U. S. NUCLEAR REGULATORY COMMISSION

REGION I

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Inspectors:	F. Paul Bonnett, Senior Resident Inspector (Acting) William T. Olsen, Resident Inspector Glen Dentel, Resident Inspector Javier Brand, Resident Inspector Intern Leonard J. Prividy, Senior Systems Engineer, DRS Alfred Lohmeier, Senior Reactor Engineer, DRS Ram S. Bhatia, Electrical Engineer, DRS Christopher Welch, DRS
Approved by:	Richard J. Conte, Chief, Projects Branch 8 Division of Reactor Projects

EXECUTIVE SUMMARY

Seabrook Generating Station, Unit 1
NRC Inspection Report 50-443/97-06

This integrated inspection included aspects of licensee operations, engineering, maintenance, and plant support. The report covers an 7-week period of resident and specialist inspection.

Operations:

- Seabrook Station's conduct of operations was professional and focused on safety principles (Section O1.1).

- Operators closely monitored and maintained control of key reactor plant parameters including: reactor power, axial flux differential, and steam generator levels throughout the "A" main feedwater pump (MFP) steam supply pipe oscillations event. Shift and operations management determined that the pipe oscillations did not warrant an immediate plant trip, and decided to reduce power to remove the "A" MFP from service. The issue of whether the decision to reduce power using the emergency boration flowpath instead of initiating a plant trip was appropriate remains open pending NRC review of the licensee's review of this event.

- Operator awareness and usage of the process to identify and clean boric acid leakage from the "A" safety injection pump mechanical seal was ineffective since boric acid was not being cleaned from the pump on a regular interval. Further, the failure to cleanup the seal area on a regular basis made trending of the leak rate difficult. The system engineer adequately assessed the pump's mechanical seal leakage, however, the inspector noted that the possible failure mode of increased leakage without drainage was not evaluated (Section O2.2).

Maintenance:

- The installation of the makeup totalizer modification was well coordinated. Good inter-departmental cooperation was demonstrated. Station and operations management demonstrated a conservative approach to conducting the on-line maintenance by establishing contingency plans for addressing a rapid power reduction scenario (Section M1.1).

- Several performance problems occurred during the troubleshooting and repair activities for the A MFP that collectively resulted in the A MFP failing to trip during the post-maintenance trip test. A lack of self-check and questioning attitude on the part of supervision and technicians resulted in the use of an inadequate procedure, poor configuration control (failure to document lifting electrical leads) during corrective maintenance, and adherence to procedures (Section M1.2).

- The plant staff demonstrated good plant awareness in identifying the leak in the circulating water piping. Maintenance technicians responded well to stop the leaks.

Engineering's evaluation of the issue was very good, in that, it identified a non-conformance between the plant's configuration and the Updated Final Safety Analysis Report (UFSAR). Comprehensive corrective actions were implemented to address the issue (Section M1.3).

Engineering:

- Overall, Seabrook performed the fuel inspection activities well. The inspector observed adequate Reactor Engineering supervisory and vendor oversight on the job. Further, there was excellent HP coverage and radiation controls, good FME program implementation, adequate Operations support, and adequate self-assessment by the QA Department. The inspector concluded that several minor issues had no effect on the safe implementation of the fuel inspections, and that they were promptly and adequately evaluated and addressed. The station's procedure review was completed in accordance with Technical Specifications (Section E1.1).

- A weakness existed in the maintenance/procurement engineering (PE) interface, such that a barrier to ensuring the use of the correct replacement component broke down. Personnel performing the work identified the wrong component in the field, but that information was never related to PE contrary to the guidance in MA 3.0 (Section E8.1).

Plant Support:

- Security personnel properly responded to alarms caused by card readers inaccurately reading security access cards. The security staff adequately demonstrated that the security system appropriately alarmed and identified errors in access control (Section S1.1).

