APPENDIX B

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-498/89-38 Operating License: NPF-76
50-499/89-38 NPF-80

Dockets: 50-498
50-499

Licensee: Houston Lighting & Power Company (HL&P)
P.O. Box 1700
Houston, Texas 77001

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

Inspection At: STP, Matagorda County, Texas

Inspection Conducted: September 1-30, 1989

Inspectors: J. E. Bess, Senior Resident Inspector, Unit 1, Project Section D, Division of Reactor Projects

J. I. Tapia, Senior Resident Inspector, Unit 2, Project Section D, Division of Reactor Projects

R. J. Evans, Resident Inspector, Unit 1, Project Section D Division of Reactor Projects

D. M. Hunnicutt, Senior Project Engineer, Project Section D Division of Reactor Projects

Approved: E. J. Holler 10/16/89
E. J. Holler, Chief, Project Section D Date
Division of Reactor Projects

Inspection Summary

Inspection Conducted September 1-30, 1989 (Report 50-498/89-38; 50-499/89-38)

Areas Inspected: Routine, unannounced inspection of plant status, onsite followup of plant events, licensee action on previous inspection findings, onsite followup of written reports of nonroutine events, monthly maintenance observations, monthly surveillance observations, operational safety verification, spent fuel pool activities and refueling activities.

Results: Within the areas inspected, one violation was identified. The violation involved the failure of operations personnel to follow safety-related procedures (paragraph 10). The licensee's response and followup to three Unit 2 reactor trips were complete and adequate in identifying root causes and initiating corrective actions (paragraph 3). Several procedure discrepancies were identified to the licensee for implementation into the licensee's ongoing procedure upgrade program (paragraph 7). General housekeeping concerns are still in need of attention (paragraph 8).

DETAILS

1. Persons Contacted

*C. L. Kern, Nuclear Safety Department
*A. K. Khosla, Senior Licensing Engineer
*T. J. Jordan, Plant Engineer Manager
*A. C. McIntyre, Manager, Support Engineer
*W. H. Kinsey, Plant Manager
*J. R. Lovell, Technical Services Manager
*J. W. Loesch, Plant Operations Manager
*A. W. Harrison, Supervising Licensing Engineer
*S. L. Rosen, Vice President. Nuclear Engineer and Construction
*W. J. Jump, Maintenance Manager
*G. E. Vaughn, Group Vice President, Nuclear
*E. L. Stansel, Manager, Plant Computer Division
*R. W. Chewning, Vice President, Nuclear Operations
*W. D. Palmer, Security Section Supervisor
*J. P. Northrop, Security Section Foreman
*S. M. Shropshire, Central Power and Light, Owner Representative
*J. E. Geiger, General Manager, Nuclear Assurance
*J. J. Drymiller, Supervisor, Operations Training
*J. W. Hinson, Administration-Investigation/Compliances
*M. R. Wisenburg, General Manager, Nuclear Safety Review Board
*C. A. Ayala, Supervising Licensing Engineer

In addition to the above, the inspectors also held discussions with various licensee, architect engineer (AE), maintenance and other contractor personnel during this inspection.

*Denotes those individuals attending the exit interview conducted on September 29, 1989.

2. Plant Status

Unit 1 began this inspection period in "no-mode" condition (all fuel assemblies removed from the reactor core).

On September 26, 1989, Unit 1 entered Mode 5 (cold shutdown), on day 53 of a scheduled 55-day refueling outage. The licensee rescheduled the refueling outage to be completed in 70 days. This new schedule would return the unit to operation on October 13, 1989.

Unit 1 entered mid-loop operation on September 28, 1989, in order to remove the steam generator (SG) nozzle dams and re-install the (primary side) SG manway covers. At the end of this inspection period, Unit 1 was in Mode 5.

Unit 2 began this inspection period at 99 percent reactor power. On September 5, 1989, a reactor trip was experienced while troubleshooting a

main feed pump control problem. The reactor was restarted on September 6, 1989 after corrective actions were taken. On September 19, 1989, the unit tripped on an overtemperature-delta T signal. The unit was restarted on September 20, 1989 after corrective actions were taken. On September 22, 1989, the unit tripped as a result of a turbine trip. After a Reliability and Trip Reduction Review was completed and the results implemented, the reactor was restarted on September 26, 1989. At the end of this inspection period, Unit 2 was operating at 100 percent reactor power.

3. Onsite Followup of Plant Events (93702)

On September 5, 1989, at 4:02 p.m., Unit 2 tripped from 100 percent power on C steam generator low-low level when speed control of a main feedwater pump was lost. Prior to this event, Steam Generator Feed Pump No. 22 had exhibited erratic speed control and the licensee isolated the pump for troubleshooting of a suspected speed control power ground. The speed control circuitry for all three steam generator feed pumps is housed in a common card frame in the main feed pump control cabinet. While technicians were troubleshooting the speed control problem, they removed one of the printed circuit cards for Feed Pump No. 22 (there are four cards for each of three pumps on one nonseismic rack). During the card removal, a defective edge connector on a circuit card associated with Feed Pump No. 21 caused erratic speed controller output. The control room operators observed speed oscillations on Feed Pump No. 21. The operators attempted to regain speed control, however, the pump did not respond. In anticipation of a feedwater pump trip, the operators began reducing turbine load and reactor power. Due to the design of the control circuit, loss of continuity of the speed demand signal caused the controller to drive the feed pump governor valves open. This subsequently resulted in an overspeed pump trip. The resultant loss of steam generator level caused a reactor trip and auxiliary feedwater (AFW) actuation. The reactor power at the time of the trip was 84 percent. The turbine tripped on the reactor trip and the feedwater isolation valves closed on low reactor coolant system average temperature. Approximately 90 seconds following the reactor trip, the operators closed the main steam isolation valves to prevent excessive cooldown. No safety injection actuation occurred and the plant was brought to a stabilized Mode 3 condition.

