TXU Electric
Comanche Peak
Steam Electric Station
P.O. Box 1002
Glen Rose, TX 76043
Tel: 254 897 8920
Fax: 254 897 6652
lterry1@txu.com

C. Lance Terry
Senior Vice President & Principal Nuclear Officer

Ref: 10CFR50.90

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June 28, 2001

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 NRC REQUEST FOR ADDITIONAL
INFORMATION ON LICENSE AMENDMENT REQUEST 01-05
(TAC NOS. MB1625 AND MB1626)

REF:
1) TXU Electric letter logged, TXX-01042, from C. L. Terry to the NRC dated April 5, 2001
2) NRC letter from David H. Jaffe to C. Lance Terry dated May 11, 2001.

Gentlemen:

In the referenced letter (Reference 1), TXU Electric submitted a request to amend the CPSES Unit 1 Operating License (NPF-87) and CPSES Unit 2 Operating License (NPF-89) by incorporating changes into the CPSES Units 1 and 2 Technical Specifications and the CPSES Unit 2 Operating License to increase the licensed power for operation of CPSES Units 1 and 2 to 3458 MWt. Per Reference 2, TXU Electric received a request to provide the attached additional information regarding License Amendment Request 01-05. Attachment 1 is the affidavit for this information supporting License Amendment Request 01-05. Attachment 2 provides our response to the information requested.

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If you have any questions regarding the attached information, please contact Mr. J. D. Seawright at (254) 897-0140.

This communication contains the following new commitment which will be completed as noted:

| Commitment Number | Commitment |
|---|---|
| 27237 | Confirmatory documentation reviews for Unit 1 uprate will be completed prior to Cycle 10 operation. |

The Commitment number is used by TXU Electric for the internal tracking of CPSES commitments.

Sincerely,

Charles L Terry

C. L. Terry

JDS/grp
Attachments

c - E. W. Merschoff, Region IV
D. N. Graves, Region IV
D. H. Jaffe, NRR
Resident Inspectors, CPSES

Mr. Authur C. Tate
Bureau of Radiation Control
Texas Department of Public Health
1100 West 49th Street
Austin, Texas 78704

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

| | | |
|---|---|---|
| In the Matter of | ) | |
| | ) | |
| TXU Electric | ) | Docket Nos. 50-445 |
| | ) | 50-446 |
| (Comanche Peak Steam Electric | ) | License Nos. NPF-87 |
| Station, Units 1 & 2) | ) | NPF-89 |

## AFFIDAVIT

C. L. Terry being duly sworn, hereby deposes and says that he is the Senior Vice President and Pricipal Nuclear Officer of TXU Electric, the licensee herein; that he is duly authorized to sign and file with the Nuclear Regulatory Commission this Request for Additional Information regarding License Amendment Request 01-05; that he is familiar with the content thereof; and that the matters set forth therein are true and correct to the best of his knowledge, information and belief.

Charles L Terry

C. L. Terry
Senior Vice President and
Principal Nuclear Officer

STATE OF TEXAS )
)
COUNTY OF Somervell )

Subscribed and sworn to before me, on this 28th day of June, 2001.

SUSAN C. GRAVATT NOTARY PUBLIC STATE OF TEXAS EXPIRES 4-02-2005

Susan C Gravatt
Notary Public

**Question:** (DLPM1) **The application indicates that an unspecified number of CPSES, Unit 1, balance of plant systems have not been fully analyzed. For each system, provide a description of the analyses to be completed, and a system-specific justification for the delay in the completion of the analyses.**

**CPSES Response:**

As described within the License Amendment Request (LAR), the evaluation of the design of CPSES for the proposed uprates was divided into two separate scopes of work. All portions of the plant that were the original design responsibility of Westinghouse as the NSSS supplier constituted the "NSSS Scope". The remainder of the plant encompassed the "Balance of Plant (BOP) Scope". The NSSS Scope fully addressed both units for up to a 4.5% uprate from the original rated thermal power of 3411 MWt. Within this scope, there are no open design-related issues remaining to be evaluated for either unit to support the proposed uprates to 3458 MWt Rated Thermal Power. The BOP Scope focused on Unit 2, but due to the extensive similarity between the two units, most of the review scope evaluated both units. Confirmatory documentation reviews remaining to be completed for Unit 1 are described herein and are reflected in tabular form below. The Unit 1 confirmatory documentation reviews will be completed prior to Cycle 10 operation.

