TXU Power

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Ref: 10CFR50.90

CPSES-200601797
Log # TXX-06150
File # 00236

September 12, 2006

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 05-08, REVISION TO TECHNICAL SPECIFICATIONS FOR NOMINAL TRIP SETPOINTS (NTS) AND ALLOWABLE VALUE (AV) SETPOINTS FOR SG WATER LEVEL LOW-LOW AND HIGH-HIGH, TAC NOS. MD0187 AND MD0188

REF: 1) TXU Power letter, logged TXX-06001, from Mike Blevins to the U. S. Nuclear Regulatory Commission, dated February 21, 2006.

Dear Sir or Madam:

In Reference 1, TXU Generating Company LP (TXU Power) submitted a proposed amendment which would revise the Nominal Trip Setpoints (NTS) and Allowable Values (AV) of setpoints for steam generator (SG) water level low-low and high-high. The changes will be applicable to the replacement SGs in Unit 1.

Based on questions provided by Mr. Mohan Thadani of the NRC in an email dated July 06, 2006, TXU Power hereby provides additional information regarding LAR 05-08. The NRC questions and TXU Power's response immediately following each question are provided in Attachment 1 to this letter.

This communication contains no new or revised commitments.

Should you have any questions, please contact Mr. Bob Kidwell at (254) 897-5310.

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In accordance with 10CFR50.91(b), TXU Power is providing the State of Texas with a copy of this proposed amendment.

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

Executed on September 12, 2006

Sincerely,

TXU Generation Company LP

By: TXU Generation Management Company LLC
Its General Partner

Mike Blevins

By: [signature]
Fred W. Madden
Director, Regulatory Affairs

RJK

Attachment TXU Power Response to Request for Additional Information

c - B. S. Mallett, Region IV
M. C. Thadani, NRR
Resident Inspectors, CPSES

Ms. Alice Rogers
Bureau of Radiation Control
Texas Department of Public Health
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ATTACHMENT to TXX-06150

TXU POWER RESPONSE TO
REQUEST FOR ADDITIONAL INFORMATION
RELATED TO LICENSE AMENDMENT REQUEST 05-08

REVISION TO TECHNICAL SPECIFICATIONS FOR
NOMINAL TRIP SETPOINTS AND AV SETPOINTS
FOR SG WATER LEVEL LOW-LOW AND HIGH-HIGH
TAC NOS. MD0187 AND MD0188

BACKGROUND:

By letter dated February 21, 2006, the licensee of the Comanche Peak Steam Electric Station proposed to revise the nominal trip setpoints (NTS) and Allowable Values (AV) of setpoints for steam generator (SG) water level low-low and high-high. The changes are applicable to the replacement SGs in Unit 1. The licensee indicated that the changes had included the SG water level measurement uncertainties discussed in Westinghouse Nuclear Safety Advisory Letters (NSALs).

NSAL-02-3 and its revision dealt with the uncertainty in the SG water level measurement caused by the placement of mid-deck plate between the upper and lower pressure taps. NSAL-02-4 dealt with uncertainties in the measurement created because the void content of the two-phase mixture above the mid-deck plate was not reflected in typical setpoint calculations. NSAL-02-5 dealt with potential inaccuracies in the initial conditions assumed in safety analysis affected by SG water level. NSAL-03-9 discussed a program for Westinghouse Owners' Group that evaluated the effects on the SG water level control system uncertainties from various items, including the mid-deck plate, feedwater ring and feedwater ring supports, lower-deck plate supports, non-recoverable losses due to carryunder, decrease in subcooling due to carryunder, and transient conditions due to event such as single loop loss of normal feedwater, etc..

NRC Question: (a) **Please discuss how the specific plant accounted for the applicable uncertainties documented in the above Westinghouse NSALs in determining the SG water level (low-low and high-high) NTS and AV setpoints.**

TXU Power Response:

During the development of the replacement steam generator design, specific values for the uncertainties identified in the cited Nuclear Safety Advisory Letters were developed by the vendor. These uncertainties, summarized in the response to Question (c), were applied as described in the NSALs supplemented by the guidance provided by the Westinghouse Owners Group in WCAP-16115-P, "Steam Generator Water Level Uncertainties Program."