During post-trip troubleshooting, the effects of disturbances of the card frame on the pump controller output were verified. The licensee also determined that approximately 30 percent of the screws in the feed pump control card rack were loose. The defective card edge connector was repaired, the card frame alignment and tightness were checked, the remaining printed circuit cards and the edge connectors were inspected, and the contact surfaces were cleaned. The printed circuit cards in the speed controller circuits on Unit 1 were also inspected and cleaned. The licensee restarted the reactor at 4:54 a.m. on September 6, 1989.

On September 19, 1989, at 12:37 p.m., Unit 2 tripped from 100 percent reactor power on an overtemperature delta T (OT delta T) reactor trip signal. This reactor trip signal was preceded by an OT delta T turbine

runback of 200 MWe. During this event, the licensee was in the process of performing Procedure OPSP10-II-0001, Revision 2, "Incore-Excore Detector Calibration." The purpose of this procedure is to determine the relationship between incore and excore axial offsets for calibration of the Excore Axial Flux Difference amplifier gains and to provide the data required to calibrate the f(Delta I) penalty to the overpower-delta T and OT delta T protective setpoints. Incore-excore detector calibration requires that flux maps be obtained at various values of axial flux difference (AFD). The method used in conducting the calibration requires use of control rod motion to slowly decrease AFD to a negative value by inserting the rods. Once the rods have been inserted to maintain AFD negative, RCS temperature is maintained by dilution of the boron concentration in the RCS.

During the conduct of the calibration, Tavg dropped to 592°F. The operators responded by diluting the RCS in order to get back to 593°F, the normal program value at 100 percent reactor power. Because control of Tavg by dilution is not a precise operation that is free from time affects, Tavg went to 594°F. This resulted in the lowering of the OT delta T trip setpoint in the reactor protection system circuitry. This is necessary because the increased average temperature reduces the margin to departure from nucleate boiling which causes a large decrease in the heat transfer coefficient between the fuel rods and the reactor coolant, resulting in high fuel clad temperatures.

Prior to reaching the OT delta T trip setpoint, both automatic and manual control rod withdrawal is inhibited and a cyclic turbine runback is initiated. This action occurred when 2 of the 4 channels came to within 3 percent below the OT delta T trip setpoint. A turbine runback of 200 MWe was experienced for 12 seconds. Because the control rods were in manual, the turbine runback created a loss of heat sink which then increased Tavg further. This in turn caused the OT delta T setpoint to come down. The delta-T signal exceeded the calculated setpoint on two channels which then gave a reactor trip signal.

The posttrip review disclosed that the runback signal was incorrectly set at 12 seconds. Subsequent licensee investigation showed that the Westinghouse process block diagram, used as a specification to the manufacturer, indicated the time for the initial runback signal as 0-15 seconds. Westinghouse installed the major circuitry using the block diagram but later issued a Precautions, Limitations, and Setpoint document which specified that the initial runback signal timer should be set at 1 1/2 seconds. This information was erroneously not incorporated into the process block diagram nor was it used to set the timing relays during the startup program. A problem report was written to address the generic implications of this problem and to correctly set the runback signal timers. In addition, the licensee planned to address, with Westinghouse, the philosophy of operating the reactor during other than normal operating periods with the control rod drives in the manual mode of operation. The reactor was restarted at 2:52 a.m. on September 20, 1989.

On September 22, 1989, at 2:01 a.m., Unit 2 tripped from 95 percent reactor power on a turbine trip caused by low-low signals on 3 of 3 channels of turbine electrohydraulic (EH) control system header pressure. The loss of EH control system header pressure was caused by the opening of all four autostop trip solenoid valves which are normally energized closed. The opening of these solenoid valves caused the dumping of the EH control fluid and subsequent loss of pressure. The posttrip review disclosed that the autostop solenoid relays became deenergized because power was lost to Non-Class 1E Vital 120V AC Distribution Panel No. DP-0002. This, in turn, resulted from a loss of a 25 KVA inverter when a capacitor in that inverter malfunctioned. Although an automatic transfer switch is located between the 25 KVA inverter and DP-0002, its design does not provide for a fast transfer to the available backup transformer.

In response to this trip, the licensee initiated a reliability review study comprised of four teams; (1) a design change document review team, (2) a maintenance/inspection/testing review team, (3) a single point failure analysis team, and (4) a trip analysis team. These teams were charged with: (1) reviewing all outstanding modifications to look for single point failure-related problems, (2) reviewing all outstanding work requests and deferred protective maintenances to look for single point failure related problems, (3) reviewing the design of balance of plant (BOP) systems to identify single power sources, inadequate logic response times, loss of instrument air or hydraulic system affects, and (4) reviewing all previous trips looking for similar causes or trends.

The overall purpose of the reliability review study was to reduce the likelihood of occurrence of another plant trip and to improve the reliability of BOP systems. The teams developed a list of potential single point failures which could result in a reactor trip. Design changes were then conceptualized and given a priority rating with respect to implementation prior to restart of the unit, implementation in the next outage (November 1989), or implementation sometime in the future. Two modifications issued for implementation prior to restart of the reactor addressed the cause of the reactor trip on September 22, 1989. The turbine trip system single power supply from Distribution Panel DP-0002 was modified to provide another independent supply so that failure of a single inverter will not trip the turbine and the wiring to the turbine trip solenoids was changed to provide another independent power source such that the turbine will not trip upon failure of one breaker. These changes were implemented and the reactor was restarted at 4 p.m. on September 26, 1989. The actions taken by the licensee as a result of the September 22, 1989, trip are indicative of a conservative approach to plant operations and represent a strong commitment to improving the safety and reliability of the plant.

During the refueling of Unit 1, the licensee discovered bowing in many of the irradiated fuel assemblies when the assemblies were removed from the reactor vessel and stored in the spent fuel pit. Bowing of an irradiated fuel assembly is the deviation of the individual fuel rods from the true

vertical centerline within a fuel assembly. The licensee, the nuclear steam system supplier (NSSS), and fuel manufacturer have determined that the maximum bowing observed and measured in the irradiated fuel assemblies (3/4-inch) is acceptable from the mechanical, nuclear, and physics criteria for the 14-foot length fuel assemblies. The fuel manufacturer has identified similar fuel assembly bowing at other commercial nuclear power reactors in the United States and certain foreign countries, including reactors fueled with 12-foot length fuel assemblies. The experience at some other commercial nuclear power reactors in the United States indicates that bowing is a phenomenon that is characteristic to the particular reactor. Bowing experience at similar reactors does not follow similar patterns; however, the bowing characteristics at a particular reactor appear to recur in a specific pattern in that particular reactor from fuel cycle to fuel cycle.