The Unit 2 BOP evaluation process began with the Design Basis Documents (DBD), which are common to both units and clearly identify the unit differences. With guidance from the DBD review, the evaluation process then focused on reviewing the calculations that provide the analytical basis for the plant design. Each relevant calculation was reviewed to determine whether the design inputs, assumptions, and / or the methodology included sufficient margin to support a determination that the calculation conclusion(s) would remain valid under the proposed uprate conditions. Of the calculations reviewed in support of the Unit 2 proposed uprate, approximately 10% required some change, typically to reflect the "assignment" of existing margin to support of the uprate. Approximately 2% of the calculations reviewed required some form of revision or the issuance of a new, Unit 2-specific calculation.

The overwhelming majority of the CPSES calculations are either clearly applicable to both units or specifically reflect one unit and a second calculation simply reconciles the unit differences to establish applicability of the conclusions of the primary calculation to the second unit. Since Unit 1 was constructed and licensed first, in most instances, the Unit 1 calculation is the lead document and in order to evaluate the corresponding Unit 2 calculation, a review of the Unit 1 calculation was required.

With the exception of the steam generators, there are few differences in major components or in system arrangement and operation. (Most of the differences associated with the two models of steam generators were addressed within the NSSS Scope.) Furthermore, in most cases a common bounding set of design inputs (temperatures, pressures, flow rates, etc.) were applied despite minor differences in these design parameters due to the steam generator differences. Consequently, the common analytical basis for the units generally extends to encompass most system-level and major component-level analyses. Those areas of analysis that are a direct function of the specific routing of interconnecting piping, tubing, and cable or are sensitive to minor differences in the physical arrangement of plant hardware were more likely to be addressed on a unit-specific basis. However, many of these areas of analysis were determined to be relatively insensitive to the proposed uprate or the changes fell within reasonable calculation or construction margins. Although focused on Unit 2, the BOP Scope of the uprate evaluation carefully tracked those areas where the reviewed documentation was applicable to only Unit 2 as well as those areas where Unit 1 applicability was also clearly established. Consequently, confirmation that the remaining unreviewed Unit 1 analyses encompass adequate margin to support the proposed uprate involves a rather well defined work scope.

The BOP evaluation report identifies four systems with analyses that are potentially sensitive to the proposed uprate, are unit-specific, and were completed independently for each of the two units. Despite the independence of the calculation scopes, the methodology and most design inputs are typically very similar. However, since review of only the Unit 2 analysis has been completed in these cases, direct extension of the Unit 2 conclusion to Unit 1 was inappropriate and a confirmatory review of each such Unit 1 calculation will be completed. The identified systems are Main Steam, Feedwater, Steam Generator Blowdown, and Auxiliary Feedwater. The areas of analysis associated with those systems that remain to be reviewed are generally limited to specific pipe stress analyses and the effects of mass and energy release due to certain pipe breaks. In addition, certain Unit 1 evaluations of the mass and energy release effects due to pipe breaks in systems affected by the small changes in RCS parameters also require confirmatory reviews. Finally, the I & C scaling calculations are generally unit-specific and similar confirmatory reviews must be performed for Unit 1. In each of these cases, the corresponding Unit 2 analysis contained adequate margin to support, as a minimum, the proposed uprate to 3458 MWt. Given that the extent of consequential unit differences is limited and with full knowledge of the corresponding Unit 2 analytical margin, a similar positive conclusion is fully anticipated for those Unit 1 calculations remaining to be reviewed.

In summary, there is substantial similarity in the overall design as well as specific installed equipment between the two CPSES units and they share a largely common analytical basis. This similarity is reflected in the broad applicability to Unit 1 of the Unit 2 uprate evaluation conclusions documented in the BOP evaluation report. Despite this extensive shared analytical basis, a limited set of unit-specific independent analyses were completed in support of plant design due either to physical differences or simply for convenience. However, notwithstanding such unit-specific analyses awaiting completion of confirmatory reviews for Unit 1, similarity between the two units and the prior completion of all Unit 2 evaluations lends credence to the expectation that the Unit 1 analyses also fully support the proposed uprate.

