Ref: 10 CFR 50.55a

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April 2, 2002

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)
DOCKET NOS. 50-445 AND 50-446
RESPONSE TO NRC BULLETIN 2002-01, "REACTOR PRESSURE VESSEL HEAD DEGRADATION AND REACTOR COOLANT PRESSURE BOUNDARY INTEGRITY"

Gentlemen:

In accordance with 10CFR50.54(f), attached is the TXU Generation Company LP (TXU Energy) response to U.S. Nuclear Regulatory Commission (NRC) Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity" dated March 18, 2002. TXU Energy coordinated preparation of this response with the other participants in the Strategic Teaming and Resource Sharing (STARS) group.

If you should have any questions regarding this submittal, please call Mr J. D. Seawright at (254) 897-0140 (Email - jseawright@txu.com).

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

Commitment Number	Commitment
27261	CPSES will perform a remote visual inspection of the bare metal upper head of both reactor vessels during their respective next refueling outages. The Unit 2 vessel head inspection will occur during 2RFO6 in April 2002 followed by Unit 1 during 1RFO9 in the fall of 2002. These inspections will be performed to support an engineering evaluation of the condition of the vessel heads with regard to the issues addressed in NRC Bulletin 2002-01.
27262	TXU Energy will submit the inspection scope, results, corrective actions taken and root cause of any degradation found within 30 days after plant restart following the next reactor pressure vessel head inspection. The next inspection is currently planned for the next refueling outage for Units 1 and 2 (1RFO9 and 2RFO6, respectively).
27263	TXU Energy will submit by May 17, 2002 either the basis for concluding that the boric acid inspection program for the remainder of the reactor coolant pressure boundary is providing reasonable assurance of compliance with the applicable regulatory requirements discussed in Generic Letter 88-05 and NRC Bulletin 2002-01 or any plans for review of the program.

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

Executed on April 2, 2002.

Sincerely,

TXU Generation Company LP

By: TXU Generation Management Company LLC,
Its General Partner

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

By: ______________________
Roger D. Walker
Regulatory Affairs Manager

JDS/js
Attachment

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

Response to NRC Bulletin 2002-01

Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity

Below is the TXU Generation Company LP (TXU Energy) response to Nuclear Regulatory Commission (NRC) Bulletin 2002-01, Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity, dated March 18, 2002. The Bulletin's "Required Information" is shown in bold.

Required Information

1. Within 15 days of the date of this bulletin, all PWR addressees are required to provide the following:

A. a summary of the reactor pressure vessel head inspection and maintenance programs that have been implemented at your plant,

TXU Energy Response:

Reactor Pressure Vessel Head Inspection Programs

TXU Energy performs visual inspections to identify boric acid deposits/reactor coolant system (RCS) leakage that could cause degradation of the reactor vessel head. These inspections are being performed under the auspices of Generic Letter 88-05 and ASME Section XI and entail the following:

- Boric Acid surveilances

  Boric acid corrosion (BAC) verification walkdowns are performed each refueling outage in accordance with site procedures. Locations that are susceptible for leakage onto the reactor vessel head are specifically identified for inspection. The walkdowns are performed early in the outage to ensure evidence of RCS leakage, such as boric acid deposits at the leakage sites, is not disturbed prior to engineering evaluation.

  The CPSES inspection program does not currently require a routine 100 percent bare metal reactor pressure vessel head inspection, and such an inspection has not been performed in the past.

- ASME Section XI VT-2 at normal operating pressure and normal operating temperature (NOP/NOT)

  Inspections within the scope of ASME Section XI (i.e., VT-2) are performed following each refueling outage at NOP/NOT for leakage, and evidence of leakage above the reactor vessel head insulation would be documented and corrected in accordance with ASME Section XI and the CPSES corrective action program.

- Reactor Vessel Stud/Nut VT-1 and MT examinations

  Reactor vessel studs/nuts are inspected in accordance with the CPSES ASME Section XI Inservice Inspection Program Plan. The studs/nuts receive a periodic VT-1/MT examination. Boric acid corrosion would be identified during these examinations. Additionally, UT examination of the Reactor Vessel Head flange, performed in accordance with the site ASME Section XI ISI Program Plan, would also identify boric acid corrosion degradation.