The licensee and the fuel manufacturer are assembling data and analyzing the problem. The licensee and fuel manufacturer are measuring the bowing in irradiated fuel assemblies and observing the apparent mechanical changes within fuel assemblies. The fuel manufacturer is obtaining data and information from fuel cycle to fuel cycle at other reactors; performing calculations to determine mechanical, nuclear, and physics properties; defining the limits and boundaries for bowing and related mechanical tolerances; and attempting to determine the magnitude of apparent changes in these properties both within individual irradiated fuel assemblies and among all irradiated fuel assemblies from reactor to reactor.

No violations or deviations were identified in this area of the inspection.

4. Licensee Action on Previous Inspection Findings (92701)

(Closed) Open Item (498/8811-03): Inadvertent Safety Injection Actuation - Unit 1

A safety injection (SI) occurred when Unit 1 was in Mode 3 at normal operating pressure and temperature and a reactor coolant system (RCS) flow coastdown test was in progress. The inadvertent SI occurred because of a rate of change circuit associated with the Low-Low Tcold SI setpoint. This associated circuitry contained a rate circuit which for every instantaneous change of 3°F, provided a 4:1 gain signal; therefore, a 12°F net change was processed. With approximately 9°F actual temperature decrease and the instrumentation receiving a rapid change when the reactor coolant pump (RCP) was started, the low-low Tcold SI circuitry signaled a 36°F decrease which was sufficient to reach the SI actuation setpoint.

The licensee submitted a proposed revision to Technical Specifications (TS) and Final Safety Analysis Report (FSAR) for excessive cooldown protection on May 18, 1988. The change was requested because the licensee determined that the low-low compensated Tcold excessive cooldown protection can cause unnecessary actuation of safety systems. The NRC

issued Amendment No. 1 to Facility Operating License No. NPF-76 on May 24, 1988. The amendment consisted of changes to the TS to delete all references to the excessive cooldown protection and associated items.

Subsequent to receipt of Amendment No. 1, the licensee accomplished an interim modification in Unit 1. The interim modification disabled the associated circuitry by cutting the signal wires from the process instrument cabinet to the engineered safety features actuation system (ESFAS) cabinet. The safety evaluation for Amendment No. 1 stated that the interim modification combined with continued surveillance is acceptable to ensure the continued safe operation of Unit 1. The licensee has scheduled completion of the interim modification for Unit 1 during the refueling outage in the spring of 1990. The permanent modification has been installed in Unit 2. The inspector determined that the licensee's corrective actions were appropriate. This item is closed.

(Closed) Open Item (498/8854-01; 499/8854-01): Referenced Procedure Revision Numbers Cannot Be Revised Easily When Revising a Procedure - Units 1 and 2

The inspector observed several procedures that had more than three field change requests (FCRs) outstanding against the procedures. The inspector questioned the process for incorporating FCRs into the procedures and maintenance of the status of these changes. Also, the inspector noted that the FCRs were not being applied to Unit 1 and 2 procedures concurrently.

The licensee reviewed the administrative controls for procedures. The licensee prepared a revision (Revision 17) to Procedure OPGP03-ZA-0002, "Plant Procedures." The licensee's procedure controls provide for the following:

- Procedure OPGP03-ZA-0002 has administrative controls for preparing, reviewing, and approving (1) new procedures for incorporation into the plant procedures manual (PPM); (2) field changes, revisions, and deletions to procedures contained in the PPM; (3) temporary procedures; and (4) converted procedures.

- Procedure OPGP03-ZA-0002 applies to all procedures contained in the PPM, except the procedures contained in (1) PGP01 (Plant Organization), Controlling Procedure OPOGP02-ZA-0001; (2) PGP02 (Plant Management Policies), Controlling Procedure OPGP02-ZA-0000; (3) POP05 (Emergency Operating Procedures), Controlling Procedure OPOP01-ZA-0006.

- Procedures determined to contain safeguards information are controlled in accordance with the requirements of Interdepartmental Procedure (IP) 7.1Q, "Protection of Safeguards Information" in addition to the requirements of Procedure OPGP03-ZA-0002.

- Procedure OPGP03-ZA-0002 satisfies the requirements of FSAR Sections 13.5.1.2 and 17.2.5 and TS 6.5 and 6.8.

- When new procedures are written or existing procedures are revised, DIVISION PROCEDURES are replaced by DEPARTMENT PROCEDURES.

The inspector's review of the licensee's corrective actions and plant procedures determined that:

- The procedural approval form (-2) required listing all FCRs evaluated during the revision process.

- When the FCR Form (-4) is revised, the affected pages of the procedure being changed will be listed in Section A, the sequence of approval signatures in Section B will be revised, and Section C will be revised.

- An "FCR in-out Box" was established in each main control room for temporary placement of approved FCRs. These FCRs are routinely hand carried to procedure tracking. The licensee established a requirement that legible/reproducible copies of approved FCRs be sent to procedure tracking by the end of the applicable shift.

- The automatic procedure revision requirement after three FCRs have been issued was replaced with a requirement that a department manager determine when a revision shall be initiated.

- The technical review checklist (-5) was revised.

The inspector determined that the licensee's corrective actions were appropriate. This item is closed.

(Closed) Open Item (498/8854-03; 499/8854-02): Supplemental Training of Operators on Design Differences Between Units 1 and 2

In a previous inspection, the inspector determined from discussions with employees in the training department that the training department intended to train on the differences between Units 1 and 2 as differences were identified.