- The fire suppression system configuration in the main control room meets the requirements of the station's fire protection program. With no automatic Halon system in the control room, the negative implications caused by an inadvertent initiation or release of Halon into the control room do not apply. Seabrook management adequately evaluated and implemented corrective actions to provide adequate guidance for operations personnel use of SCBAs (Section F1.1).

- Seabrook Station's fire suppression systems meet General Design Criterion 3 with respect to inadvertent operation of fire suppression systems (Section F2.1).

TABLE OF CONTENTS

EXECUTIVE SUMMARY ii

TABLE OF CONTENTS iv

I. Operations 1
- O1 Conduct of Operations 1
  - O1.1 General Comments (71707) 1
  - O1.2 Main Feed Pump Oscillations - Reactor Power Reduction 1
- O2 Operational Status of Facilities and Equipment 3
  - O2.1 Routine Plant Tours 3
  - O2.2 Safety Injection Pump Mechanical Seal Leakage 3
- O7 Quality Assurance in Operations 5
  - O7.1 Technical and Safety Reviews 5
- O8 Miscellaneous Operations Issues 5
  - O8.1 (Closed) URI 50-443/97-02-02: Temporary Installation of Portable Heaters in the Cooling Tower Pump Room. 5
  - O8.2 Licensee Event Report Review 6
  - O8.3 (Closed) LER 50-443/94-06-00: "Unanalyzed Tornado Loading on Ventilation Damper/Ductwork and Metal Partitions". 6
  - O8.4 (Closed) LER 50-443/94-13-00: "Non-compliance with Technical Specification 3.9.12 Action Requirements". 7
  - O8.5 (Closed) LER 50-443/94-015-00: "Missed Technical Specification 4.0.5 Surveillance". 7

II. Maintenance 7
- M1 Conduct of Maintenance 7
  - M1.1 Makeup Totalizer Modification 7
  - M1.2 Main Feed Pump Troubleshooting and Repair 9
  - M1.3 Circulating Water Leak Activities 11

III. Engineering 12
- E1 Conduct of Engineering 12
  - E1.1 Follow-up Inspection of Failed Fuel Rods and Fuel Assemblies 12
- E8 Miscellaneous Engineering Issues 14
  - E8.1 (Closed) Unresolved Item 50-443/97-04-04: Engineering Evaluation of Dissimilar Replacement Components 14

IV. Plant Support 15
- R8 Miscellaneous RP&C Issues 15
  - R8.1 (Closed) LER 50-443/94-04-00: "Missed Surveillance - Technical Specification 3.3.3.10, Radioactive Gaseous Effluent Monitoring Instrumentation". 15
  - R8.2 (Closed) LER 50-443/97-13-00: Inoperable Turbine Gland Seal Condenser Exhaust Radioactive Gaseous Effluent Monitor. 15
- S1 Conduct of Security and Safeguards Activities 16

S1.1 Security Badge Failures 16
F1 Control of Fire Protection Activities 17
F1.1 Control Room Fire Suppression 17
F2 Status of Fire Protection Facilities and Equipment 18
F2.1 Design of Fire Suppression Systems 18

V. Management Meetings 19
X1 Exit Meeting Summary 19
X3 Other NRC Activities 19

PARTIAL LIST OF PERSONS CONTACTED 20

INSPECTION PROCEDURES USED 21

LIST OF ACRONYMS USED 24

Report Details

Summary of Plant Status

Seabrook Station began this inspection period operating at 100% power. On September 15, operators reduced reactor power to 49% due to sustained oscillations in the "A" main feed pump (MFP) governor valve servo unit. The "A" MFP was removed from service and repaired. However, during power ascension on September 17, with reactor power at 90%, the MFP governor oscillations recurred and operators reduced reactor power to 50% and removed the "A" MFP from service. Operators restored the unit to 100% power on September 19 and operated essentially at full power for the remainder of the period, with minor power reductions to support instrument calibrations and turbine valve testing.

I. Operations

O1 Conduct of Operations

O1.1 General Comments (71707)

Using Inspection Procedure 71707, the inspectors conducted frequent reviews of ongoing plant operations. In general, Seabrook Station's conduct of operations was professional and focused on safety principles.