- Operations RCS leakage identification walkdowns

  RCS leakage is determined in accordance with CPSES Technical Specifications 3.4.13 and 3.4.14 on a frequency specified within the Technical Specifications. Once it is determined RCS leakage is occurring, through the RCS inventory balancing calculations, efforts are made to identify, evaluate, and correct the condition.

<u>Reactor Vessel Head Maintenance Activities</u>

CPSES performs routine maintenance activities on and in the vicinity of the reactor vessel head each refueling outage as discussed below. Non-routine corrective maintenance activities are performed as required in response to identified conditions.

- Refueling activities associated with reactor vessel head removal (e.g., core exit thermocouple (CET) removal and installation, control rod drive mechanism (CRDM) maintenance, HVAC removal, and RCS drain/fill and vent)

  As part of each refueling outage, operations and maintenance personnel are involved in conoseal removal and reinstallation, CET termination removal and reinstallation, RCS drain/fill and vent, and head detach/attach involving reactor vessel stud and nut removal activities. Removal of the CRDM cooling ducts also provides direct visual access to the portion of the head penetrations that are inside the cooling shroud and above the reflective metal insulation. During these evolutions, essentially all of the visible areas of the head assembly are scrutinized.

Based on the methodologies described above, evidence of boric acid accumulation in areas where operational leakage sources are most likely to develop would be readily visible and addressed in accordance with the site corrective action program.

B. an evaluation of the ability of your inspection and maintenance programs to identify degradation of the reactor pressure vessel head including, thinning,

pitting, or other forms of degradation such as the degradation of the reactor pressure vessel head observed at Davis-Besse,

TXU Energy Response:

Current CPSES inspection programs, as described in 1.A above, are consistent with industry experience in identifying leakage from the likely sources of borated water above the reactor vessel head. Surfaces of components above the insulation that could potentially leak boric acid onto the head are sufficiently accessible to support visual inspection for evidence of such leakage. Joints (mechanical or welded) above the J-groove welds of reactor vessel penetrations that are visible above the head insulation include those in or associated with control rod drive mechanisms (CRDM), core exit thermocouple (CET) columns, reactor vessel level indicating system (RVLIS) columns, and reactor vessel head vent piping and components. Visual inspection inside the CRDM cooling shroud and from atop the seismic platform would reveal leakage from any of the aforementioned penetration joints without requiring the removal of any insulation. Therefore, boric acid residue and/or leakage from these joints, including the resultant flow path, would be readily evident.

Preliminary results from the Davis-Besse root cause evaluation indicate that the dominant root cause was a through-wall crack in the adjacent CRDM penetration tube. Both CPSES units are considered to be in the lowest susceptibility group to CRDM penetration tube cracking. Therefore, it is unlikely that a defect, similar to that observed at Davis-Besse, exists at CPSES and prior to recent events, industry experience suggested that a bare head inspection for consequential wastage corrosion was not warranted.

The insulation that covers the portion of the reactor vessel head below the CRDM cooling shroud is removed during each refueling outage. This provides direct visual access to the lower area of the reactor vessel head and to the reactor vessel studs, nuts, and washers. Significant boric acid leakage onto the reactor vessel head above or below the insulation would be identified as visible deposits in this region.

Any boric acid deposits identified during inspections are evaluated in accordance with the programs identified in 1.A. above.

C. **a description of any conditions identified (chemical deposits, head degradation) through the inspection and maintenance programs described in 1.A that could have led to degradation and the corrective actions taken to address such conditions,**

TXU Energy Response:

The following instances of RCS leakage/spills were identified although our review concluded that these occurrences would not have led to degradation of the reactor vessel head:

Unit 1

1) During the Unit 1 eighth refueling outage (1RF08), a light dusting of a white substance was identified on a CRDM housing. The canopy seal weld between the CRDM housing and the rod travel housing was inspected by both visual and liquid penetrant methods. No defect was identified in the seal weld. Based on interviews with maintenance, operations, and radiation protection personnel, it was concluded that a spill had occurred at a previous outage. A remote visual inspection of the reactor vessel head bare metal was performed in the area of the suspect CRDM. A light dusting of boric acid crystals on the vessel head was observed along with a localized accumulation of approximately three cubic inches near one penetration. This small deposit was removed to the extent practical and no evidence of head degradation was observed.