The licensee's nuclear training department completed the classroom training regarding the identified differences between Units 1 and 2. To satisfy the NRC's criteria for dual licensing (NUREG 1021, "Operator Licensing Examiner Standards, Revision 4, dated May 1987, Section ES106), the personnel making application for a dual license, who were currently licensed, were trained on the following differences between Units 1 and 2:

- Facility design and systems relevant to control room personnel

- TS

- Procedures (primarily abnormal and emergency operating procedures)

- Control room design and instrument location

- Operational characteristics

The inspector reviewed the learning objectives for plant differences, the student handout, and the attachments to the student handout. The material is summarized below:

- Attachment 1 - Student handout, LOT203.21, Revision 0, discussed the differences between Units 1 and 2. The cover letter stated which items from this handout were not differences between Units 1 and 2 as of December 9, 1988.

- Attachment 2 - Student handout, LOT203.21, Revision 0, discussed the differences between Units 1 and 2. The differences were updated as of November 21, 1988. This update documented the additional differences between Units 1 and 2 based on the most recent reports from engineering and other departments.

- Attachment 3 - Student handout, LOT201.40, Revision 0, discussed anticipated transients without scram (ATWAS) mitigation system actuation circuitry (AMSAC). This handout served as a review of AMSAC to support other portions of the student handout (LOT203.21).

The licensee's documentation and attendance records were used to verify that personnel required to receive the above training had attended the training specified. The training objective that each student would be able to explain the differences between Units 1 and 2 as presented in the classes and how these differences affect the operation of each unit were appropriate. The inspector determined that the licensee's actions were satisfactory. This item is closed.

(Closed) Open Item (498/8868-04; 499/8868-04): <u>Emergency Operating Procedure (EOP) Requires a Containment Entry to Complete the Action - Units 1 and 2</u>

Procedures 1POP05-EO-EC00 and 2POP05-EO-EC00, "Loss of All AC Power," contained an immediate action step that required a containment entry to isolate letdown in the event that isolation could not be achieved from the main control board. The inspectors determined that a containment entry was inappropriate for an immediate action step because it would require approximately 1 hour to close the letdown valves (the required action) under ideal conditions. The licensee revised the procedures for Units 1 and 2 (Revision 6 for Unit 1 and Revision 1 for Unit 2) to delete the containment entry requirements. The EOPs (Step 3.2.1) state that isolation of the letdown system will be accomplished by closing the outside containment isolation valve. This procedure revision alleviated the containment entry concern related to isolation of the letdown system. The inspector's review determined that the licensee's corrective actions were adequate. This item is closed.

(Closed) Violation (498/8873-02): Failure to Satisfy Technical Specification Requirements for Containment Isolation - Unit 1

The licensee discovered that Valve HC-FV-9776 (supplemental purge isolation valve outside containment) was partially disassembled during maintenance, while Valve HC-MOV-0003 (supplemental purge isolation valve inside containment) was closed but not deenergized as required by TS 3.6.3.b. This condition existed for approximately 24 hours before Valve HC-MOV-0003 was deenergized.

The licensee determined that the cause of this event was failure of the control room supervisor to properly control the work activity on the outboard supplementary purge isolation valve.

The licensee's corrective actions included: (1) holding shift briefings for control room operators on both Units 1 and 2 to discuss this event and reinforce the need to ensure that containment integrity is maintained; (2) developing a special test procedure for leak rate testing of the normal and supplementary containment purge valves, which included control of the installation and removal of blind flanges required to satisfy TS action statements; and (3) revising equipment clearance orders and operability tracking procedures which are issued as a result of TS action statements, to require a review of equipment clearance orders prior to their release. The licensee issued Unit 1 Licensee Event Report (LER) 88-62, "Failure to Satisfy Technical Specification Requirements for Containment Isolation Due to Operator Error," as a result of this personnel error. Unit 1 LER 88-62 was closed in NRC Inspection Report 50-498/88-19; 50-499/88-19.

The inspector determined that the licensee's corrective actions were adequate. This item is closed.

5. Onsite Followup of Written Reports of Nonroutine Events at Power Reactor Facilities (92700)

(Closed) Unit 1 LER 87-11: "Control Room Ventilation Actuation to Recirculation Mode Due to a Failure of a Toxic Gas Monitor Printed Circuit Board " - Unit 1

On October 17, 1987, with Unit 1 in Mode 5, and prior to initial criticality, an auto-actuation of the control room ventilation to recirculation mode occurred as a result of a malfunction of a toxic gas monitor.

The licensee's investigation determined that the event was caused by a failure of a "read only" memory printed circuit board in the toxic gas monitor. The failed printed circuit board was replaced as required by work request (WR) HE-80625. Design changes were completed and the set points for ammonia were changed on both toxic gas monitors to agree with Calculation Nos. NC9006-3 and NC9015-3, as required by configuration control package (CCP) 2-J-ST-0459. Installation and Quality Control (QC)

verification was accomplished in accordance with the appropriate drawings (9 E-HE10-01, 8448-00007-QK, 8487-00004-7D, 8487-00005-7D, 8487-00007-7D, 8487-00008-7D, 9-E-HE32-01, and 9-E-VCAA-01 No. 2) and CCP 2-J-ST-0459. The two toxic gas monitors were tested and restored to normal operation. The inspector determined that the licensee's corrective actions were satisfactory. This item is closed.

(Closed) Unit 1 LER 88-34: "Failure to Test Containment Spray Pump Sequencer Actuation" - Unit 1

On May 17, 1988, with Unit 1 in Mode 5, a systems engineer discovered that the preoperational test procedures did not test one of the engineered safety features (ESF) sequencer actuations of the containment spray pumps (CSP).

The licensee determined that the cause of this event was an isolated preoperational test procedure inadequacy due to the uniqueness of the multiple permissive signals provided for CSP actuation. The untested actuation was subsequently tested and determined to be satisfactory.

The licensee's corrective actions included: (1) preparing a temporary surveillance procedure (1TSP03-CS-0001, "Containment Spray Pump Sequenced Start Test," Revision 0) and satisfactorily completing testing, (2) revising Procedure OPGP03-ZA-0002, "Plant Procedures," (Revision 13) to include independent technical reviews and procedure walkthroughs, (3) examining all surveillance credit packages used to assure that TS were completed, (4) verifying that Unit 2 preoperational test procedures test this design feature (sequencers at 40 seconds of operation), and (5) preparing permanent surveillance procedures (1PSP03-SP-0013, "Safety Injection Actuation and Response Time Test," Revision 1 and 2PSP03-SP-0013, "Safety Injection Actuation and Response Time Test," Revision 0) to test this feature.