NRC Question: (b) Please discuss the results of non-LOCA transients that were analyzed to determine uncertainties for the SG water level low-low and high-high setpoints. Identify and justify the limiting cases used to determine the proposed NTS and AV setpoints. The discussion should include a description of the methods or computers codes used in the analysis, and demonstrate the appropriateness of the methods and codes used.

TXU Power Response:

This response is based on a discussion between the NRC reviewer and the licensee clarifying the above question.

The analyses of the non-LOCA accident analyses were performed using the NRC-approved methodologies described in the TXU topical report RXE-91-001-A, "Transient Analysis Methods for Comanche Peak Steam Electric Station Licensing Application," dated October 1993, as supplemented by the TXU topical report ERX-04-005, "Application of TXU Power's Non-LOCA Transient Analysis Methodologies to a Feed Ring Steam Generator Design," dated January 2005. The latter topical report is currently under NRC review (TAC NO. MC6899).

The steam generator water level – high-high trip function is credited for mitigation of the increase in feedwater flow transient, described in FSAR Section 15.1.2. In that analysis, the steam generator water level – high-high trip function, with an assumed Safety Analysis Limit of 100% of the narrow range span, is credited to terminate the excessive feedwater flow by initiating a feedwater isolation signal and a turbine trip, which in turn initiates a reactor trip. The relevant event acceptance criterion for that analysis is that the minimum Departure from Nucleate Boiling ratio remains greater than the design limit. As described in NSAL-02-4, the effective safety analysis limit is reduced to the "Maximum Reliable Indicated Level" of 97.9% of the narrow range span to address the effects of the void fraction above the top of the mid-deck plate. This value was determined from a calculation performed by the vendor, consistent with the descriptions in NSAL-02-4.

The steam generator water level – low-low trip function is credited with initiating a reactor trip and actuation of the Auxiliary Feedwater System for the following transient and accidents:

- Certain turbine trip scenarios where a high pressurizer pressure reactor trip signal is not generated (FSAR 15.2.3)
- Loss of non-emergency AC power to the station auxiliaries (FSAR Section 15.2.6)
- Loss of normal feedwater flow (FSAR Section 15.2.7)
- Feedwater line pipe break (FSAR Section 15.2.8)
- Certain steam line breaks outside containment where a steam line isolation signal is not generated (performed for environmental qualification of equipment outside containment).

Adverse containment conditions near the time that the trip function is required to function are only created for the feedwater line break accident. In all analyses, an assumed Safety Analysis Limit of 0% of the narrow range span is used.

The turbine trip transient is analyzed to demonstrate that the peak Reactor Coolant System and Main Steam System pressures remain below 110% of the design pressures, and that the minimum Departure from Nucleate Boiling ratio remains greater than the design limit. The turbine trip scenario in which the steam generator water level – low-low trip function is credited does not challenge these acceptance criteria.

The loss of non-emergency AC power and loss of normal feedwater flow transients are analyzed to demonstrate the adequacy of the Auxiliary Feedwater System, which is accomplished if the pressurizer is shown to not completely fill with liquid prior to the time the decay heat removal rate becomes less than the heat removal rate of the Auxiliary Feedwater System.

The main feedwater pipe break accident is also analyzed to demonstrate the adequacy of the Auxiliary Feedwater System, but for this ANS Condition IV transient, the Auxiliary Feedwater System adequacy is shown through maintenance of subcooling in the Reactor Coolant System hot legs.

NRC Question: (c) Please provide the actual calculations or the results of summary sheets for the proposed NTS and AV setpoints.