O1.2 Main Feed Pump Oscillations - Reactor Power Reduction

a. Inspection Scope (71707)

On September 15, at 7:45 p.m., control room operators noted oscillation of the "A" main feed pump (MFP) governor control valve position and the steam flow indications to the MFP. Operators were unable to immediately reduce reactor power to remove the MFP from service due to a rod control system failure. The inspector observed portions of the control room activities during the event and portions of the troubleshooting activities. The inspector discussed the event with various operations department personnel.

b. Observations and Findings

The operators became aware of the MFP problem when the "A" MFP Emergency Oil Pump Running alarm annunciated in the main control room. The operators observed that steam flow and governor control valve position indication were oscillating. The operators noted that the actual speed of the MFP was not changing significantly and that steam generator (SG) levels and feed regulating valve (FRV) positions remained stable. The operators dispatched a nuclear shift operator (NSO) to the MFP and contacted the system engineers to assist in troubleshooting the MFP governor. The NSO and system engineers observed the governor control valve servo cycling from full open and to full closed, lifting the high pressure steam inlet poppet, which caused the long length of 4-inch high pressure steam supply piping to vibrate. Shift management notified the security supervisor to restrict normal access to the turbine building in the event the pipe failed.

With reactor power and SG levels essentially steady, shift management evaluated the high pressure steam pipe oscillations to determine if power could be reduced to remove the MFP from service or if a plant trip was necessary. They determined that the pipe oscillations were not at the point to justify placing a major transient (plant trip) on the plant and decided to perform a controlled power reduction to 55% power to remove the MFP from service. The system engineers and I&C supervisor believed that foreign material in the control oil system could be causing the servo to hunt. This problem had occurred previously on June 29, during the startup from the refueling outage, and was the subject of an adverse condition report (ACR) 97-1739.

The shift manager directed the operators to reduce power per operating procedure OS1000.06, Power Decrease. The operators were to use control rods to start the down power evolution, maintaining axial flux differential (AFD) close to the target value, and to borate per the contingency plan through the emergency boration valve, CS-V426 using procedure OS1202.04, Rapid Boration. However, when the reactor operators attempted to insert control rods, the rods failed to move. The operators entered abnormal procedure OS1210.2, Failure of Control Rods to Move, which directed the operators to stop any power increase/decrease evolution and allow I&C technicians to troubleshoot and repair the rod control problem.

The shift manager then directed that power should be reduced using the emergency boration flow path to reduce the high pressure steam piping oscillations per a contingency procedure developed for work in progress. The emergency boration path was used due to the normal blended makeup path being out-of-service for the boric acid blender modification (see Section M1.1). Prior to performing the boric acid blender modification the licensee had established contingency actions in the event that the plant experienced a transient that would require a power reduction. The decision to reduce reactor power using the emergency boration flowpath was consistent with the contingency plan. The inspector noted that the decision to reduce power using the continency plan instead of maintaining power steady in accordance with the abnormal rod control procedure was not documented.

The shift manager directed that a plant trip be initiated at any time that the operators believed the plant to be in an unstable condition or excessively challenged. The inspector questioned whether the decision to reduce power using the emergency boration flowpath in lieu of initiating a plant trip was appropriate since this increased the amount of time required to mitigate the steam pipe oscillations. Operations management initiated an ACR to review this event. The inspector will further inspect this issue pending completion of the licensee's review of the ACR findings. **(URI 50-443/97-06-01)**

The operators successfully decreased reactor power to 92% which reduced the high pressure steam piping oscillations. The lower steam demand also reduced the MFP servo oscillations which stopped the MFP high pressure poppet valve from cycling open. Operators held power at 92% until the rod control system could be repaired and because AFD was trending toward the upper limit. Power could not be reduced further with boric acid alone without violating AFD limits and entering a 15 minute TS limiting condition for operation (LCO). Further, work on the MFP could not be performed until it was removed from service. To further reduce steam line oscillations and the effects of the "A" MFP

governor oscillation, the operators placed the "B" MFP in manual and increased pump load which unloaded the "A" MFP.