The procedures provided detailed instructions to verify that each applicable component actuated as designed with acceptable response times. The inspector determined that the licensee's corrective actions were adequate. This item is closed.

(Closed) Unit 1 LER 89-12: "Operation of the Control Room Ventilation System in Violation of Technical Specifications Due to Operator Error" - Unit 1

On May 6, 1989, Unit 1 was in Mode 1 with both toxic gas monitors declared inoperable in accordance with TS 3.3.3.7, when a shift supervisor discovered that a surveillance (Procedures 1PSP03-HE-0003, "C Train Control Room Emergency Ventilation System," Revision 1 and 1PSP03-HE-0001, "A Train Control Room Emergency Ventilation System," Revision 7) had been performed. Performance of this surveillance test placed the control room heating, ventilating, and air conditioning (HVAC) system in the makeup mode for a period of about 10 hours while both of the toxic gas analyzers were out of service.

The licensee determined that the cause of this event was personnel error. The shift supervisor inadvertently authorized the performance of the surveillance procedure.

The licensee's corrective actions included: (1) counseling the shift supervisor on the consequence of this event and the need for attention to detail, (2) adding a discussion of this event to lessons learned training for licensed operators (Course LOR893), (3) revising the surveillance test procedures for the control room HVAC system to include prerequisites which ensure TS compliance during performance of surveillances, and (4) reviewing TS surveillance requirements to determine whether their performance could result in a violation of the action statement requirements of other TS. The inspector determined that the licensee's corrective actions were adequate. This item is closed.

(Closed) Unit 1 LER 89-13: "Unplanned Engineered Safety Features Actuation of the Fuel Handling Building HVAC Due to Personnel Error" - Unit 1

On June 7, 1989, Unit 1 was in Mode 1. An unplanned ESF actuation of the fuel handling building (FHB) HVAC system to the filtered exhaust mode occurred during the performance of a surveillance test (Procedure OPSP14-RA-1113, "Spent Fuel Pool Exhaust Monitors Response Time Test"). The licensee determined that the cause of this event was personnel error by the technicians performing the surveillance test. The technicians incorrectly removed the checksource actuation wires when a test switch was installed. The procedure did not indicate that the checksource actuation wires should be removed. Because the checksource actuation wiring was removed, the monitor failed the checksource surveillance test. The indicated failure caused an "operate failure" actuation of the FHB HVAC system.

The licensee's corrective actions included: (1) counseling the technicians, (2) briefing radiation monitoring section personnel regarding the correct method of installing test devices, (3) adding a caution (paragraph 5.1.13, Procedure OPSP14-RA-1113) and requirement for a pre-test briefing (paragraph 2.5, Procedure OPSP14-RA-1113) to the surveillance procedure, and (4) issuing Nuclear Plant Operations Department (NPOD) Bulletin No. 68, "Infrequently Performed Procedures," to plant personnel regarding this event. The inspector determined that the licensee's corrective actions were adequate. This item is closed.

(Closed) Unit 2 LER 89-18: "Control Room Actuation to Recirculation Mode Due to a Failure of a Toxic Gas Analyzer" - Unit 2

On August 2, 1989, Unit 2 was in Mode 1. The control room ventilation system actuated to the recirculation mode as a result of a high level trip of the vinyl acetate channel on a toxic gas analyzer. The redundant analyzer did not actuate. Plant operations personnel verified that the control room damper lineup was correct for the recirculation mode of operation.

Each toxic gas analyzer uses a spectrum analyzer to determine the concentration of five selected toxic gases in samples of control room intake air. A movable infrared light filter is positioned by a microprocessor controller and an electro-mechanical positioning system to select the proper light wavelength for analysis of each of the five toxic gas channels to determine the concentrations of the selected toxic gases. The licensee's investigation determined that the cause of this actuation of a toxic gas analyzer was a failure of an electro-mechanical positioner within the analyzer. The analyzer was replaced. The replacement toxic gas analyzer was tested and placed in service. The inspector determined that the licensee's corrective actions were adequate. This item is closed.

6. Monthly Maintenance Observations (62703)

The inspector observed selected maintenance activities to verify whether the activities were being conducted in accordance with approved procedures and TS. The activities observed included:

- Maintenance Work Request (MWR) HE-73897, adjustment of Flow Control Valve A2HE-FCV-9584 limit switch

- Procedure OPMP08-ZI-0049, "Dytronics Model 4644S/4644SS Seismic Vibration Monitor Calibration," Revision 0, performed on the Centrifugal Charging Pump 201B Gearbox Vibration Monitor N2VM-XI-8259

- MWR PM-63819, troubleshooting cause of Spent Fuel Pool Pump 2B cooling fan breaker trip

- Work Request CH-70434, changing of oil in the MAB Chiller 21B

The inspectors verified that the activities were conducted in accordance with approved work instructions and procedures, test equipment was within its current calibration cycles, and housekeeping was being maintained in an acceptable manner.

No violations, deviations, or concerns were identified in this area of the inspection.

7. Monthly Surveillance Observations (61726)

Selected surveillance activities were observed to ascertain whether the surveillance of safety significant systems and components were being conducted in accordance with TS and other procedural requirements. The surveillance activities observed included:

- 2PSP02-SI-0931, "Refueling Water Storage Tank Level Set 2 ACOT (L-0931), Revision 0

- 2PSP06-PK-0004, "4.16KV Class 1E Undervoltage Relay Channel Calibration/TADOT-Channel 4," Revision 4

- 2PSP03-AF-0010, "Auxiliary Feedwater System Valve Operability Test," Revision 1

- 1PSP03-SP-0011C, "Train C Diesel Generator Slave Relay Test," Revision 0

Specific items inspected included verifying that as left data was within acceptance criteria limits, the acceptance criteria listed in the procedures agreed with values listed in design documents or instrument setpoint indexes, and test equipment used was within its current calibration cycle. Following observation of the surveillance activities, the procedures were reviewed for technical accuracy and conformance to TS requirements. Items noted and discussed with the licensee included:

Procedure 2PSP02-SI-0931 was performed by instrumentation and controls (I&C) technicians to verify the Train A logic functions of the automatic switchover to the containment sump on low refueling water storage tank level were within required limits. Several minor observations were reported to the licensee: Steps 4.5 and 7.4.2 both verified the same status light was off (Step 4.5 was unnecessary), and Status Lampbox 2-5M23 was not labelled on Control Panel 2-CP-005.

