

APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION  
REGION IV

NRC Inspection Report No.: 50-498/93-50  
50-499/93-50

Licenses: NPF-76  
NPF-80

Licensee: Houston Lighting & Power Company  
P.O. Box 289  
Wadsworth, Texas 77483

Facility Name: South Texas Project Electric Generating Station (STP),  
Units 1 and 2

Inspection At: Region IV office, Arlington, Texas

Inspection Conducted: October 12, 1993, through March 18, 1994

Inspectors: M. A. Satorius, Project Engineer, Project Branch A, Division of  
Reactor Projects

W. C. Sifre, Reactor Engineer, Technical Support Staff, Division  
of Reactor Projects

Approved: W. D. Johnson  
W. D. Johnson, Chief, Project Branch A

3/30/94  
Date

Inspection Summary

Areas Inspected: Routine in-office inspection of the Engineering Support  
issues contained in the Diagnostic Evaluation Team (DET) Report.

Results:

- The Engineering Support section of the DET report was reviewed. Based on this review, issues that the NRC considers necessary to be addressed which do not pertain to the restart of either unit were identified.
- Items identified in the review of the DET report related to nonrestart issues were assigned an inspection followup item (IFI) in order to facilitate tracking and eventual closure.

Summary of Inspection Findings:

- The following IFIs were opened:

498;499/9350-10, -11, and -20.

- The following IFIs were opened, but were subsequently closed by referencing other NRC inspection reports:

498;499/9350-01, -02, -03, -04, -05, -06, -07, -08, -09, -12, -13, -14, -15, -16, -17, -18, -19, -21, -22, -23, -24, -25, -26, -27, -28, -29, -30, -31, -32, -33, -34, and -35.

Attachments:

- Persons Contacted and Exit Meeting

## DETAILS

### 1 BACKGROUND

Both units at STP were shut down in early February 1993 and remained shutdown as a result of numerous broad scope problems identified by the NRC and the licensee. Unit 1 started up in February 1994 after meeting the conditions of the Confirmatory Action Letter.

The NRC Office for Analysis and Evaluation of Operational Data conducted a Diagnostic Evaluation of STP during the period March 29 to April 30, 1993. The findings of this evaluation were forwarded to the licensee on June 10, 1993. Numerous items were documented in the DET report, including a number of issues that NRC considered of sufficient scope and safety significance to require resolution prior to either unit being restarted.

In an effort to identify the Engineering Support issues that NRC did not consider necessary to address prior to restart, a review was conducted of the DET report. As a result of this review, the issues in the following sections were identified.

### 2 DIAGNOSTIC EVALUATION TEAM NONRESTART ITEMS RELATED TO ENGINEERING SUPPORT

This section was structured to address the issues in Section 2.3, "Engineering Support," of the DET Report. The introductory section was not addressed because the issues addressed in the introduction were also determined to be identified in the detailed portion of the corresponding section of the report. In addition, the positive observations and Restart Issues were not addressed because these issues were determined to be not applicable or addressed by other NRC inspections.

#### 2.1 IFIs Identified in Paragraph 2.3 of the DET Inspection Report

2.1.1 (Closed) IFI 498;499/9350-01: Engineering work backlogs were large, rapidly increasing, poorly tracked, and not well managed.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/93-45; 50-499/93-45.

2.1.2 (Closed) IFI 498;499/9350-02: Industry and site operational experience was not effectively used, which led to avoidable site events, repetitive equipment failures, and additional engineering time expenditures.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/93-43; 50-499/93-43.

2.1.3 (Closed) IFI 498;499/9350-03: The design, maintenance, and testing of the essential chilled water system contained functional and programmatic weaknesses, which, if not corrected, could adversely affect the operability of

the system. The licensee had never demonstrated or analyzed the ability of the system to function under design basis accident low heat load conditions.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/94-04; 50-499/94-04.

## 2.2 IFIs Identified in Paragraph 2.3.1 of the DET Inspection Report

2.2.1 (Closed) IFI 498;499/9350-04: The root cause analysis and accompanying corrective actions were ineffective in preventing repeated failures of the toxic gas monitors and containment ventilation isolation system. Since 1987, 28 toxic gas monitor events occurred, including 6 during 1991 through 1992. Similarly, there were several repeat occurrences involving spurious actuation of the containment ventilation isolation system, including 4 during 1991 through 1992.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/93-45; 50-499/93-45.

