STP Nuclear Operating Company

South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

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U. S. Nuclear Regulatory Commission
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South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Response to NRC Bulletin 2002-01,
"Reactor Pressure Vessel Head Degradation
and Reactor Coolant Pressure Boundary Integrity"

In accordance with 10CFR50.54(f), attached is the STP Nuclear Operating Company (STPNOC) 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. STPNOC 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 contact me at 361-972-8757 or Mr. Michael Lashley at 361-972-7523.

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

Executed on: 4/2/02

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Vice President,
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AWH
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1. Response to Bulletin 2002-01
2. List of Commitments

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Response to NRC Bulletin 2002-01
Reactor Pressure Vessel Degradation and Reactor Coolant Pressure Boundary Integrity

Below is the STP Nuclear Operating Company (STPNOC) response to Nuclear Regulatory Commission (NRC) Bulletin 2002-01, Reactor Pressure Vessel 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,

STP Response:

STP has not performed a one hundred percent bare metal inspections of the reactor vessel head at either Unit. The inspection and maintenance programs performed at STP are described below.

STP has performed visual inspections, including VT-2, of the reactor vessel head to comply with NRC Generic Letter 88-05 and ASME Section XI requirements. Table 1 provides a summary of recent inspections that were performed.

Boric Acid Leak Inspection (GL88-05):

During station performance of procedure 0PGP03-ZE-0033, "RCS Pressure Boundary Inspection For Boric Acid Leaks", all head penetration joints above the head are visually inspected. These penetrations include all control rod drive mechanisms (CRDMs) including spares, core exit thermocouple (CET) columns, reactor vessel water level (RVWL) columns, and internal disconnect devices (IDD). Leakage from any joints on those penetrations is visible when inspected inside the CRDM cooling shroud. The Station procedure 0PGP03-ZE-0033 requires inspection of the reactor vessel head area on any shutdown if the plant has operated near normal operating pressure and normal operating temperature (NOP/NOT) for a period greater than 90 days since the last reactor vessel head inspection. A visual inspection is performed on components inside the CRDM cooling shroud. The removal of the insulation is not required for this inspection. If the outage is expected to be of extended duration, the vessel stud insulation is removed and an inspection of the areas of the head outside the cooling shroud is performed to detect significant leakage from any through-wall cracks that might originate in the portion of the penetration that is under the head insulation.

ASME Section XI Pressure Boundary Inspection:

Inspections are performed once per operating cycle, generally at the end of refueling outages. These are performed with the RCS at NOP/NOT. Since the vessel head stud insulation is installed, only the components inside the shroud door (above the head insulation) are visible. Significant leakage originating below the insulation layer would be detected by observation of boric acid residue on the reactor vessel flange.

Other Inspection and Maintenance Activities:

STP performs other inspections on components in the vicinity of the reactor vessel head as part of its ASME Section XI Inservice Inspection Program. Specifically, the reactor vessel studs/nuts/washers, the flange weld, the dome to torus weld, the meridional welds, and the control rod drive housing welds are inspected periodically. In addition during refueling activities a number of maintenance activities are performed on the reactor vessel head. These activities afford another opportunity to identify conditions adverse to quality that warrant further investigation.

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,

STP Response:

The intent of the visual inspections performed at STP is to detect evidence of head degradation associated with boric acid leakage. The visual inspections performed at STP can detect the above forms of degradation if the source of boric acid leakage is above the insulation or if there is significant leakage from below the insulation. It is STP's practice to remove all boric acid residues on carbon steel components with demineralized water to ensure that no thinning or pitting is obscured under the residue. For potential leakage of boric acid through the penetration, STP is considered to have low susceptibility by the analysis performed as part of EPRI Report 1006284, *PWR Materials Reliability Program Response to NRC Bulletin 2001-01 (MRP-48).*

All head penetration joints are visible above the head insulation. Therefore leakage from any joint and the resultant path of boric acid residue would be readily evident. Any significant boric acid leak originating under the insulation would be visible as leakage rolls down to the reactor vessel head flange area.

STP's CRDM joints are seal welded, which reduces their susceptibility to leakage. In addition STP does not normally need to disassemble CET or RVWL connections during refueling, which minimizes the susceptibility of these joints to leakage.

In summary, STP has a quality inspection and maintenance program that has the ability to identify degradation of the vessel head.

- All joints above the head are accessible for inspection.
- Relevant areas where leakage residue would collect are inspected.
- STP CRDM housing to penetration nozzle are seal welded.
- Mechanical connections are normally not disturbed during a refueling outage.
- Any boric acid deposit identified during inspections is cleaned with demineralized water and reinspected.