# NSSS Evaluation Status

| Plant Design Review Areas | | Review Complete for Both Units | Review Complete for Unit 2 | Unit 1 – Confirmatory Review Required |
|---|---|---|---|---|
| 1. Design Transients | | Complete | ← | ← |
| 2. NSSS Systems | Reactor Coolant | Complete | ← | ← |
| | Chemical Volume & Control | Complete | ← | ← |
| | Safety Injection | Complete | ← | ← |
| | Residual Heat Removal | Complete | ← | ← |
| | Boron Recycle | Complete | ← | ← |
| | Boron Thermal Regeneration | Complete | ← | ← |
| | Gaseous Waste Processing | Complete | ← | ← |
| | Cold Overpressure Mitigation | Complete | ← | ← |
| | NSSS / BOP Interfaces | Complete | ← | ← |
| 3. NSSS Components | Reactor Vessel | Complete | ← | ← |
| | Reactor internals | Complete | ← | ← |
| | Control Rod Drive Mechanisms | Complete | ← | ← |
| | RC Loop Piping & Supports | Complete | ← | ← |
| | RC Pumps | Complete | ← | ← |
| | Steam Generators | Complete | ← | ← |
| | Pressurizer | Complete | ← | ← |
| | NSSS Auxiliary Equipment | Complete | ← | ← |
| 4. NSSS Accident Analyses | | Complete | ← | ← |

# Balance of Plant Evaluation Status

| Area of Analysis | | Reviews Complete for **Both Units** | Reviews Complete **Only** for Unit 2 | Unit 1 Confirmatory Review Required |
|---|---|---|---|---|
| 1. Design Basis Documents | | Complete | ← | ← |
| 2. Fluid Systems | Thermal-Hydraulics | Complete | ← | ← |
| | Piping Stress | • Common & Interdependent calculations for all BOP systems including Spent Fuel Pool Cooling | Independent unit-specific calculations for:<br>• Main Steam & Reheat<br>• Feedwater<br>• Steam Generator Blowdown<br>• Auxiliary Feedwater | Review Unit 1-specific calculations for:<br>• Main Steam & Reheat<br>• Feedwater<br>• Steam Generator Blowdown<br>• Auxiliary Feedwater |
| | Equipment | Complete | ← | ← |
| | I & C | Complete | ← | ← |
| | Pipe Break – Mass & Energy Release Consequences | • Common & Interdependent calculations for all BOP systems including Spent Fuel Pool Cooling | Independent unit-specific calculations for:<br>• Main Steam & Reheat<br>• Feedwater<br>• Steam Generator Blowdown<br>• Auxiliary Feedwater | Review Unit 1-specific calculations for:<br>• Main Steam & Reheat<br>• Feedwater<br>• Steam Generator Blowdown<br>• Auxiliary Feedwater<br>(See Note 1) |
| 3. Instrumentation & Controls | | → | Complete | Review Unit 1-specific calculations |
| 4. Subcompartment Pressurization from Pipe Breaks within Containment | | Common and Interdependent Calculations | Independent unit-specific calculations | Review Unit 1-specific calculations |
| 5. Mass & Energy Releases Outside Containment – Environmental Concerns | | Common and Interdependent Calculations | Independent unit-specific calculations | Review Unit 1-specific calculations |
| 6. RCS Effects on Pipe Break – BOP Components | | Common and Interdependent Calculations | Independent unit-specific calculations | Review Unit 1-specific calculations |
| 7. Jet Impingement Effects on RCS – NSSS Components | | Complete | ← | ← |

# Balance of Plant Evaluation Status

| Area of Analysis | | Reviews Complete for **Both Units** | Reviews Complete **Only** for Unit 2 | Unit 1 Confirmatory Review Required |
|---|---|---|---|---|
| 8. Equipment | Containment Penetrations | Complete | ← | ← |
| | Hydrogen Recombiner | Complete | ← | ← |
| | Main Turbine | → | Complete | High Pressure Turbine to be replaced prior to uprate |
| | Generator | Complete | ← | ← |
| | Isophase Bus, Main Transformers, Switchyard | Complete | ← | ← |
| 9. Programs | Equipment Qualification | Complete | ← | ← |
| | Fuel | Cycle-specific evaluations assure reloaded reactor core meets all relevant design criteria. | ← | ← |
| | Fire Safe Shutdown Analysis | Complete | ← | ← |
| | Radiological Consequences | Complete | ← | ← |
| | HVAC | Complete | ← | ← |
| | Station Blackout | Complete | ← | ← |
| | Permits | Complete | ← | ← |

Note #1: The majority of the Unit 2 pipe break analyses were based on a comparison review of Unit 1. Therefore, the majority of the conclusions drawn for Unit 2 also apply to Unit 1. Some Unit 1 calculations require further review for those cases where an independent Unit 2 calculation exists.