Unit 2

1) During restart from the Unit 2 second refueling outage (2RF02), a small amount of RCS leakage was observed on the west instrument port. The instrument port connection (conoseal) was reworked and the immediate area around the leakage source was cleaned up. No further leakage was observed and none was noted upon reinspection at the start of the next refueling outage (2RFO3).

2) During the Unit 2 fifth refueling outage (2RF05), RCS water was spilled from the reactor vessel head vent line during drain down activities. Approximately 10 gallons of RCS inventory was spilled over the CRDMs and onto the reactor vessel head insulation. The spill was cleaned-up, except for any potential leakage through the insulation to the bare metal of the reactor vessel head. The spill occurred with the head cool, approximately 30 days prior to the head reaching normal operating temperature (NOT). During this timeframe, it is expected that any RCS inventory that reached the bare metal of the reactor vessel head would have evaporated. As such, no degradation would be expected.

D. your schedule, plans, and basis for future inspections of the reactor pressure vessel head and penetration nozzles. This should include the inspection method(s), scope, frequency, qualification requirements, and acceptance criteria, and

TXU Energy Response:

CPSES will perform a remote visual inspection of the bare metal upper head of both reactor vessels during their respective next refueling outages. The Unit 2 vessel head inspection will occur during 2RFO6 in April 2002 followed by Unit 1 during 1RFO9 in the fall of 2002. These inspections will be performed to support an engineering evaluation of the condition of the vessel heads with regard to the issues addressed in NRC Bulletin 2002-01.

Inspection Method:

The visual inspections under the insulation will be via video camera delivered either manually or by remotely controlled crawler. Less accessible areas may be inspected via other video equipment.

Personnel Qualifications:

An evaluation team composed of personnel qualified at a minimum as VT-2 Level II and cognizant engineering staff will evaluate the results of the visual inspection.

Inspection System Qualification:

The tools and techniques employed for the Unit 1 inspection and to the extent practical for Unit 2, will meet the standards of ASME B& PV Code, Section XI, 1986 edition, (no addenda), paragraph IWA-2210 for VT-2 examinations with respect to resolution capabilities and lighting.

Scope:

The Unit 2 inspection will be performed on a best-effort basis with a goal of 100% coverage of the reactor vessel head under the insulation but as a minimum sufficient to support an engineering evaluation of the condition of the vessel head outer surface. In the fall Unit 1 outage, we anticipate being able to inspect essentially 100% of the vessel head under the insulation and all penetration tubes at the point that they emerge from the vessel head surface.

Acceptance criteria:

Accumulations of boric acid residue found on the reactor vessel head will be investigated sufficiently to determine whether the origin is an RCS pressure boundary leak. Discolored surfaces or areas with boric acid buildup will be given particular attention to determine, to the extent possible with visual examination equipment, if the surface below the residue is sound. If necessary, supplemental investigation aids such as scrapers/brushes, compressed air, and water washing will be applied to suspect areas to assist in the resolution of these areas.

Boric acid residue whose source is determined to originate in the juncture annulus of a head penetration tube and the head will be cause for immediate in-depth investigation to determine the extent and severity of the defect.

Boric acid residue from sources other than a penetration tube juncture will be investigated and corrective measures will be taken regarding the termination of the leak source and the arrest of any corrosive attack of the head.

Frequency:

Any inspections beyond those currently scheduled will be based on CPSES inspection results, the Davis-Besse root cause analysis, industry inspection results, and industry initiatives.

E. your conclusion regarding whether there is reasonable assurance that regulatory requirements are currently being met (see the Applicable Regulatory Requirements, above). This discussion should also explain your basis for concluding that the inspections discussed in response to Item 1.D will provide reasonable assurance that these regulatory requirements will continue to be met. Include the following specific information in this discussion:

1. **If your evaluation does not support the conclusion that there is reasonable assurance that regulatory requirements are being met, discuss your plans for plant shutdown and inspection.**

2. **If your evaluation supports the conclusion that there is reasonable assurance that regulatory requirements are being met, provide your basis for concluding that all regulatory requirements discussed in the Applicable Regulatory Requirements section will continue to be met until the inspections are performed.**

TXU Energy Response:

CPSES has reviewed relevant facts regarding compliance with the Applicable Regulatory Requirements identified within this Bulletin and concluded that there is reasonable assurance that regulatory requirements are currently being met. That review considered original compliance as well as actions related to assuring continued compliance during the operating period.

