 of the submittal that, "the upgraded Turbine Overspeed Protection System is redundant and diverse and most of the devices are tested on line at least once a day." Confirm whether this upgrade was considered in the $P_{10}$ (probability of a runaway due to a failure of the Overspeed Protection System) calculation. Provide sufficient details for staff review if this upgrade is considered quantitatively.**

**CPNPP Response:**

The Turbine Overspeed Protection System upgrade was included in the $P_{10}$ calculation. System failure probabilities were calculated and documented in a plant specific evaluation of the Comanche Peak protection and trip system, as summarized in Appendix A, including analysis of the system and reliability of the steam turbine protection and trip systems for the plant based on test cycles for the valves of 26 weeks (semi-annually).

The resulting system failure probabilities were then incorporated into the $P_1$ missile analysis as summarized in Appendix B. The calculated probabilities were performed at 100,000 hours inspection interval. The $P_1$ probability was found to be below 1E-4/year.

**NRC Question 2 (Part 1):**

**It was stated on Page 14 of the submittal that, "[except for the 26-week testing interval,] all other variables remain the same as in the previous analysis on which the current testing interval of 12 weeks is based." Confirm that both the previous and the proposed analyses are based on the plant-specific turbine information reflecting all turbine modifications (retrofits) made in the Comanche Peak Units.**

**CPNPP Response:**

The plant specific missile probability report incorporates the current HP and LP turbine design, the digital overspeed trip system, and the planned HP turbine retrofit for uprate conditions.

**NRC Question 2 (Part 2):**

**List all deviations of the current methodology, if they exist, from the methodology approved by the staff on July 22, 2003, regarding Siemens Westinghouse Power Corporation's missile analysis methodology for General Electric nuclear steam turbine rotors and justify their adequacy.**

**CPNPP Response:**

No changes were made to the methodology approved by the NRC staff on July 22, 2003.

## Appendix A

### PROBABILITY OF A RUN-AWAY OVERSPEED >120% ($P_{10}$)

Run-away overspeed events >120% are due to failure of the overspeed protection system which consists of speed monitoring devices, trip devices and fast closure of steam stop and control valves. The Comanche Peak Units 1 and 2 control system components that protect against overspeed events are being upgraded with a new digital overspeed trip protection system, which is documented in re-evaluated report ER-504. This document provides the individual system failure probabilities for an overspeed event >120% of rated speed for a 4-flow turbine as tabulated below.

A study was performed by Siemens to analyze the safety and reliability of the steam turbine protection and trip systems of the Comanche Peak nuclear power plant with test cycles for the valves of 26 weeks (semi-annually).

| | System Failure Probability | | | |
|---|---|---|---|---|
| | Original ER-504 | Re-evaluated ER-504 | | |
| Valve Test Frequency | Bi-weekly | Bi-weekly | Quarterly | Semi-annually |
| Load Rejection | 8.040E-8 | 4.937E-8 | 1.592E-6 | 6.814E-06 |
| No Load | 8.216E-8 | 4.937E-8 | 1.593E-6 | 6.816E-06 |
| Extraction System | 4.020E-8 | 4.020E-8 | 4.020E-8 | 4.020E-08 |
| Total | 2.1E-7 | 1.39E-7 | 3.23E-6 | 1.37E-05 |

Siemens evaluates nuclear and fossil unit control systems together due to common control components, with the older fossil units adding conservatism. Based on upper confidence limit evaluations, the following overspeed probability values are used for typical valve test frequencies.

| Valve Test Frequency | Probability of Overspeed $Yr^{-1}$ ($P_{10}$) Per Original ER-504 | Probability of Overspeed $Yr^{-1}$ ($P_{10}$) With New Digital Overspeed Trip System per Re-evaluated ER-504 |
|---|---|---|
| Bi-Weekly | 2.1E-7 | 1.39E-7 |
| Monthly | 9.0E-7 | |
| Quarterly | 3.0E-6 | 3.23E-6 |
| Semi-annually | | 1.37E-5 |

Note: Original ER-504 was submitted to the NRC during the initial licensing process and provided as documentation as part of the July 22, 2003 staff assessment. Re-evaluated ER-504 with new digital overspeed trip system was prepared in support of the current 26 week valve test frequency submittal.

Based on the above factors, the Comanche Peak Unit 1 and 2 value is $P_{10}$ = 1.37E-5 per year for semi-annual (26 weeks) valve test intervals.

## Appendix B

## CALCULATIONS FOR THE 100,000 HOURS INSPECTION INTERVAL

Assumptions:

1. Initial Crack Size = 0 mm
2. Overspeed Protection Valve test frequency: semi-annual
3. One year = 8760 hours.
4. $P_{1r}$= 1.0, $P_{20}$=1.0, $P_{30}$ = 1.0, for all disks.

| ITEM | DISK 1 | DISK 2 | DISK 3 | DISK 4 | METHODOLOGY |
|---|---|---|---|---|---|
| $P_{2ri}$ | 1.6E-3 | 1.6E-3 | 1.6E-3 | 1.6E-3 | |
| $P_{2rg}$ | 8.07E-1 | 6.20E-2 | 1.88E-2 | 2.15E-2 | |
| $P_{2r}$ | 1.29E-3 | 9.92E-5 | 3.01E-5 | 3.44E-5 | $P_{2r} = P_{2ri} * P_{2rg}$ |
| $P_{3r}$ | 1E-6 | 1E-6 | 1E-6 | 1E-6 | |
| $P_r$ | 1.29E-9 | 9.92E-11 | 3.01E-11 | 3.44E-11 | $P_r = P_{1r} * P_{2r} * P_{3r}$ |

Note: Further details and explanations of the terms can be found in the plant specific missile probability report.

$P_{10}$ = @ 1.37E-5 per year for 100,000 hours = 1.56E-4 at 100,000 hours

$P_{2r}$ per Unit = 4 * $\sum$ $P_{2r}$ (@ 2 ends per rotor x 2 rotors per Unit) = 5.82E-3 at 100,000 hours

$P_r$ per Unit = 4 * $\sum$ $P_r$ (@ 2 ends per rotor x 2 rotors per Unit) = 5.82E-9 at 100,000 hours

$P_1 = P_r$ per Unit + $P_{10} * P_{20} * P_{30}$ = 5.82E-9 + 1.56E-4 * 1.0 * 1.0 = 1.56E-4 at 100,000 hours

$P_1$ Limit = @ 1E-4 per year for 100,000 hours = 11.42E-4 at 100,000 hours

Since 1.56E-4 at 100,000 accumulated hours is less than 11.42E-4 at 100,000 accumulated hours, $P_1$ is less than the $P_1$ limit of 1E-4 per year for 100,000 hours.[1], [2]

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[1] NRC Guide NUREG-1048 Table U1

[2] SWPC Topical Report: Engineering Report TP-03143 (Unrestricted), "Missile Analysis Methodology for GE Nuclear Steam Turbine Rotors by the SWPC", July 31, 2003, Siemens Westinghouse Power Corporation.

NRC Acceptance Letter: Safety Evaluation for Acceptance of Referencing the Siemens Westinghouse Topical Report, "Missile Analysis Methodology for General Electric (GE) Nuclear Steam Turbine Rotors by the Siemens Westinghouse Power Corporation (SWPC)", TAC No. MB5679, July 22, 2003.

NRC Safety Evaluation: Safety Evaluation by the Office of Nuclear Reactor Regulation, Siemens Westinghouse Topical Report, "Missile Evaluation Methodology for General Electric (GE) Nuclear Steam Turbine Rotors by the Siemens Westinghouse Power Corporation (SWPC)", Project No. 721.