<u>**Question:**</u> **What design bases parameters, assumptions or methodologies were**

(SPSB1) **changed in the radiological design basis accident analyses because of the proposed changes? If there are many changes, it would be helpful to compare and contrast them in a table. Also, please provide justification for any changes.**

(SPSB2) **Please describe how the source terms utilized for your dose analyses were generated. Provide the methodology, codes, and databases utilized.**

(SPSB3) **Please provide the offsite and control room dose results from your accident analyses.**

<u>**CPSES Response:**</u>

In response to SPSB1, SPSB2, and SPSB3 above, CPSES has not changed any of the licensing basis associated with the control room and offsite dose consequences presented in the FSAR. Cycle specific assessments are performed as part of each reload analyses to confirm that the radiological analyses presented in the FSAR remain bounding.

The radiological dose consequences reported in FSAR Chapter 15 are calculated using the computer analysis tools listed in FSAR Appendix 15B. Neither the assumed reactor power of 3565 MWt, nor the licensing basis methodologies have been changed in support of the proposed amendment to increase the Rated Thermal Power for Units 1 and 2 to 3458 MWt (1.4% and 0.4% increases, respectively).

The radiological dose consequences are based on a fission product inventory derived from an assumed reactor power of 3565 MWt (104.5% of original licensed power level) and a standard three-region, 12 month fuel cycle at equilibrium. (i.e., a total core mass loading of 89.05 MTU, core average burnup of 24,018 MWD/MTU, and a 12 month fuel cycle with 3 fuel burnup regions of 300, 600, and 900 EFPD). The radiological dose consequences derived from the above fission product inventory have continued to remain bounding through the increase in fuel enrichments and cycle lengths as provided for in Amendments 17/3 and 27/13 to the Technical Specifications because of the significant margin provided by the assumed power level of 3565 MWt. The radiological dose consequences presented in the FSAR continue to remain bounding upon implementation of the proposed amendment to increase the Rated Thermal Power to 3458 MWt for Units 1 and 2. This conclusion has also been confirmed to remain valid when an additional allowance of +0.6% has been included to address the power calorimetric uncertainty; (i.e. the assessments for this submittal were performed at 3479 MWt).

The cycle-specific fission product inventories submitted in the proposed amendment provide an example, from a previous cycle, as to how the overall effects of the fission product inventories are assessed to assure that the radiological dose consequences remain valid for each cycle. The current cycles for Unit 1 and Unit 2 have been assessed at 3479 MWt, and, as before, it has been determined that the radiological dose consequences presented in FSAR Chapter 15 continue to remain valid.

**Question:** (EEIB1) **.....Please submit a plant specific power calorimetric measurement uncertainty calculation, using an approved methodology, to establish the stated value of the uncertainty in thermal power measurement.....**

**CPSES Response:**

The CPSES-specific uncertainty analyses associated with the measurement of the core thermal power is based on the square root of the sum of the squares methodology summarized in "Westinghouse Setpoint Methodology for Protection Systems Comanche Peak Unit 1, Revision 1, " WCAP-12123, Revision 2, April, 1989. The Westinghouse statistical setpoint methodology was used for all setpoints presented in the plant Technical Specifications when CPSES Unit 1 was originally licensed. This methodology was licensed by TXU Electric from Westinghouse and applied to all RPS and ESFAS-related Technical Specification setpoints for the original licensing of CPSES Unit 2 and in all subsequent applications to either unit. References to this methodology may be found in the Bases to Technical Specification 3.3.1 and 3.3.2.

Similarly, the current power calorimetric uncertainty calculation is consistent with the 1990-vintage Westinghouse methods with which CPSES was originally licensed. Although specific input values have changed, the methodology has not been revised since the plant was initially licensed. This specific methodology was used to support the recent 1% power uprate to CPSES Unit 2.