2.2.2 (Closed) IFI 498;499/9350-05: Widespread, long-standing problems with the application and performance of Target Rock solenoid-operated valves were not resolved. These valves were used extensively in several safety-related systems. Multiple licensee event reports involving wear, aging, debris, contamination, and valve misapplication had occurred since 1990. Temporary modifications were installed to bypass containment isolation valves to allow steam generator sampling. Previous corrective actions, such as re-orienting the main steam isolation valve above the seat drains, did not prevent additional failures.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/93-45; 50-499/93-45.

2.2.3 (Closed) IFI 498;499/9350-06: Corrective actions for numerous safety and nonsafety-related circuit breaker problems were not aggressive or complete. The licensee evaluated each breaker failure and took corrective actions for safety-related breakers. Many of these actions were incomplete. Further, the licensee was slow in resolving problems and taking corrective actions for many nonsafety-related breakers.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/93-45; 50-499/93-45.

2.2.4 (Closed) IFI 498;499/9350-07: After a reactor trip, the startup feedwater pump failed to start upon demand because of low oil pressure. Repeated occurrences of moisture intrusion had caused the oil filters to become clogged, reducing the lube oil pressure. A previous startup feedwater pump trip on low lube oil pressure had not been properly evaluated, resulting in the failure to recognize design deficiencies.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/93-55; 50-499/93-55.

2.2.5 (Closed) IFI 498;499/9350-08: During oil pump transfers, the steam generator feed pump turbine tripped repeatedly because the oil pressure decreased rapidly. Engineering mistakenly accepted the recommendation of a vendor to drill holes in the pump casing to prevent air binding, which, when implemented, exacerbated the problem.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/93-55; 50-499/93-55.

2.2.6 (Closed) IFI 498;499/9350-09: The Technical Support Center diesel generator was not reliable, as evidenced by repeated failures to start and load during testing. Contributing to the poor reliability was exposure to the environment, design weaknesses, and poor circuit breaker reliability. The licensee only partially implemented proposed resolutions to these problems.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/93-55; 50-499/93-55.

2.2.7 (Open) IFI 498;499/9350-10: The installation of plant modifications to effect plant improvements was not always successful. TMs were not thoroughly evaluated and were not aggressively pursued to closure, as illustrated in the following:

- Sixteen TMs were installed for more than 2 years, including some that caused problems for operators. Some TMs were originally assigned a long restoration period (1 to 2 years) or given an extension without adequate justification. Some were later converted to permanent modifications and remained open until the permanent modifications were closed.
- In performing engineering evaluations for TMs affecting the chill water system and steam generator sample valves, the engineering staff failed to realistically evaluate required operator action in a potential high radiation field to compensate for failed safety-related automatic valve actuators.

### 2.3 IFI Identified in Paragraph 2.3.2 of the DET Inspection Report

2.3.1 (Open) IFI 498;499/9350-11: Program expectations for the system engineers greatly exceeded the resources provided. Some system engineers were assigned the "primary" responsibility for as many as 10 systems, with an additional 10 systems assigned as "backup." Most system engineers were not knowledgeable in their backup system assignment. Staffing allocation was not consistent for the three-train safety system design. The system engineers could not effectively do their job because of the large amount of emergent work, inaccurate material history databases, and lack of individual computer systems. System engineers generally did not complete their monthly walkdowns



or did not sufficiently document them when performed. System health reports lacked useful detail and trending information. Most system engineers did not review and track service requests on their assigned systems, did not know how many service requests were outstanding on or how many modification affected their systems, and did not track and trend problems or particular attributes of their systems. Several engineers were deficient in training or equivalent work experience. Management did not oversee and direct the system engineering program in a consistent manner. System engineers reported to different supervisors who had differing standards for implementing the system engineering program, which resulted in program inconsistencies.

#### 2.4 IFIs Identified in Paragraph 2.3.3 of the DET Inspection Report

2.4.1 (Closed) IFI 498;499/9350-12: Emergent work consumed approximately 40 percent of engineering time and prevented engineering from reducing the backlog, accomplishing scheduled work, or helping to improve the plant.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Reports 50-498/93-45; 50-499/93-45 and 50-498/93-55; 50-499/93-55.

2.4.2 (Closed) IFI 498;499/9350-13: The licensee did not have an effective method to determine the size and composition of the engineering backlog.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Reports 50-498/93-45; 50-499/93-45 and 50-498/93-55; 50-499/93-55.