Procedure 2PSP06-PK-0004 was performed by electrical technicians to test the Channel 4 undervoltage relays logic associated with the 4.16KV Bus E2A. No specific concerns were noted during the performance of this surveillance.

Procedure 2PSP03-AF-0010 was performed by the Unit 2 control room operators to verify the AFW System valves cycled open and closed completely and within the required time intervals. The following observations were reported to the licensee: the step numbers on the data sheet (-2) not corresponding to the same step number in the procedure (step number on data sheet should match step number in procedure), a note prior to Step 5.7.b.1 stating that Valve MOV-0143 was supposed to open within approximately 15 seconds but it took approximately 41 seconds for the valve to open, and repeating of two timing tests for Valves FV-7518 and FV-0143 because the valves cycled much quicker than expected by the operator.

Procedure 1PSP03-SP-0011C was performed by the Unit 1 control room operators to verify the Diesel Generator Train C actuation slave relay output continuity and operability were acceptable, as required by TS. Procedure 1PSP03-SP-011C was performed in conjunction with Procedure 1PSP03-DG-0003, "Standby Diesel 13 Operability Test," Revision 5. These two procedures are routinely performed simultaneously on all three Unit 1 diesel generators. During this particular test, two additional surveillances were to be performed, resulting in four surveillances being run simultaneously. The other two surveillance tests dealt with the test mode override verification and autostart of diesel generator on an actuation test signal. The four procedures require

Diesel Generator 13 to be started, therefore, running all four procedures at once minimizes the diesel generator starting requirements.

During the performance of 1PSP03-SP-0011C, the control room operator attempted to perform Step 7.6.8, which instructed the operator to "parallel diesel generator 13 4.16 KV feeder breaker." The operator incorrectly performed the step by attempting to close the output breaker while the generator voltage was out of phase (approximately 120 degrees) with the bus voltage. The diesel generator output breaker opened and the diesel generator tripped offline. A review of events occurring at the local control panel indicated: the generator trip lockout relay actuated, the reverse power relay actuated, and the overcurrent relays (all three phases) actuated. The surveillance test was suspended pending review of the events leading up to the trip and assessment of possible equipment damage.

The licensee performed an inspection of the diesel generator and other related components. No apparent damage was observed. The diesel generator was later run to verify operability, and the surveillance tests were performed with satisfactory results. The inspectors questioned the licensee on the simultaneous performance of four surveillances and the wording of Step 7.6.8 in 1PSP03-SP-0011C. The licensee stated that the four surveillances had been performed on the other two diesel generators, and the wording of Step 7.6.8 provided the information needed by trained operators. Procedure 1POP02-DG-0003, "Emergency Diesel Generator #13," Revision 8, provided detailed instructions on how to parallel the diesel generator to the associated emergency bus. The licensee should consider revising Step 7.6.8 to the level of detail provided in 1POP02-DG-0003 or referencing 1POP02-DG-0003 in a note prior to the step.

No violations or deviations were identified in this area of the inspection.

8. Operational Safety Verification (71707)

The purpose of this inspection was to ensure that the facility was being operated safely and in conformance with license and regulatory requirements. This inspection also included verifying that selected activities of the licensee's radiological protection program were being implemented in conformance with requirements and procedures, and that the licensee was in compliance with its approved physical security plan.

The inspectors visited the control room on a daily basis when onsite and verified that control room staffing, operator behavior, shift turnover, adherence to TS limiting conditions for operation, and overall control room decorum were being conducted in accordance with requirements.

Tours were conducted in various locations of the plant to observe work and operations to ensure that the facility was being operated safety and in conformance with license and regulatory requirements. The following Unit 1 items were observed and discussed with licensee representatives who took appropriate corrective action:

- Slight lapses in the control of radiation boundaries were observed. The radiation boundary rope and sign were laying on the floor in the doorway leading to the low activity storage Room 236A in the Mechanical Auxiliary Building (MAB). A radiation boundry sign and rope were laying on the floor in the reactor containment building (RCB) at the minus 11-foot elevation near the Safety Injection Accumulator Tank 1C. Potentially contaminated equipment was extending beyond the boundary line at the hot machine shop/decontamination area Room 324 in the MAB. Used, potentially contaminated, anticontamination clothing was found outside the roped off area near the chemical and volume control system (CVCS) Letdown Filter 1A valve room in the MAB. Miscellaneous anticontamination clothing was found on equipment and on the floor throughout the RCB.

- Two unsecured compressed gas cylinders (half size bottles) labelled "Argon" and "full" were observed in the MAB at the 60-foot elevation. Flow Transmitter N1HC-FT-9594, RCB supplemental purge supply system flow, was missing the faceplate cover on its air regulator pressure gauge (no MWR tag was attached).

- The exterior seal around the FHB truck bay door was reported missing in Inspection Report (IR) 50-498/89-30; 50-499/89-30. The seal was replaced per MWR XF-81507. During this inspection period, the door seal was observed to be damaged in four places. The seal is not safety-related but is not performing its intended function of providing a dust and dirt barrier between the inside and outside of the FHB.

- The essential cooling water pumphouse was inspected. Two public address speakers were observed to have rags stuffed into the speakers to mute the noise level. A third speaker was observed to be completely taped shut with duct tape. Water accumulation was observed on the floor of Room 2B. The source of the water spill should be eliminated for industrial safety reasons.

The inspectors noted through walkdowns that the overall cleanliness of the MAB and RCB was improving as the Unit 1 outage was winding down. However, some housekeeping was still required, such as picking up and controlling the miscellaneous anticontamination clothing that was observed throughout the RCB.