In the current CPSES-specific application of this methodology to the core power measurement uncertainty when using the LEFM✓ as the source for the feedwater mass flow rate, the benefits attainable through the use of multiple channels are not pursued. In other words, the calculation is a single-loop uncertainty and overstates the actual uncertainty associated with the core power measurement. As noted in the "Response to NRC Request for Additional Information On License Amendment Request 98-010," (TXX-99105, April 23, 1999), from the previous 1% uprate documents for Unit 2, this approach is consistent with ASME PTC 19.1 - 1985, "Measurement Uncertainty."

The general methodology for determining the core power is summarized below:

$$Q_{core} = Q_{ss} - NPHA$$

where: $Q_{core}$ = the core thermal power (BTU/hr)

$Q_{ss}$ = the heat removal through the secondary side of the plant

$$= W_f \cdot \{h_{stm}(P_{stm},x) - h_{fw}(P_{fw}, T_{fw})\} - W_{bldn} \cdot \{h_{stm} - h_{bldn}\}$$

where $W_f$ = Feedwater mass flow rate

$h_{stm}$ = steam generator outlet steam enthalpy as a function of steam pressure and quality

$h_{fw}$ = main feedwater enthalpy as a function of feedwater pressure and temperature

$W_{bldn}$ = steam generator blow down mass flow rate

$h_{bldn}$ = steam generator blowdown enthalpy

NPHA = the net pump heat adder, which is the sum of the heat addition added to the reactor coolant by the reactor coolant pumps less system heat losses, primarily attributed to the charging and letdown flows, less an allowance for the ambient heat loss attributed to conduction and convection from the RCS metal masses.

The uncertainty associated with the feedwater mass flow rate is extracted from the NRC-approved report by the LEFM✓ supplier, Caldon, Inc. ("Improving Thermal Power Accuracy and Plant Safety While Increasing Operating Power Level Using the LEFM✓ System," ER-80P, Revision 0, March 1997).

The uncertainties associated with the remainder of the secondary-side heat removal calculation are determined by calculating the uncertainty associated with each process measurement (e.g., steam pressure) and then relating that uncertainty to an equivalent uncertainty associated with the secondary-side heat removal calculation through the use of sensitivity factors.

Effects of the Feedwater Flow Indication

The LEFM✓ system allows for a very precise determination of the feedwater mass flow rate. The LEFM✓ actually measures the fluid velocity. Based on precise measurements of the feedwater pipe diameter, a volumetric flow rate is digitally calculated. Given reasonably accurate feedwater pressure indications, the LEFM✓ digitally calculates a feedwater mass flow rate. As described in Reference 5, the LEFM✓ can measure/calculate the mass flow rate to within ±0.48% of the nominal (or rated) feedwater flow. As may be observed in the preceding equation, there is a direct, one-to-one relationship between the feedwater flow indication and the core thermal power indication.

Effects of Steam Generator Blowdown

To obtain the most "accurate" core thermal power measurement, steam generator blowdown should be isolated. However, recognizing that blowdown isolation is not always practical, an evaluation of the accuracy associated with the effects of blowdown on the secondary power uncertainty is appropriate.

When performing calorimetric measurements when steam generator blowdown is not isolated, an explicit calculation of the blowdown heat removal rate is performed. This calculation is based on the blowdown flow rate, pressures, and temperatures, and assumes an uncertainty allowance of ±10% of the steam generator blowdown heat removal. The "inlet" enthalpy for the blowdown heat balance is based on the feedwater pressure and final temperature. For the "exit" enthalpy, feedwater pressure is again assumed and the temperature is approximately 500°F. Although typically operated at much lower flow rates, the maximum blowdown flow rate can be as high as approximately 310,000 lbm/hr. Based on these conditions, the blowdown can remove approximately 6.26 MWt (total, from all four steam generators). The nominal NSSS thermal power is 3458 MWt plus the net RCP heat. Thus, blowdown accounts for a maximum of approximately 0.2% of the total heat removal through the secondary system. A ±10% uncertainty in the blowdown heat removal rate would affect the total NSSS calorimetric measurement by ±10% of 0.2%, or 0.02% RTP.

