

August 8, 2003

LICENSEE: South Texas Project Nuclear Operating Company

FACILITY: South Texas Project, Unit 1

SUBJECT: SUMMARY OF THIRD MEETING WITH SOUTH TEXAS PROJECT NUCLEAR OPERATING COMPANY REGARDING SOUTH TEXAS PROJECT, UNIT 1, REACTOR VESSEL AND BOTTOM-MOUNTED INSTRUMENTATION PENETRATION INTERFACE LEAKAGE (TAC NO. MB8435)

On July 17, 2003, STP Nuclear Operating Company (STPNOC), the licensee for South Texas Project (STP), Units 1 & 2, met with the U. S. Nuclear Regulatory Commission (NRC) staff at the NRC Headquarters. The purpose of the meeting was for STPNOC to brief the NRC staff and management regarding STPNOC's concluding efforts to address the issues arising from the April 12, 2003, discoveries of indications of leakage from the STP, Unit 1, bottom mounted instrument (BMI) penetrations 1 and 46. There are 58 BMI penetrations at STP, Unit 1.

At the outset, the NRC staff informed the audience that the NRC staff would not be making any decisions at this meeting. The purpose of the meeting was to gather information to facilitate the NRC staff's comprehensive evaluation of the issues raised.

The STPNOC stated that it has documented its commitments to take follow up actions as outlined in its letter dated July 11, 2003. The NRC staff commented that the letter does not specifically state that the described actions are in fact licensee commitments. The licensee stated that it will provide a follow up in response to the comment.

A list of meeting attendees is included as Enclosure 1 to this summary. Enclosure 2 contains the licensee's presentation view-graphs .

The STPNOC outlined its desired meeting outcomes: (1) to keep NRC fully informed and ensure that NRC has sufficient information to complete its comprehensive assessment; (2) to explain the results of comprehensive nondestructive examination (NDE); and (3) to describe remaining future activities, i.e., to collect boat samples, perform nozzle remnants analyses, and submit a licensee event report supplement. The licensee then summarized its root cause analysis process and planned monitoring and inspection activities. The STPNOC provided answers to NRC questions and understood the remaining NRC needs for information. The STPNOC summarized that the residue found at BMI penetration no. 1 and penetration no. 46 was very small. It indicated a very small leak from the reactor bottom.

#### NDE Campaign

An extensive NDE campaign included ultrasonic testing (UT), enhanced visual examination of J-groove weld surface, volumetric interrogation of vessel base metal for wastage, eddy current testing (ET) of penetration tube inside diameter, ET of J-groove weld surface, profilometry, boroscope examination, Helium leak tests, metallurgical analysis of removed nozzle remnants, and future boat sample analysis.

The licensee stated that the results of the evaluation indicated that the observed leakage was caused by one axial crack in each of the two penetrations. Penetration no. 1 had three crack indications, with one leak path. Penetration no. 46 had two axial indications with one leak path.

### Nozzle Repairs

The condition was limited to two identified nozzles and the cracks identified were axial in orientation. Evaluation of stresses indicated that circumferential cracking was not likely to occur. The licensee selected the half-nozzle repair method. Repair of both of the leaking nozzles is complete.

### Root Cause Process

The licensee outlined that there were no circumferential indications, no cracks above or below the J-groove weld, and no material wastage was found. The STPNOC considered two possible causes of crack initiation: (1) The cracks were caused by primary water stress corrosion cracking (PWSCC), or (2) the cracks were caused by a fabrication flaw over-stress in the nozzle and/or weld. The cracks were either propagated by PWSCC or low-cycle fatigue. The licensee then deduced that the facts are not consistent with PWSCC. No cracks were identified in 56 out of 58 BMI nozzles. The cracks were about 4 years old, were about the same age, and did not initiate from the inside diameter of the tubes. The licensee concluded that for PWSCC to be the cause, the expectation would be to observe defects in approximately 20 percent of the penetrations. Hence, defects would be expected in 12 penetrations out of 58 examined, but only 2 penetrations with defects were found.

The residual stresses do not appear to show any correlation with the observed cracks. Penetration no. 1 and penetration no. 46 differ in residual stresses, and still they are the only penetrations showing crack indications and leakage. Furthermore, some cracks did not appear to be in contact with primary water. Based on the above rationale, the licensee concluded that the root cause of the BMI cracks was fabrication flaws.

The NRC staff commented that the licensee's hypothesis did not explain why the fabrication flaws occurred only in penetrations 1 and 46. The licensee responded that it would consider the NRC comment in further evaluation of the root cause.

### Monitoring and Inspection Plan

The licensee proposed that it will continue the bare metal inspections under its boric acid control program. It will perform UT and enhanced visual testing of the BMI instrumentation at the next Unit 1 vessel inservice inspection program inspection. It will also perform periodic UT of vessel base material around the repaired penetrations, and will perform volumetric examination of Unit 2 penetrations at the next refueling outage with the core barrel removed.

### Conclusions

The licensee concluded that: (1) the extent of the condition is known, (2) that STPNOC has identified the probable cause as understood at the time, (3) engineering work has been completed, (4) the condition has been corrected by the half-nozzle design repair, (5) the

licensee has confidence in the effectiveness of the repair, and (6) the plant staff is trained and is prepared for start up of the plant.

The NRC staff informed the STPNOC that its boric acid inspection program has been proactive, and that its response to the conditions of leakage in BMI penetrations 1 and 46 has been thorough. The staff asked how is it that STPNOC can perform the operations at STP, Units 1&2, in such a proactive and thoroughly responsive manner. The licensee responded that it is the policy of the STPNOC management to ensure that, when challenges are identified, the company mobilizes the best internal resources and the world's best contractors to support the resolution of the issues, and to eliminate the challenges.

The NRC staff then asked for public comments for the meeting attendees and the teleconference participants. No comments were offered. The meeting was then adjourned.

*/RA/*

Mohan C. Thadani, Senior Project Manager, Section 1  
Project Directorate IV  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket No. 50-498

Enclosures: 1. List of Attendees  
2. View-graphs (ADAMS Accession No.: ML032090144)

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NRC-001

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Dated: August 8, 2003

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ON JULY 17, 2003

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