On September 16, following the repair to the control rod drive system, operators decreased reactor power to 50% and removed the "A" MFP from service. On September 17, I&C technicians replaced a failed control circuit board and tested the MFP. Operators placed the MFP in-service and began to increase reactor power. When power had reach 90%, the "A" MFP began to oscillate as previously. Operators immediately commenced a rapid down-power to 50% per OS1000.06, and removed the MFP from service. I&C technicians troubleshooting the problem determined that the new circuit card had failed. I&C technicians installed a new replacement card on September 18. The operators tested the MFP, placed it in-service, then began to increase reactor power. Power reached 100% power on September 19.

c. Conclusion

Operators closely monitored and maintained control of key reactor plant parameters including: reactor power, axial flux differential, and steam generator levels throughout the event. Operations management determined that the steam plant oscillations did not warrant an immediate plant trip, and decided to reduce power to remove the "A" MFP from service.

The issue of whether the decision to reduce power using the emergency boration flowpath instead of initiating a plant trip was appropriate remains open pending NRC review of the licensee's review of this event.

O2 Operational Status of Facilities and Equipment

O2.1 Routine Plant Tours (71707)

The inspectors used Procedure 71707 to perform routine tours of the facility and also to walkdown accessible portions of engineered safety feature (ESF) systems:

- Emergency Diesel Generators
- Safety Injection Systems
- Service Water System

Equipment operability, material condition, and housekeeping were acceptable in all cases. Several minor discrepancies were brought to management's attention and were corrected. The inspectors identified no substantive concerns as a result of these walkdowns.

O2.2 Safety Injection Pump Mechanical Seal Leakage

a. Inspection Scope (71707)

On August 25, during a surveillance test of the "A" safety injection (SI) pump, the inspector observed boric acid accumulation at the pump's mechanical seal, in the seal basin, and the seal basin drain. In addition, the seal basin drain appeared to be completely

blocked. The inspector discussed the deficiency with the operator and system engineer, reviewed the impact of the accumulated boric acid and the engineering processes for evaluating and correcting the deficiency.

b. Observations and Findings

Operator awareness and usage of the process to identify and clean boric acid leakage from the "A" safety injection pump mechanical seal was ineffective. The boric acid leakage at the pump mechanical seal had been previously identified with a deficiency tag dated February 15, 1996. The operator in the field stated that the boric acid leaks had been identified and referred to the Health Physics (HP) department for cleanup. HP personnel cleanup boric acid from plant components through a quarterly repetitive task sheet (RTS 97RH00033002). The inspector's review of the RTS indicated that the last HP cleanup of the pump seal was October 11, 1996, and that boric acid leakage at the "A" SI pump had not been cleaned during the current RTS period. The inspector determined that the operators demonstrated a lack of a questioning attitude concerning the buildup of boric acid on the pump over an extended period.

The inspector's concern focused on the potential for leak-off water from the seal to fill the basin with the seal basin drain blocked, come in contact with the pump shaft, and interact with the pump bearing causing a failure and subsequent pump damage. The SI pumps are safety-related and are required to operate during a design-basis accident. Further, the inspector observed during recent plant tours, boric acid accumulation on both SI pumps.

The "A" SI pump mechanical seal was not replaced during the last refueling outage, but was postponed until the next refueling outage. Engineering personnel evaluated the "A" SI pump seal leakage as acceptable until the next refueling outage, based on the results of the "B" SI pump replacement and inspection. The "B" SI pump was experiencing the same type of boric acid accumulation as the "A" SI pump and the vendor replaced the mechanical seal during the outage in June 1997. The as-found condition of the "B" mechanical seals were "as new" according to vendor documentation.