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,

STP Response:

Table 2 describes the history of relevant head conditions found for both Units and the corrective actions taken. There was one instance where boric acid was deposited on the reactor head. For this occurrence, the head was thoroughly cleaned and the areas subjected to boron deposits were confirmed to be free from degradation. In addition, about half of the head surface was inspected to confirm no carbon steel degradation had occurred. Other occurrences of leakage showed no evidence of any boric acid approaching the reactor vessel head. All occurrences were appropriately investigated as to the source of leakage. These conditions were corrected, cleaned, and reinspected.

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

STP Response:

STP has a high degree of confidence that no boric acid deposits are present on the reactor head in either Unit. The single occurrence where boric acid reached the reactor vessel head was cleaned and reinspected. STP has confidence that the current visual inspection procedures meet all regulatory requirements and are appropriately implemented.

STP will continue to explore options to optimize inspections of our reactor vessel head. This may include enhanced techniques such as the use of robotics, videos, etc. for STP's fall 2002 and spring 2003 refueling outages. STP will continue to monitor developments and industry experience on this issue and apprise the NRC of inspection plans in the 60 day response to this Bulletin.

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.

STP Response:

Based on the following there is reasonable assurance that the reactor pressure vessel head, head penetrations and reactor coolant pressure boundary are in the as-designed condition and are capable of fulfilling all license and design basis requirements. Specific licensing basis requirements are addressed below.

The NRC Bulletin 2002-01 section entitled Applicable Regulatory Requirements cites the following regulatory requirements as providing the basis for the bulletin 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 Boundary, and*
    - Criteria 32 - *Inspection of Reactor Pressure 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 (Reactor Coolant Pressure Boundary), GDC 31 (Fracture Prevention of Reactor Coolant Pressure Boundary), and GDC 32 (Inspection of Reactor Coolant Pressure Boundary). GDC 14 specifies that the reactor coolant pressure boundary (RCPB) has an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture. GDC 31 specifies that the probability of rapidly propagating fracture of the RCPB be minimized. GDC 32 specifies that components which are part of the RCPB have the capability of being periodically inspected to assess their structural and leaktight integrity; inspection practices that do not permit reliable detection of degradation are not consistent with this GDC."

As part of its original design and licensing, STP demonstrated that the design of the reactor coolant pressure boundary meets these requirements. STP complied with these criteria in part by: 1) selecting corrosion resistant materials with high fracture toughness for the reactor coolant pressure boundary, 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.

STP Units 1 and 2 are in the low susceptibility range based upon the MRP-48 susceptibility rankings. To date, penetration cracking inspection results have been very consistent with the susceptibility ranking. Plants with higher susceptibility have performed both visual inspections and non-visual NDE and have not found signs of cracking. Based upon the industry susceptibility ranking and good agreement with inspection results to date, STP has concluded that STP is extremely unlikely to have any leakage from head penetration cracking.

Plant Technical Specifications:

The limits for STP reactor coolant pressure boundary leakage are provided in Technical Specification 3.4.6.2, and are stated in terms of the amount of leakage, i.e., no pressure boundary leakage, 1 gallon per minute for unidentified leakage, and 10 gpm for identified leakage from the reactor coolant system. Most leaks from reactor coolant system Alloy 600 penetrations have been well below the sensitivity of on-line leakage detection systems. STP has evaluated this condition and has determined that STP's inspection and maintenance processes are adequate, as described earlier in this response. If leakage or unacceptable indications are found, then defects will be repaired before startup. If measurable leakage is detected by the on-line leak detection systems, then the leak will be evaluated per the Technical Specifications, and the plant will be shut down if required. Upon detection and identification of a leak, corrective actions will be taken to restore reactor coolant pressure boundary integrity. STP continues to meet the requirements of this Technical Specification.

Inspection Requirements (10 CFR 50.55a and ASME Section XI):

The Bulletin describes the requirements for inspection in accordance with the ASME Code, detection of leakage from insulated components, and the acceptance standards if through wall leakage is detected. STP has complied with the inspection requirements for insulated components as part of the STP 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. STP also complies with the requirements of Generic Letter 88-05 by performing walkdowns during refueling outages and other shutdowns as described in the response to 1.A. If conditions are identified in the course of these inspections, corrective actions are performed, including supplemental examinations, repairs and/or evaluations, and inspections for consequential degradation of carbon steel or low alloy steel.

Quality Assurance Requirements (10 CFR 50, Appendix B):

The Bulletin states that special processes, including nondestructive testing, shall be controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements, as required by Appendix B, Criteria V (Instructions, Procedures, and Drawings) and Appendix B, Criteria XI (Control of Special Processes). STP complies with these standards on a programmatic basis.