Effects of the Net Pump Heat Adder

The uncertainty associated with the net pump heat adder is derived by Westinghouse from the combination of primary system net heat losses and additions. The uncertainty allowance for the system heat losses (primarily attributed to charging and letdown flows) is ±10% of the measured value. An allowance of ±50% of the calculated value is provided for the ambient heat losses. The reactor coolant pump heat is known to a relatively high confidence level based on testing. The arithmetic sum of these uncertainties is less than 2 MWt which is less than the 0.085% RTP value used when RTP was defined to be 3411 MWt. This same conservative allowance will continue to be applied, even though Rated Thermal Power will be redefined as 3458 MWt.

For the remainder of the input parameters and indications to the core calorimetric measurement, standard Square Root of the Sum of the Squares (SRSS) methods are used to determine the uncertainty associated with a particular indication. Sensitivities of the core power to changes in the input parameters or indications are used to translate the uncertainty in the input to an equivalent uncertainty on the core calorimetric measurement. The sensitivities are summarized in Table 1.

The input parameters and indications actually used in the plant calorimetric measurement are feedwater pressure, feedwater temperature and steam pressure. A design allowance of 0.25% moisture for the steam moisture carryover input is used. Precision instrumentation, distinct from the main plant monitoring equipment, is used for this calorimetric measurement.

The basic components of the pressure indication uncertainty calculations (for both the main steam pressure and the feedwater pressure) are:

$$P_{unc} = \pm\{(SCA + SMTE + SD)^2 + STE^2 + SPE^2 + RCA^2\}^{1/2}$$

where (all units are % span):

| | | |
|---|---|---|
| SCA | = | Sensor calibration allowance |
| | = | ±0.60% span |
| SMTE | = | Sensor measurement and test equipment accuracy allowance |
| | = | ±0.60% span |
| SD | = | Sensor drift allowance between calibration intervals |
| | = | ±0.90% span |
| STE | = | Sensor temperature effect (an allowance for changes to the ambient temperature from calibration) |
| | = | ±0.25% span |
| SPE | = | Sensor pressure effect (an allowance, only required for differential pressure transmitters, for changes to ambient and process pressures from calibration) |
| | = | ±0.00% span |

RCA = Rack calibration allowance (an allowance for the accuracy with which the plant computer reflects the signal from the transmitter). Because the plant computer, with its digital output, is used as the M&TE device in the calibration, only a very small value for RCA is required to address any uncertainties introduced by the indication. For example, the stated accuracy of the plant computer A/D conversion and indication is less than ±0.05% span.

= ±0.15% span

Therefore, $P_{unc} = \pm\{(SCA + SMTE + SD)^2 + STE^2 + SPE^2 + RCA^2\}^{1/2}$

$= \pm\{(0.60 + 0.60 + 0.90)^2 + 0.25^2 + 0.0^2 + 0.15^2\}^{1/2}$

$= \pm 2.12\%$ span.

These transmitters have a span of 500 psi; thus, the pressure uncertainty is 10.6 psi, rounded to 11 psi.

The feedwater temperature indication is calculated by the LEFM✓ system and has a stated accuracy of ±0.9°F.

The individual uncertainties associated with the precision calorimetric measurement are summarized in Table 1.

**Table 1. Precision Calorimetric Uncertainties Using the LEFM✓**

| COMPONENT | INSTRUMENT ERROR | SENSITIVITY | POWER UNCERTAINTY |
|---|---|---|---|
| **Feedwater Flow LEFM✓** | **±0.48%** | **1:1** | **±0.48% RTP** |
| **Steam Generator Blowdown** | **±10.0%** | **1:0.002** | **±0.02% RTP** |
| **Feedwater Enthalpy**<br>**Temperature**<br>**Pressure** | <br><br>**±0.9°F**<br>**±11.0 psi** | <br><br>**0.1430%RTP/°F**<br>**0.0001035%RTP/psi** | <br><br>**±0.129% RTP**<br>**±0.001% RTP** |
| **Steam Enthalpy**<br>**Pressure**<br>**Moisture** | <br>**±11.0 psi**<br>**±0.25 %mst** | <br>**0.00491%RTP/psi**<br>**0.85%RTP/%mst** | <br>**±0.054% RTP**<br>**±0.21% RTP** |
| **Net Pump Heat Addition** | | | **±0.085% RTP** |