Currently, HPs cleaned the basin drain and both SI pumps. The system engineer determined that the existing seal leakage for both SI pumps was normal for this type of seal. Pump seals are not designed to be zero leakage and the leakage rate was very small. The "B" seal inspection previously performed confirmed that minor leakage was not an indication of seal degradation. No immediate safety issue exists at this time. In the mean time, the system engineer has taken corrective actions to ensure frequent cleanup of the seal, basin and drain piping after the corresponding quarterly surveillance run of each pump.

c. Conclusion

Operators did not ensure that boric acid leakage was removed from the "A" safety injection pump mechanical seal. Further, the failure to cleanup the seal area on a regular interval made trending of the leak rate difficult. The system engineer adequately assessed the pump's mechanical seal leakage, however, the inspector noted that the possible failure mode of increased leakage without drainage was not fully evaluated.

O7 Quality Assurance in Operations

O7.1 Technical and Safety Reviews (71707)

During the inspection period, the inspectors reviewed or attended multiple self-assessment activities, including:

- various Station Operational Review Committee (SORC) meetings and meeting minutes;
- various Management Review Team (MRT) meetings and adverse condition reports (ACRs).

The SORC reviewed several activities related to safe station operation. The members of SORC actively participated in the meeting with open discussions on the plant issues while maintaining a focus on safety principles. The inspectors concluded that the SORC and MRT members performed a detailed and critical review of the issues.

O8 Miscellaneous Operations Issues

O8.1 (Closed) URI 50-443/97-02-02: Temporary Installation of Portable Heaters in the Cooling Tower Pump Room.

a. Inspection Scope

On March 26, the inspector observed the use of temporary heaters in the cooling tower pump room and questioned whether the equipment was properly controlled. In the current period, the inspector evaluated the control of these temporary heaters and the requirements for installation of temporary equipment. The inspector interviewed the supervisor in charge of installing the temporary heaters and reviewed ACR 97-1064.

b. Observation and Findings

The inspector determined that personnel installing the temporary heaters followed maintenance administrative procedure MA 4.8, "Control of Temporary Equipment". Procedure MA 4.8 provided guidance for evaluating and controlling the installation of temporary equipment. Personnel properly stored the temporary heaters at a lateral distance away from safety-related components by at least twice the height of the temporary components, and also secured to supports in the cooling tower pump room. The inspector concluded that the responsible supervisor had properly evaluated the temporary heater installation per MA 4.8, but noted that the procedure did not require this review to be documented.

The inspector noted a weakness in that control room personnel were not aware of the purpose for the temporary heaters, nor of the supervisor's review. Poor communications and not documenting the supervisor's review were considered to be contributing factors to this minor deficiency. Maintenance management indicated that MA 4.8 would be enhanced to require that the temporary equipment evaluation be documented.

c. Conclusion

The temporary heaters were installed in accordance with the applicable station procedure. A weakness was noted in the process in that the evaluation was not required to be documented and the operators were not aware that this equipment had been installed. The licensee planned to enhance procedure MA 4.8 to address this weakness. This unresolved item is closed.

O8.2 Licensee Event Report Review

The following licensee events report (LER) events were reviewed in previously issued inspection reports, but the LERs were not documented as having been reviewed. The LERs and supplements met the requirements of 10 CFR 50.73, and the inspector had no further questions regarding each event.

- (Closed) LER 50-443/94-010-00 and Supplement 01: "Potential Fuel Damage Due to RCP Turning Vane Capscrew Locking Nut Failure". The event was reviewed in inspection report 50-443/94-13.

- (Closed) LER 50-443/94-011-00 and Supplement 01: "Non-compliance with High Radiation Area Controls". The event was reviewed in inspection reports 50-443/94-13 and 94-14.

- (Closed) LER 50-443/94-012-00: "Non-compliance with High Radiation Area Controls. The event was reviewed in inspection reports 50-443/94-14 and 94-20.

- (Closed) LER 50-443/94-014-00: "Missed Technical Specification Surveillance on Containment Air Locks". The event was reviewed in inspection report 50-443/94-24.