The following regulatory requirements were cited in the Bulletin as providing the basis for the Bulletin's assessment:

- Appendix A to 10 CFR Part 50, General Design Criteria for Nuclear Power Plants
- Criteria 14 – Reactor Coolant Pressure Boundary
- Criteria 31 – Fracture Prevention of Reactor Coolant Pressure Boundary, and
- Criteria 32 - Inspection of Reactor Coolant Pressure Boundary
- Plant Technical Specifications
- 10 CFR 50.55a, Codes and Standards, which incorporates by reference Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, of the ASME Boiler and Pressure Vessel Code
- Appendix B of 10 CFR Part 50, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants, Criteria V, IX, and XVI
- NRC Generic Letter 88-05

General Design Criteria (GDC):

The Bulletin states that the applicable GDC include GDC 14, GDC 31, and GDC 32. GDC 14 specifies that the reactor coolant pressure boundary (RCPB) be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture. GDC 31 specifies that the RCPB be designed with sufficient margin to assure that the probability of rapidly propagating fracture is minimized. GDC 32 specifies that components that are part of the RCPB be designed to permit periodic inspection and testing of important areas and features to assess their structural and leaktight integrity.

As part of the original design and licensing of CPSES, TXU Energy demonstrated that the design of the reactor coolant pressure boundary meets these requirements. CPSES complied with these criteria in part by: 1) selecting materials with excellent corrosion resistance and extremely high fracture toughness for reactor coolant pressure boundary materials, and 2) following ASME Codes and Standards and other applicable requirements for fabrication, erection, and testing of the pressure boundary parts. As described above, the requirements established for design, fracture toughness, and inspectability in GDC 14, 31, and 32 respectively were satisfied during the initial design and licensing, and continue to be satisfied during operation, even in the presence of a potential for stress corrosion cracking of the reactor pressure vessel head penetrations.

The review during the operating period has focused on both the operational and outage-related events in both Units 1 and 2 that had the potential to deposit boric acid on the reactor vessel head or otherwise create aggressive corrosive conditions on the reactor vessel head.

Plant Technical Specifications:

The limits for CPSES reactor coolant pressure boundary leakage are provided in Technical Specification 3.4.13. If measurable leakage is detected by the leak detection systems, evaluations and actions will be performed per the Technical Specifications requirements.

No operational leakage of consequence has been identified above the reactor vessel head since initial startup of either unit, although one instance of minor leakage was noted (see response to question 1.C) during startup from an outage and was promptly corrected. During outage activities associated with the operation of and making connections to the head vent piping in both units, spills of borated water have occurred. They can be characterized as low temperature, short duration (minutes), controlled volume (gallons to tens of gallons) events. The majority of any water that actually flowed down to the head surface would continue to flow down the head and out under the insulation to the flange area and ultimately to the floor of the refueling cavity. Only the thin film of water directly wetting the vessel surface would remain and thus only a very small amount of boric acid would ultimately be deposited when this water evaporates. If a spill puddled on the reflective metal insulation panels and flowed slowly down through the joints between insulation panels, subsequently dripping to the head, localized accumulation might also occur. However, due to the limited retention capacity of a puddle on the relatively flat surfaces of the narrow adjoining insulation panels, such accumulation would be small. Therefore, consequential accumulation of boric acid in contact with either unit's reactor vessel head is extremely remote because no known events involving a continuous supply of borated water reaching the reactor vessel head have occurred while the head was at elevated temperature. Furthermore, this review supports the conclusion that no consequential corrosion wastage of either reactor vessel head has occurred.

Although the final root cause analysis of the metal loss at Davis-Besse is not yet complete, leakage through the cracked penetration tube is considered a likely significant contributing factor. Consequently, susceptibility to Alloy 600 reactor vessel head penetration cracking, as addressed under NRC Bulletin 2001-01, continues to be the best indicator of relative risk that similar conditions could occur at other PWRs. CPSES continues to participate in the Electric Power Research Institute, Inc. (EPRI) Materials Reliability Program (MRP) activities associated with this issue. At this time, all visual and non-visual NDE data continues to support the MRP time-at-temperature model as an effective management tool. Using the criteria stated in NRC Bulletin 2001-01, both CPSES units are considered as having a low susceptibility to cracking of the reactor pressure vessel head penetration nozzles and thus would not reasonably expect such cracking to be of concern for many more effective full power years of operation.