TXU Power Response:

The methods described in WCAP-12123, "Westinghouse Setpoint Methodology for Protection Systems" (previously reviewed by the NRC for application to the initial Comanche Peak Unit 2 Technical Specifications as well as for several Reactor Protection System setpoint changes for both CPSES units since that time), were used to determine the proposed Nominal Trip Setpoint and Allowable Value. The Nominal Trip Setpoint was selected such that the difference (in % narrow range span) is greater than the Channel Statistical Allowance determined using the uncertainty allowances presented in Table 1. The Channel Statistical Allowance was calculated using the square root of the sum of the squares method for the random uncertainties. Consistent with the description in WCAP-12123, the sensor calibration, sensor M&TE, and sensor drift allowances were combined arithmetically, since these effects are not readily distinguishable from each other. A similar treatment was applied to the equivalent rack uncertainty allowances. The systematic uncertainties, including the uncertainties identified in the cited NSALs and the allowances for adverse containment environments, were treated as biases. Even though the adverse containment environmental allowances are only required for the feedwater line break accident, there is only one steam generator water level – low-low setpoint. In effect, there is a great deal of conservatism applied for this setpoint for the loss of non-emergency AC and loss of normal feedwater transients. Other considerations, such as the elevations of the secondary separators and the start of the annular downcomer region internal to the SG itself, and input from the reactor operators were then considered for the final selection of the Nominal Trip Setpoints.

The Allowable Value is then determined, again using the methodology in WCAP-12123.

The basic equation used to determine the Channel Statistical Allowance, consistent with the methodology described in WCAP-12123, is:

$$CSA = \pm\left\{\sqrt{\begin{array}{l}[(PMA)^2 + (PEA)^2 + (SCA + SMTE + SD)^2 + (SPE)^2 \\ + (STE)^2 + (RCA + RMTE + RCSA + RD)^2 + (RTE)^2]\end{array}}\right\} + Biases$$

The specific values for the proposed setpoints are provided in Table 1. The biases consist of the process measurement uncertainty allowances, as described in the cited NSALs, as well as the allowances for adverse containment environments, where applicable. The biases for the process measurements uncertainty allowances were applied selectively to the high-high and low-low setpoints, depending on the direction of conservatism. All applicable process measurement uncertainties were considered at consistent plant conditions to avoid crediting offsetting effects that do not simultaneously exist.

The Channel Statistical Allowances thus calculated are presented below:

Function	**Channel Statistical Allowance (% span)**	**Total Allowance (% span)**
Steam Generator Water Level – high-high	12.6	13.9
Steam Generator Water Level – low-low	25.7	38
Nominal Steam Generator Water	+4.0%, -3.9 at 100% RTP	NA

The Total Allowance is defined as the absolute difference between the Nominal Trip Setpoint and Safety Analysis Limit and must be greater than the Channel Statistical Allowance.

As described in WCAP-12123, the difference between the Allowable Value and the Nominal Trip Setpoint consists of the rack uncertainty allowances that would be periodically tested, up to the difference between the Total Allowance and the statistical combination of the sensor with other uncertainty allowances (i.e., excluding rack uncertainty allowances), coupled with the arithmetic summation of the rack uncertainties. For the –high-high trip function, this difference is limited to 2.0% span; for the –low-low trip function, this difference is calculated to be 2.05% span. These values of the Allowable Value represent the least conservative value of the trip setpoint which ensures a protective function will occur consistent with the accident analyses.

Table 1. Uncertainty Allowances Considered for the CPSES Unit 1 Steam Generator Water Level Trip Functions