- (Closed) LER 50-443/94-016-00: "Non-compliance with Technical Specification 3.3.2 Action requirements". The event was reviewed in inspection report 50-443/94-24.

- (Closed) LER 50-443/94-02-00 and Supplement 01: "Inadequate Slave Relay Testing". The event was reviewed in inspection reports 50-443/94-03, 94-24.

O8.3 (Closed) LER 50-443/94-06-00: "Unanalyzed Tornado Loading on Ventilation Damper/Ductwork and Metal Partitions".

Seabrook reported on April 15, 1994, an event concerning discovery that documentation was not available to substantiate the analysis regarding the effects of differential pressure on ventilation dampers, associated ductwork and diesel generator building metal partitions. The licensee determined that the components in question were capable of meeting the design basis tornado criteria as defined in the Updated Final Safety Analysis Report (UFSAR) and Regulatory Guide 1.76. The licensee has enhanced the design documentation requirements to prevent recurrence of this type of administrative weakness. The inspector determined that the licensee's corrective actions to resolve the issue were appropriate.

O8.4 (Closed) LER 50-443/94-13-00: "Non-compliance with Technical Specification 3.9.12 Action Requirements".

The licensee identified that rod control cluster assemblies and thimble plugs were moved in the spent fuel pool (SFP) prior to ensuring that the fuel storage building (FSB) emergency air cleaning system could maintain the SFP area at the TS required negative pressure following a modification to the FSB access door. The licensee promptly and satisfactorily performed the required testing. The inspector noted that the event had no actual impact on plant safety since the system performed properly during the test, however, it did indicate a work control process weakness. The station's corrective actions included: revision of the work control process to enhance tracking of required retests prior to system restoration. This non-repetitive licensee-identified and corrected violation is being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the NRC Enforcement Policy. **(NCV 50-443/97-06-02)**

O8.5 (Closed) LER 50-443/94-015-00: "Missed Technical Specification 4.0.5 Surveillance".

The licensee discovered that two Main Steam Drain valves (MSD-V44 and 47) were also containment isolation valves and had not been surveillance tested as required by Technical Specification surveillance requirement 4.0.5. This surveillance demonstrated the operability of these valves and requires them to be stroke tested every 92 days, or 115 days including the 25% extension allowed by Technical Specification 4.0.2. The licensee satisfactorily performed the required testing and revised the routine test sheet to improve the guidance regarding test frequency. This non-repetitive licensee-identified and corrected violation is being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the NRC Enforcement Policy. **(NCV 50-443/97-06-03)**

II. Maintenance

M1 Conduct of Maintenance

M1.1 Makeup Totalizer Modification

a. Inspection Scope

On September 15, maintenance technicians installed a minor modification (MMOD) to the blended makeup totalizer in the chemical volume and control (CS) system. Design change (DCR) 95-030, Boric Acid/Dilution Blend Flow Transmitter Replacement, was the controlling document to replace flow element CS-FE-111 and add flow straightener CS-MM-903, downstream of the boric acid blender. The inspector reviewed the DCR, attended engineering meetings, and observed portions of the work activities in the field.

b. Observations and Findings

The boric acid counter was not accounting for the total amount of boric acid added to the reactor coolant system (RCS). Control room operators identified the issue when a minor

reactor power increase transient occurred during a blended makeup to the RCS (see Inspection Report 50-443/97-04). The engineers determined that an insufficient distance existed between the orifice flow element (CS-FE-111) and the mixing tee (CS-MM-1) in the CS system, which was causing flow instabilities. To resolve the inaccuracy, the engineering staff developed a design change package (DCR 95-030) to reinstall CS-FE-111 downstream of the original location and install a 10-inch flow straightener. The flow straightener consisted of two flat plates connect together which cross-sectioned the two-inch pipe into four equal quadrants. The flow straightener functions to provide a stable flow profile to enable accurate flow detection.