No violations or deviations were identified in this area of the inspection.

9. Spent Fuel Pool Activities (86700)

Selected Unit 1 spent fuel pool and spent fuel handling activities were observed to ascertain whether the activities were in conformance with the requirements of TS and approved procedures. This inspection included the review of procedures relating to fuel handling operations and direct

observation of spent fuel pool activities. Procedures relating to fuel handling operations were verified in place, including:

- Provisions for verifying that the spent fuel pool cooling and cleanup system was operable, radiation monitors were in service, the FHB ventilation system was in service, and FHB isolation would occur on a high radiation signal.

- Provisions for verifying key spent fuel pool parameters were being maintained above TS limits which included water chemistry and pool level. The water chemistry was being maintained above TS 3.9.1 limits (boron concentration greater than 2500 ppm) and the pool level was above TS 3.9.11.1 limits (23 feet over the top of fuel assemblies). Both parameters were being monitored on a regular basis. A third parameter, spent fuel pool temperature, was noted to be maintained within FSAR and procedural limits.

- Procedure OPSP11-HF-0002, "FHB Exhaust Air System Functional Test," Revision 2, was reviewed for technical accuracy and compliance to TS 4.9.12 requirements. The following comments were provided to the licensee: Steps 6.4.1, 6.5.1, and 6.6.1 referred to a control switch called the "Test button" that was actually labelled "Actuate Button" on the control panel; Sections 6.4, 6.5, and 6.6 provided instructions on performing the functional tests, but did not provide instructions on system restoration following system realignment in the emergency mode; and the procedure did not verify the energization of white status lights or computer points during the functional tests (the status lights and computer points were part of the same logic circuits that were tested by Procedure OPSP11-HF-0002).

- Provisions that FHB crane interlocks or physical stops prevented the cranes from passing over fuel storage locations were verified. The 150-ton crane could not pass over the spent fuel pool due to physical stops. A second crane, the 15/2-ton crane (one hoist was rated for 15 tons, the second was rated for 2 tons), could be used over the spent fuel pool. TS 3.9.7 provided limits on the use of the 15/2-ton crane when travelling over the spent fuel pool. The use of the crane was noted to be administratively controlled. The controls included using procedure caution statements, controlling the keys to the crane's power supply disconnect switch lock, and applying caution tags to the hoist pendant. The caution tag on the 15/2-ton hoist pendant was noted to be more restrictive than TS 3.9.7 requirements.

Direct observation of conditions relating to fuel handling operations was performed. One condition inspected included verification that the FHB ventilation system (HF) was maintaining the building at the licensee's specified negative pressure. Early in the inspection period, the inspectors observed that the differential pressure was a positive value, as indicated on Instrument N1HF-PDI-9548 on main Control Room Panel CP-022. Controller N1HF-PDIC-9548 is used to maintain the building inside/outside differential pressure. Due to a nonsafety-related differential pressure

control damper failing open, the controller could not maintain the specified differential pressure. After the damper was returned to service, the building differential pressure was re-inspected. The controller was noted to be incorrectly set at 0.25 inches water gauge differential pressure. According to scaling manual Data Sheet N1HF-PDIC-9548, Revision 1, the required setpoint was 0.20 inches water gauge (plus or minus 0.02 inches). This condition was reported to the shift supervisor, who initiated corrective actions. Followup inspection by the inspectors verified that the controller had been correctly set at 0.20 inches water gauge.

Direct observation of spent fuel pool activities was conducted to verify operator conformance with approved procedures. The fuel handling machine operator was noted to be following the instructions provided by Procedure OPOP08-FH-0002, "Fuel Handling Machine," Revision 0. During the inspection, the inspector observed miscellaneous equipment on the fuel handling machine as the machine travelled over the spent fuel pool. The components observed included rags, a ruler, two rolls of tape, two ty-raps, one unstapled procedure (pages were loose), and two bags of equipment. These components were not secured to prevent them from falling into the spent fuel pool. Additionally, Procedure OPOP08-FH-0002 did not have precautions to preclude the use of unsecured equipment on the refueling machine over the spent fuel pool. Other procedures governing the use of equipment around the fuel transfer area and reactor core had unsecured equipment precautions. When the loose items were pointed out to the refueling machine operator on duty, the operator immediately removed the items from the machine.

The licensee wrote an FCR the next day to add precautions to Procedure OPOP08-FH-0002 to preclude the use of unsecured items on the machine. A followup inspection was performed after the FCR was implemented into OPOP08-FH-0002. Three rolls of tape and several rags were observed to be unsecured on the bridge. However, the bridge was unmanned at the time. This condition was reported to and corrected by the licensee. This matter is discussed further in paragraph 10.

No violations or deviations were identified in this area of the inspection.

10. Refueling Activities (60710)

Selected Unit 1 refueling activities were observed to ascertain whether the activities were being controlled and conducted as required by the TS and approved procedures. Items inspected included:

- Periodic testing and verification of the operability of refueling-related equipment and systems

- Fuel handling operations and other related activities

- Good housekeeping and loose object control in the reactor cavity and incontainment storage pools

Fuel handling operations were witnessed by the inspectors in both the FHB and RCB. Activities included movement of fuel into the fuel transfer assembly, operation of the fuel transfer assembly, and placement of new and spent fuel in the reactor core. Items inspected included verification that the correct revisions of applicable procedures were in use, radiation controls were in effect, and the fuel handling activities were in accordance with approved procedures.

The performance of Procedure OPOPO8-FH-0003, "Fuel Transfer System," Revision 0, was reviewed and witnessed in both the FHB and the RCB. The procedure provided instructions for the transfer of fuel assemblies between the FHB and RCB. Section 5.0 of the procedure provided paragraph style descriptions of the fuel handling system. Section 5.3 provided a description of instructions regarding operation of the emergency pullout cable system. The cable system was to be used in an emergency to pull the fuel transfer car back into the FHB. The inspector suggested that a step-by-step instruction be written and implemented into a procedure to minimize the time a spent fuel assembly would be stuck between buildings, assuming the emergency pullout cable system had to be used. The same comment applied to Section 5.4 (traverse drive torque release clutch) of Procedure OPOPO8-FH-0003. The licensee stated that Procedure OPOPO8-FH-0003 will be revised as part of the procedure enhancement program to include step-by-step instructions regarding the emergency pullout cable system and traverse drive torque release clutch.