As part of the resolution of the issues identified in NRC Generic Letter 97-01 and earlier correspondence regarding degradation of CRDM nozzles and other reactor pressure vessel head penetrations, evaluations and assessments concluded there would be a significant time between initiating a leak and experiencing wastage that would reduce the structural integrity margins of the reactor pressure vessel head below acceptable levels. This conclusion is consistent with preliminary findings from the

Davis-Besse event. Considering the length of time involved, relatively low susceptibility, and comparatively short operating life to date, CPSES has reasonable assurance that leakage does not presently exist.

The CPSES reactor vessel head inspection and maintenance programs discussed in response to question 1.A comply with the following requirements:

<u>Inspection Requirements (10 C.F.R. § 50.55a and ASME Section XI)</u>

CPSES complies with ASME Code Section XI inspection requirements for insulated components as part of the CPSES ISI program. Since the head is insulated, and the nozzles do not represent a bolted flange, the Code permits these inspections to be performed with the insulation left in place.

<u>Quality Assurance Requirements (10 CFR 50, Appendix B)</u>

CPSES administrative controls comply with requirements of 10 CFR 50, Appendix B, Criteria V (Instructions, Procedures, and Drawings), Criteria XI (Control of Special Processes), and Criterion XVI (Corrective Action). Inspection and evaluation of boric acid deposits and/or reactor coolant system (RCS) leakage that could cause degradation of the reactor vessel head, described in 1.A above, complies with these administrative controls.

<u>NRC Generic Letter 88-05:</u>

TXU Energy has implemented an inspection program at CPSES in response to Generic Letter 88-05 (prior to licensing of Units 1 and 2) to identify and assess reactor coolant leaks below technical specification limits. (See answers to 1.A.)

Therefore, reasonable assurance is provided that CPSES Units 1 and 2 continue to meet the applicable regulatory requirements given the present state of knowledge regarding the Davis-Besse condition root cause.

In addition, CPSES will perform bare metal inspections under the insulation of the reactor vessel upper head in both Units 1 and 2 during their next scheduled refueling outages beginning with Unit 2 in April 2002 (refer to the response to item 1.D above). The current baseline condition of the vessel heads will be established based on the evaluated inspection results. CPSES will evaluate the current boric acid inspection program for the reactor vessel head and apply the lessons learned from the Davis-Besse event.

Subsequent reinspections of the bare metal reactor vessel head under the insulation will be performed either 1) as necessary to support an evaluation of an identified leak or spill, or 2) as a scheduled activity on a frequency to be established later in consideration of the CPSES inspection results, the Davis-Besse root cause analysis, industry inspection results, and industry initiatives. Conditions adverse to quality will be evaluated and dispositioned under existing site programs that comply with the requirements of Criterion XVI of Appendix B to 10CFR 50. These actions will provide on a continuing basis, reasonable assurance that the applicable regulatory requirements discussed in Generic Letter 88-05 and NRC Bulletin 2002-01 are being met.

2. **Within 30 days after plant restart following the next inspection of the reactor pressure vessel head to identify any degradation, all PWR addressees are required to submit to the NRC the following information:**

   A. **the inspection scope (if different than that provided in response to Item 1.D.) and results, including the location, size, and nature of any degradation detected,**

   B. **the corrective actions taken and the root cause of the degradation.**

TXU Energy Response:

TXU Energy will submit the information as requested within 30 days after plant restart following the next reactor pressure vessel head inspection. The next inspection is currently planned for the next refueling outage for Units 1 and 2 (1RFO9 and 2RFO6, respectively).

3. **Within 60 days of the date of this bulletin, all PWR addressees are required to submit to the NRC the following information related to the remainder of the reactor coolant pressure boundary:**

   A. **the basis for concluding that your boric acid inspection program is providing reasonable assurance of compliance with the applicable regulatory requirements discussed in Generic Letter 88-05 and this bulletin. If a documented basis does not exist, provide your plans, if any, for a review of your programs.**

TXU Energy Response:

TXU Energy will submit the information as requested by May 17, 2002.