The total power calorimetric uncertainty is:

$$\text{UNC-PWRCAL} = \pm\{(\text{LEFM})^2 + (\text{BLDN})^2 + (\text{FWh}_{temp})^2 + (\text{FWh}_{prs})^2 + (\text{STMh}_{prs})^2 + (\text{STMh}_{moist})^2 + (\text{NPHA})^2\}^{1/2}$$

$$\text{UNC-PWRCAL} = \pm\{(0.48)^2 + (0.02)^2 + (0.129)^2 + (0.001))^2 + (0.054)^2 + (0.21)^2 + (0.085)^2\}^{1/2}$$

$$= \pm 0.55\%\ \text{RTP}$$

This value is less than the value of ±0.61% RTP reported in the previously cited Caldon, Inc. Engineering Report (ER-80P).

<u>Question:</u> (EEIB1 cont.) **.... In addition, please provide a description of the programs and procedures that will control calibration of the LEFM system and the pressure and temperature instrumentation whose measurement uncertainties affect the plant power calorimetric uncertainties. In this description, please include the procedure for:**

1. **Maintaining calibration,**
2. **Controlling software and hardware configuration,**
3. **Performing corrective actions,**
4. **Reporting deficiencies to the manufacturer, and**
5. **Receiving and addressing manufacturer deficiency reports.**

<u>CPSES</u> <u>Response:</u>

1. The LEFM✓ system contains self-diagnostic routines. Alarms annunciate the detection of any off-normal conditions (i.e., when monitored parameters fall outside acceptable ranges). In addition to the continuous self-diagnostics internally performed, the LEFM✓ system is periodically calibrated per the manufacturer's recommendations. This procedure also includes a calibration of the pressure transmitters which provide input to the LEFM and their associated A/D converters. A separate procedure is periodically performed to verify the adequacy of the calibration of all the transmitters and their associated plant computer inputs which are used in the plant power calorimetric measurement.

2.-5. As described in FSAR Table 17A-1, the LEFM and its associated software are classified as non-1E equipment. Full QA requirements were not imposed for manufacture and/or installation; however, a specifically structured non-Appendix B QA program is applied at CPSES. The software and supporting hardware associated with the LEFM is controlled in accordance with the CPSES Nuclear Software Quality Assurance Program. This program includes measures to maintain the system in the validated configuration.

The CPSES Nuclear Software Quality Assurance Program includes provisions for reporting and resolving deficiencies as well as receipt and evaluation of condition reports received from the manufacturer. Non-conforming conditions are entered into the corrective action program where, among other activities, they are evaluated for 10CFR

21 reportability. This evaluation necessitates contact with the LEFM✓ system manufacturer. The manufacturer, Caldon, Inc., is also required, both contractually and in accordance with their Quality Assurance Plan, to report any non-conformance identified with the equipment or software to TXU Electric.

**Question:** (EMEB1) **On page 26 of Attachment 2 to the referenced submittal [TXX-01042], regard to U-bend fatigue evaluation, you indicated that fluid elastic vibration and fatigue of unsupported, small radius U-bends can occur and lead to significant fatigue usage when "denting" is present at the top tube support plate. The model D5 steam generators installed in CPSES Unit 2 are not susceptable to "denting" and therefore this issue is not applicable to Unit 2. An evaluation was performed and determined that the revised design conditions will increase the susceptibility of several tubes in the Unit 1 steam generators. Provide a summary of evaluation for the fluid induced vibration and fatigue of the U-bend for SGs in Unit 1. Confirm whether corrective actions are required for the Unit 1 SG tubes for the proposed power uprate. Also, provide the following information for Unit 1 similar to that you provided for Unit 2 in the previous power uprate submittal: the maximum calculated stress and CUF for the critical locations (such as the vessel shell, secondary manway bolts, and nozzles), the allowable code stress limits, and the Code and Code edition used in the evaluation for the power uprate. If different from the Code of record, provide a justification. Also, provide an evaluation of the flow-induced vibration of the steam generator U-bend tubes due to power uprate regarding the analysis methodology, vibration level, computer codes used in the analysis and the calculated cross flow velocity.**

**CPSES Response:**

U-Bend Fatigue Evaluation

The analysis previously performed in response to Bulletin 88-02 and reported to the NRC in TXX-88330 (March 23, 1988), TXX-99121 (July 21, 1999), and TXX-00040 (February 15, 2000) was reviewed to determine the impact of operation at the uprated design conditions. The original analysis identified the most susceptible tubes given the expected operating conditions, and preventive actions were taken to stabilize and remove two of these tubes from service as reported in the above referenced correspondence.