While observing the performance of Procedure OPOPO8-FH-0003 at the FHB control console, the inspectors watched the control console operator operate the fuel transfer assembly. The operator did not have a copy of the procedure open while performing Procedure OPOPO8-FH-0003, although a copy was present at the work station. (When activities are considered to be within the skills of a qualified individual, or when activities are considered to be routine or basic, the licensee's procedures provide that the tasks may be performed without having the procedure present.) Step 7.1.8 of Procedure OPOPO8-FH-0003 instructed the operator to rotate the upender hydraulic pump control switch to the stop position. The inspector observed the operator skipping Step 7.1.8 and continuing on with Step 7.1.9. Step 7.2.9 instructed the operator to turn the pump switch to start position, but the operator skipped the step because the pump switch was already in the start position. When questioned about his actions, the operator stated that the pump was left on to keep from cycling the pump on and off. However, the inspector noted the pump was designed to cycle on and off as necessary to maintain adequate system pressure while the control switch was in the start position.

A review of the vendor technical manual (Licensee Log No. 14926-0185-00017-HWN, Fuel Transfer System Technical Manual) was performed. The vendor manual provided instructions to turn the pump on (start position) and off (stop position) during each fuel movement cycle.

Procedure OPOP03-ZA-0010, "Plant Procedure Compliance, Implementation, and Review," Revision 11, Step 3.1.1, states that procedures shall be strictly adhered to when performing plant activities (498/8938-01A). The action of the operator at the RCB console in not performing the steps requiring the pump to be turned off and on is a failure to follow an approved procedure. The safety significance of not turning the pump off and on was not determined.

The inspector also reviewed the working copies of the procedures used by the operators at the FHB control console workstation. One of the procedures reviewed was OPOP08-FH-0009, "Core Refueling," Revision 4. The green colored working copy of OPOP08-FH-0009 had only one FCR attached, FCR 89-2309. However, there were actually two more FCRs outstanding against the procedure that were not attached. The two FCRs that were not attached were FCR 89-2356 and FCR 89-2505 (a third FCR, FCR 89-2512, was issued on the day of the inspection). The FCRs that were not attached and were not incorporated into the procedure affected the activities of the operators in the FHB (498/8938-01B). The revised steps dealt with supervisory instructions and communications between the core loading supervisor and the FHB refueling operators. When this out-of-date procedure was pointed out to the licensee, the licensee stated that the controlling procedure over all refueling activities, Procedure OPOP08-FH-0009, was located in the control room. The licensee replaced the out-of-date working copy at the workstation.

Procedure OPGP03-ZO-0004, "Plant Conduct of Operations," Revision 10, Step 4.6.7, states, in part, that operating personnel assigned to watchstations (defined as the normal operating area for operators assigned to perform operating activities outside of the control room) shall only use controlled documents when performing plant operating activities. Additionally, Step 4.4.2.1 of Procedure OPGP03-ZO-0004 states that operating personnel using procedures to perform safety-related activities are responsible for verifying the document being used is the correct revision and includes the latest applicable changes (e.g., FCRs) prior to performing the allocated activity. Not having the latest applicable changes in the working copy of Procedure OPOP08-FH-0009 at the FHB control console workstation is a failure to follow an approved procedure (498/8938-01C). The working copy used at the RCB workstation was noted to be up to date with all FCRs attached.

A similar problem was reported in IR 50-498/89-02; 50-499/89-02. In that case, a maintenance technician used a procedure while performing work without an FCR attached to the working copy of the procedure. Due to the small number of procedures identified in use without all FCRs attached and the time span involved, this and the previous incident are considered isolated errors and not indications of programmatic weaknesses.

As part of the refueling activities inspection, core reloading was witnessed from the refueling machine in the RCB. The operators appeared knowledgeable and competent in their activities. The reloading of the core was a slow and tedious process, due to the geometry of the fuel

assemblies. The spent fuel assemblies were bowed, and occasionally skewed, making the reloading of the assemblies a difficult process. A "fuel shoe horn" had to be used to assist in replacing the bowed fuel assemblies in the core.

Several miscellaneous items were noted to be on the refueling machine but not secured as required by procedure precautions. Procedure OPOPO8-FH-0001, "Refueling Machine Operating Instruction," Revision 0, Step 4.3, stated that loose equipment, tools, or materials that could break or fall into the refueling cavity shall be kept off the refueling machine and kept clear of the refueling cavity. Step 4.4 stated that all material required on the refueling machine or near the refueling cavity shall be tied or taped to prevent it from falling into the refueling cavity. Despite these procedural precautions, the following items were observed unsecured on the refueling machine: two face shields, one tape roll, one rubber glove, one cloth bootie, one safety belt, one pair binoculars, and one data book. This was a safety concern because of the possibility of dropping any of the items into the reactor cavity. When this was pointed out to the refueling machine operators, the items were immediately removed. Leaving unsecured articles on the refueling machine is a failure to follow an approved procedure. A similar matter regarding the FHB fuel handling machine is discussed in paragraph 9 of this report.

One violation and no deviations were identified in this area of the inspection. Three examples of operators failing to follow approved procedures were observed during the inspection. These examples consisted of: (1) failure to follow the steps in safety-related Procedure OPOPO8-FH-0003 at the FHB fuel transfer control console, (2) failure to have an approved, up to date working document at a workstation, and (3) failure to follow procedural cautions regarding unsecured articles at the RCB refueling machine. The failure to follow approved procedures is a violation (50-498/8938-01).

11. Exit Interview

The inspectors met with licensee representatives (denoted in paragraph 1) on September 29, 1989. The inspectors summarized the scope and findings of the inspection. The licensee did not identify as proprietary any of the information provided to, or reviewed by, the inspectors.