2.4.3 (Closed) IFI 498;499/9350-14: The backlog consisted of approximately 10,800 work items on May 1, 1993, including 253 modifications, 395 engineering change notices, 6674 preventive maintenance feedback items, 209 predictive maintenance items, 200 Station Problem Report investigation items, 690 plant change form items, 204 design change notices, 381 request-for-action items, 54 TMs, 385 procedures, 33 vendor equipment technical information program items, 51 vendor packages, 660 "closure" items, 44 operating experience review items, and other miscellaneous items.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Reports 50-498/93-45; 50-499/93-45 and 50-498/93-55; 50-499/93-55.

2.4.4 (Closed) IFI 498;499/9350-15: The number of work items in the backlog was increasing at a net rate of 428 each calendar quarter (7 person years each quarter). To compensate for this workload, numerous individuals worked more than 70 percent overtime and some worked more than 100 percent overtime in a pay period.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/93-45; 50-499/93-45.

## 2.5 IFIs Identified in Paragraph 2.3.4 of the DET Inspection Report

2.5.1 (Closed) IFI 498;499/9350-16: Industry and site operating experience review performed by the licensee were not comprehensive or timely and failed to completely address problems or recommendations.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/93-43; 50-499/93-43.

2.5.2 (Closed) IFI 498;499/9350-17: In several instances, engineering failed to review and benefit from industry experience, such as described in NRC information notices and bulletins, vendor service bulletins, and industry reports or site operational experience, which led to avoidable site events, repetitive equipment failures, and additional engineering time expenditures.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/93-43; 50-499/93-43.

2.5.3 (Closed) IFI 498;499/9350-18: The licensee assigned limited personnel and hardware resources to the vendor equipment technical information program to receive, distribute, and track vendor information. The licensee added staff temporarily to correct problems, but did not take long-term corrective actions, thus permitting problems to recur.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/93-43; 50-499/93-43.

## 2.6 IFIs Identified in Paragraph 2.3.5 of the DET Inspection Report

2.6.1 (Closed) IFI 498;499/9350-19: Management did not support engineering by assigning an adequate number of staff; supplying resources to implement engineering modifications, corrective actions, and improvement initiatives in a timely manner; and maintaining an accurate management information system, including personal computer and software support.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/93-45; 50-499/93-45.

2.6.2 (Open) IFI 498;499/9350-20: The equipment maintenance history database was not accurate and current because of the poor quality of information loaded into the system, and because of the large backlog of outstanding entries, estimated by the licensee to 6-8 months for completion. A sample of various databases showed conflicting and incomplete information concerning the maintenance history of chill water chillers, failure histories for the standby diesel generators, lists of TMs, and motor-operated valve issues.

2.6.3 (Closed) IFI 498;499/9350-21: The licensee had to manually search service requests (SRs) to determine where modified standby diesel generator rocker arms were installed, and whether they were installed in accordance with a Cooper-Bessemer bulletin.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/93-44; 50-499/93-44.

2.6.4 (Closed) IFI 498;499/9350-22: Engineering performance was not substantially improved through the improvement program process. The licensee fell behind its schedule in completing many improvement programs designed to improve engineering performance and cancelled some after investing substantial resources.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Reports 50-498/93-45; 50-499/93-45 and 50-498/93-55; 50-499/93-55.

2.6.5 (Closed) IFI 498;499/9350-23: Modifications were not installed in a timely manner.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/93-45; 50-499/93-45.

## 2.7 IFI Identified in Paragraph 2.3.6 of the DET Inspection Report

2.7.1 (Closed) IFI 498;499/9350-24: In other configuration control weaknesses, such as the vendor drawings, the team observed weaknesses in configuration control that, if left uncorrected, could adversely affect plant operations. Ineffective management oversight and direction, including insufficient resources, were significant contributors to these weaknesses.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/93-45; 50-499/93-45.

## 2.8 IFIs Identified in Paragraph 2.3.7 of the DET Inspection Report

2.8.1 (Closed) IFI 498;499/9350-25: The ability of the chill water system to function for extended periods, during a design basis accident under low heat load conditions, was never demonstrated, either by testing the system at various design basis accident heat loads or by engineering analysis.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/94-04; 50-499/94-04.