This analysis employed Relative Stability Ratios (RSRs) to compare the stability ratio of individual tubes at a given set of operating conditions with the stability ratio at a chosen reference condition. For a fixed steam generator geometry, the primary operating characteristics that affect the stability ratio are the steam flow, steam pressure, and the circulation ratio. The impact of the uprated operating conditions on the next most susceptible tubes were evaluated by calculating new RSR values for a range of steam pressures at three power ratings: 100%, 102%, and 104%. The results indicate that the increased susceptibility of several additional tubes in the Unit 1 steam generators to fluid elastic vibration and fatigue may warrant additional preventive action. However, the final determination is dependant on the actual maximum steam pressure and other operating conditions as opposed to the "bounding" approach applied in the uprate reviews. Therefore, prior to implementation of the proposed uprate in Unit 1, TXU Electric will determine, consistent with all applicable requirements and operating parameters, whether additional preventive actions are necessary in addition to those previously taken and reported in response to NRC Bulletin 88-02. That final determination and associated actions will be accomplished as required to remain in compliance with the CPSES committment to Bulletin 88-02.

Stress and CUF Data

This data will be provided in a supplemental submittal but is expected to contain data considered to be proprietary to the vendor and must be reviewed and administratively processed accordingly.

Question: (EMEB1) **On page 28, Section C of Attachment 2 to the reference submittal, you stated that a detailed evaluation of Unit 2 non-NSSS systems, structures, components, and related programs was completed and demonstrated continued compliance with all CPSES applicable industry and regulatory requirements at a core thermal power of 3458 MWt. This Unit 2 evaluation also specifically addressed Unit 1 applicability throughout, identifying those unit-specific areas of design documentation that remain to be reviewed to substantiate similar conclusions to support a Unit 1 uprate. Based on the Unit 2 evaluation conclusions, the similarity of the two CPSES units, and awareness of the unit differences that might be sensitive to the revised operating conditions, Unit 1 is expected to also remain in compliance with all CPSES applicable industry and regulatory requirements at a core thermal power of 3458 MWt. The detailed evaluation of Unit 1 non-NSSS systems, structures, and components and related programs will be completed prior to implementation of the requested Unit 1 uprate. Provide a**

**summary of your evaluation of the BOP piping and supports, the analysis of high energy line break and jet impingement due to the effects of the proposed power uprate condition. Confirm whether the safety-related valves will be in compliance with the design basis and operational requirements at the power level of 3458 Mwt. Also, confirm whether and how the proposed power uprate will affect the CPSES Unit 1 and 2 commitments and responses to Generic Letter (GL) 89-10 regarding Motor Operated Valves, GL 95-07 regarding pressure locking and thermal binding of gate valves, and GL 96-06 associated with the possible overpressurization of pipe segment during a LOCA.**

<u>CPSES Response:</u>

The remaining reviews of the CPSES Unit 1 design documents are discussed in detail in the response to the first question listed on page one of this response.

No changes to the CPSES MOV program addressing GL 89-10 were required as a result of the proposed thermal power uprates. The flows, temperatures, pressures, and maximum differential pressures across the valves are not impacted by the power uprates, and the valve margins are therefore not reduced for these valves. Since resolution of the pressure locking and thermal binding issues at CPSES were based on the same pressure and temperature conditions as in the GL 89-10 program, there was also no impact on the GL 95-07 resolution.

The CPSES response to GL 96-06 is unaffected by the uprate. Since the original containment response pressure / temperature conditions remain bounding, penetrations that were evaluated for the containment environment will remain acceptable. Those penetrations that could see increases in normal temperatures due to power uprate, primarily main steam and feedwater, are protected with relief and safety valves or operate above peak post-accident temperatures and would cool down post-accident. Therefore, all penetrations remain acceptable under the uprate conditions.