Criterion XVI of Appendix B states that measures shall be established to assure that conditions adverse to quality are promptly identified and corrected. For significant conditions adverse to quality, the measures taken shall include root cause determination and corrective action to preclude repetition of the adverse conditions. STP has a strong corrective action program. If any cracking, leakage or degradation is detected during the reactor head and head penetration inspections described above, corrective actions will be taken in accordance with plant procedures. Any reactor coolant pressure boundary leakage or degradation would be considered a significant condition adverse to quality and appropriate actions including a root cause analysis will be undertaken.

In consideration of potential conditions adverse to quality, STP has been actively participating in industry organizations and continues to be aware of industry experience.

NRC Generic Letter 88-05:

As discussed above, STP has implemented the inspection and walkdown requirements of the generic letter.

Future Conformance with Regulatory Requirements:

As stated in response to item 1.D above, STP will continue to implement the ASME Section XI and GL 88-05 inspection programs as described in 1.A. In developing its response to 3.A. below, STP will evaluate current programs and practices for identifying, evaluating, and cleaning operational leaks of borated water near the reactor vessel head to apply the lessons learned from the Davis-Besse event. Where appropriate, such programs and practices will be enhanced.

All conditions adverse to quality identified through these activities 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 are being met.

Based upon the evaluation provided above, the compliance with plant Technical Specifications, and the inspections to be performed in the next refueling outage for STP Unit 1 and 2, STP has concluded that STP Units 1 & 2 continue to comply with the regulatory requirements described in NRC Bulletin 2002-01.

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.**

STP will submit the information as requested. Based on current outage schedules for STP, the submittals will be provided in January 2003 for Unit 2 and in May 2003 for Unit 1.

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.

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

Table 1: Dates of Recent RPV Head Visual Inspections

Unit 1		Unit 2	
Outside/Inside Shroud	Inside Shroud Only	Outside/Inside Shroud	Inside Shroud Only
10/03/01	10/22/01	3/09/01	10/04/01
03/03/00	12/17/00	10/15/99	3/07/01
3/29/99	5/11/00	10/4/98	2/7/01
9/16/97	09/12/99		11/6/99
	4/28/99		10/23/98
	10/03/97		7/25/98
	06/28/97		11/21/97
	04/07/97		

Table 2
STP History

-Discovery -Actions Completed	Condition Description	Corrective Actions	Boric Acid Leak to Head?
12/27/92 5/28/93	**Unit 2 Penetration 26, RVWL flange leak to head** RVWL column joint above the missile shield leaked down the column to the head insulation. Approximately 2 liters of residue was found deposited below the head and vessel stud insulation.	Prior to the 12/27/1992 discovery, the last documented inspection on 12/10/91 revealed no evidence of leakage. The length of exposure did not exceed one operating cycle. The RVWL column joint was disassembled, new seal rings installed, and the joint was reassembled. The boric acid residue was easily accessible after removing about a third of the head insulation. This allowed viewing of about 50% of the bare metal head (including all areas subjected to leakage) to confirm no wastage of carbon steel had occurred, following the cleaning of the head with demineralized water and brushes.	Yes
12/27/92 12/29/92	**Unit 2 Penetration 75, CET Conical Seal Joint** Light steam plume from upper joint of conical seal assembly. Boron crystal buildup on shroud interior and head insulation. Deposit characteristics indicates that it dried before reaching insulation. Based on deposition trace, boric acid did not deposit on reactor head or studs.	Cleaned boron crystals and determined that boric acid residue did not penetrate the reactor head insulation. Increased torque on conical seal jackscrews to nominal torque value.	No
06/28/94 06/28/94	**Unit 2 Penetration 75, CET Conical Seal Joint** Minor boron buildup at CET conical seal upper joint. Boric acid did not reach head insulation.	Cleaned boron crystals and determined that boric acid residue did not penetrate the reactor head insulation. Replaced conical seal.	No
12/09/92 12/21/92	**Unit 1 Penetration 28, Spare CRDM Housing Leak** CRDM spare housing exhibited 2"steam plume from seal weld. Based on deposition trace, boric acid did not deposit on reactor head or studs.	Cleaned boron crystals and determined that boric acid residue did not penetrate the reactor head insulation. Installed a CSCA clamp on housing.	No
10/5/91 11/23/91	**Unit 2 Penetration 76, CET Conical Seal Joint** Minor boron buildup at CET conical seal upper joint. Boric acid did not reach head insulation.	Cleaned boron buildup and determined that the boron residue had not reached the head insulation. Joint was disassembled, cleaned and reassembled.	No

LIST OF COMMITMENTS

The following table identifies those actions committed to by STP in this document. Any other statements in this submittal are provided for information purposes and are not considered to be commitments. Please direct questions regarding these commitments to Mr. Wayne Harrison at 361-972-7298.

COMMITMENT	Due Date/Event
Respond to Required Action 2 for STP Unit 1	May 2003
Respond to Required Action 2 for STP Unit 2	January 2003
Submit 60 response for Required Action 3, including plans for inspection	May 17, 2002