	Uncertainty Allowance (% NR span)	Affected Setpoint: High-High (H) Low-Low (L) Nominal Operating Level (N)	Description
Process Measurement Uncertainty Allowances			
Process Pressure Variations	-0.50 +0.75 +0.63	L H N	Accounts for differences in process conditions between calibration conditions and conditions at which the trip function is required
Reference Leg Temperature Variations	-0.63	H,N	Accounts for differences in reference leg density between calibration conditions and conditions at which the trip function is required (for normal containment environments only)
Fluid Velocity Effects	-1.50 -4.0 -3.16	L H N	Fluid Velocity Effects due to fluid velocity pressure effects at the lower tap
Downcomer Subcooling Effects	+1.4 +1.9	L N	Accounts for differences in the assumption that the downcomer fluid is saturated, when there may be local subcooling
Mid-Deck Pressure Drop Effects	+3.3	L,N	Accounts for the pressure drop due to steam flow through the mid-deck plate
Intermediate Deck Pressure Drop Effects	-0.0	H,N	Accounts for the pressure drop due to recirculating liquid flow through the intermediate deck plate
Feed Ring Pressure Drop Effects	-0.0	H,N	Accounts for the pressure drop due to recirculating liquid flow by the feedwater distribution ring
Lower Deck Plate and Deck Supports Pressure Drop Effects	-1.0 -2.5 -2.0	L H N	Accounts for the pressure drop due to recirculating liquid flow by the lower deck plate and the supports which are located near the lower narrow range tap
Non-recoverable Losses due to carryunder into the lower downcomer	-0.0	H,N	Accounts for increased pressure drops at the entrance to the lower downcomer caused by presence of bubbles in the recirculating fluid
Total of biases for low-low trip function	+2.2		Sum of fluid velocity effects, downcomer subcooling effects, mid-deck plate pressure drop effects, and lower deck plate effects; maximum value when considered at consistent plant conditions
Total of biases for high-high trip function	-7.2		Sum of reference leg temperature variations, fluid velocity effects, and lower deck plate effects; maximum value when considered at consistent plant conditions.
Total of biases for normal operations	+0.08 at 100% power; -2.0@ 20% power		Sum of all process measurement uncertainty allowances when considered at consistent plant conditions

Table 1. Uncertainty Allowances Considered for the CPSES Unit 1 Steam Generator Water Level Trip Functions

	Uncertainty Allowance (% NR span)	Affected Setpoint: High-High (H) Low-Low (L) Nominal Operating Level (N)	Description
Random Uncertainties			
Primary Element Accuracy (PEA)	±0.0		Uncertainty used for venturis or elbow taps; not applicable to dP transmitters
Sensor Calibration Accuracy (SCA)	±0.5		Uncertainty allowance for calibration of sensor
Sensor Measurement & Test Equipment Accuracy (SMTE)	±0.5		Allowance / requirement for accuracy of the M&TE used to perform the calibration
Sensor Drift Allowance (SD)	±1.0		Allowance for sensor drift over the 18 month calibration intervals
Sensor Pressure Effects (SPE)	±1.0		Allowance for the uncertainty in the correction for the effects of the static head differences between calibration and operating conditions
Sensor Temperature Effects (STE)	±1.0		Allowance for changes in the operating environment relative to the calibration environment
Rack Calibration Accuracy (RCA)	±0.5		Allowance for the calibration tolerance of the individual modules and entire string comprising the channel (exclusive of the sensor)
Rack Measurement and Test Equipment (RMTE)	±0.30		Allowance / requirement for the M&TE used to perform the calibration; also, includes an allowance for use of dynamic verification of the calibration
Rack Comparator Setting Accuracy (RCSA)	±0.25		Allowance for the comparator setting accuracy for a single input function
Rack Drift (RD)	±1.0		Allowance for rack drift between the calibration interval; recently extended to 184 days per Technical Specification Amendment 114.
Rack Temperature Effects (RTE)	±0.5		Allowance for changes in the ambient temperature between calibration and operation
Environmental Allowances			
Sensor Temperature Effects	±6.2		Allowance for the effects of adverse containment environments on the sensor; only applied to trip functions required in this environment; includes effects of conduit seal assemblies
Reference Leg Heatup Effects	+13.9		Reference leg heatup effects for adverse containment conditions
Cable Insulation Resistance Effects	+0.2		Allowance for effects of temperature and humidity on the cable insulation resistance

Table 1. Uncertainty Allowances Considered for the CPSES Unit 1 Steam Generator Water Level Trip Functions

	Uncertainty Allowance (% NR span)	Affected Setpoint: High-High (H) Low-Low (L) Nominal Operating Level (N)	Description
Transient Effects			
Single loop loss of normal feedwater	0.0		Bounded by reference leg heat up effects; no adverse containment conditions required for this transient
Small steamline breaks outside containment	0.0		Bounded by reference leg heat up effects; no adverse containment conditions required for this transient
Increase in feedwater flow	-2.2		Conservative allowance developed in WCAP-16115-P