2.8.2 (Closed) IFI 498;499/9350-26: The licensee did not complete an analysis for the chill water system under low heat load conditions. If an accident occurred during cold weather and all chillers operated, the chillers would be under-loaded, causing surging and failure, resulting in loss of chill water cooling of safety-related equipment.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/94-04; 50-499/94-04.

2.8.3 (Closed) IFI 498;499/9350-27: Compressor refrigerant and oil



contamination was a long-term problem that significantly affected reliability. The vendor proposed installing a proven refrigerant clean-up kit that would allow uninterrupted chiller operation. Although the modification was approved in September 1991 for installation in 1992, its installation date was deferred to October 1994 for Unit 1 and April 1995 for Unit 2.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/94-04; 50-499/94-04.

2.8.4 (Closed) IFI 498;499/9350-28: In 1989, the licensee implemented a temporary modification to remove an essential cooling water valve actuator which automatically controlled flow to the chiller condensers by using an upstream manual valve rather than correcting automatic control system design and material deficiencies.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/94-04; 50-499/94-04.

2.8.5 (Closed) IFI 498;499/9350-29: The maintenance craft personnel introduced air into the essential chillers and flooded a control panel with oil because they did not understand how the chillers function under vacuum. Inadequate training caused poor maintenance work and contributed to degraded performance of the equipment and the lack of availability.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Report 50-498/94-04; 50-499/94-04.

## 2.9 IFIs Identified in Paragraph 2.3.8 of the DET Inspection Report

2.9.1 (Closed) IFI 498;499/9350-30: Excessive shrinkage and resultant cracks of Hydrosil-type penetration seals allowed free air to pass between fire areas and raised questions of structural integrity, making the seals ineffective fire barriers.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Reports 50-498/93-37; 50-499/93-37 and 50-498/93-45; 50-499/93-45.

2.9.2 (Closed) IFI 498;499/9350-31: The Pyrotronics fire protection computer system, which monitors fires in various plant areas and alarms in the control room, was unreliable with numerous chronic problems, including defective detectors and electronic transmitter boards.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Reports 50-498/93-37; 50-499/93-37 and 50-498/93-45; 50-499/93-45.

2.9.3 (Closed) IFI 498;499/9350-32: Numerous fire protection false alarms frequently annunciated (20-30 each day) and control room operators could not quickly ascertain which detector was in alarm status.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Reports 50-498/93-37; 50-499/93-37 and 50-498/93-45; 50-499/93-45.

2.9.4 (Closed) IFI 498;499/9350-33: Replacement parts were not available because the fire protection system was obsolete. Although a modification was proposed to replace the system, the modification received low priority and was not scheduled for installation until 1996.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Reports 50-498/93-37; 50-499/93-37 and 50-498/93-45; 50-499/93-45.

2.9.5 (Closed) IFI 498;499/9350-34: At the time of the evaluation, the licensee had a large backlog of 361 open SRs for fire protection systems (164 for Unit 1, 122 for Unit 2, and 75 common). Included are 249 SRs associated with fire suppression system problems, the majority being valve packing leaks, and 112 SRs associated with fire detection systems, 30 percent caused by trouble alarms because of dirty fire detectors.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Reports 50-498/93-37; 50-499/93-37 and 50-498/93-45; 50-499/93-45.

2.9.6 (Closed) IFI 498;499/9350-35: In April 1993, the licensee located significant quantities of transient combustibles such as wooden tables, waste oil, oil-soaked rags, and miscellaneous combustible items located throughout the plant. The presence of such large amounts of transient combustibles was indicative of an inadequate control program.

This item was closed based on the action taken by the licensee and documented in NRC Inspection Reports 50-498/93-37; 50-499/93-37 and 50-498/93-45; 50-499/93-45.

## ATTACHMENT

### 1 PERSONS CONTACTED

#### 1.1 Licensee Personnel

J. Sheppard, General Manager, Nuclear Licensing  
M. Coughlin, Senior Licensing Engineer  
other members of the licensee's staff

#### 1.2 NRC Personnel

W. Johnson, Chief, Project Branch A, Division of Reactor Projects  
M. Satorius, Project Engineer, Project Branch A, Division of Reactor Projects

### 2 EXIT MEETING

A telephonic exit meeting was conducted on February 22, 1994. During this meeting, the inspectors reviewed the scope and findings of this report. The licensee did not take exception to any of the inspection findings nor identify as proprietary any information provided to, or reviewed by, the inspectors.