Plant management determined that the modification work could be performed at power and that the optimum time to complete the work was during the fuel cycle high boron point (the window when core reactivity is such that no boric acid or dilution is needed to maintain reactor power) for a relatively long period of time. This window occurred between September 15 and 18. The modification would require that the normal makeup to the volume control tank (VCT) be unavailable for two operating shifts and that the required TS boration flowpath be maintained for the duration of the evolution. Although the system would be functional after two shifts, the makeup totalizer would not be fully operable until the completion of system calibration and post-maintenance testing.

The licensee established contingency actions in the event the plant experienced a transient that would require a power reduction. The assistant operations manager issued Standing Operating Order (SOO 97-025) which listed existing abnormal procedures and applicable procedure steps to rapidly reduce power or shutdown the reactor. Further, operating crews developed a briefing sheet to ensure accurate turnover of the status of the work in-progress and applicable contingencies in-place. The operators removed the boric acid blender from service on the morning of September 15 after completing a 250 gallon makeup to the RCS via the charging pump suction. The last 50 gallons of the makeup was reactor makeup water to flush boric acid from the piping.

Maintenance technicians performed the modification work well. Much of the replacement piping was pre-fabricated in the maintenance shop reducing the amount of work to be accomplished in the field. The welders were qualified and well supervised. The work package (WR 97W002746) was in order and located at the work site. Fire watches were present and aware of the responsibilities.

Following the installation, technicians flushed the system to the "B" boric water storage tank (BWST). I&C technicians calibrated the flow transmitter and collected data as operations personnel performed various blended makeup evolutions to the VCT. Post-maintenance testing was completed and the system declared operable on September 19.

c. Conclusions

The installation of the makeup totalizer modification was well coordinated. Good inter-departmental cooperation was demonstrated. Station and operations management demonstrated a conservative approach to conducting the on-line maintenance by establishing contingency plans for addressing a rapid power reduction scenario.

M1.2 Main Feed Pump Troubleshooting and Repair

a. Inspection Scope

The inspector observed troubleshooting activities performed regarding the "A" MFP governor servo oscillations and rod control system failure (see Section O1.2). The inspector also discussed the activities with various I&C department personnel.

b. Observations and Findings

Rod Control Failure

I&C technicians, troubleshooting the rod control system, found and replaced a failed supervisory memory buffer card (A-112). Failure of this card causes the rod control system to block all control rod motion except for reactor protection system activation. This was the second failure of this nature to occur within a two week period. A similar card, A-111, failed on September 2 during the monthly control rod operability surveillance test which prevented insertion of control rods. The licensee determined that the A-112 card had been replaced three years earlier with an older style circuit card. These older circuit cards were being systematically replaced because of repeated poor performance in the late 1980s. The failed card, however, had been stored in the warehouse with the same stock code as that of the new style replacement circuit cards, and was inadvertently used. The licensee currently verified that all of the old circuit cards were removed from the warehouse.

The inspector observed several examples of the wrong part with the correct part number being used in the plant. These included: the wrong size springs for safety-related check valves (Section E8.1) and several ACRs. The inspector was concerned that further examples remain unidentified by procurement engineering. Therefore, this issue will remain unresolved pending further inspection and review **(URI 50-443/97-06-04)**.

Main Feedwater Pump

I&C technicians performed the initial troubleshooting activities well for the MFP governor servo control circuit failure. They found a failed demodulator in the pilot valve feedback circuit on the redundant speed pickup card (POS5). The demodulator produces a DC feedback signal proportional to an AC signal produced by pilot valve stem motion through a linear variable differential transformer (LVDT). The technicians replaced the circuit card with a new circuit card from the warehouse. The technicians properly installed, calibrated, and tested the circuit card using procedure IN1640.910, MDT-20 SG Feed Pump A Speed Control Calibration.

During the second MFP oscillation event, I&C technicians found that the new circuit board (POS5) had catastrophically failed. The demodulator failed in the low pressure poppet stem feedback circuit (which was similar to the pilot valve feedback circuit). No other replacement circuit card existed in the warehouse and procurement engineers had to obtain a replacement circuit card from a fossil station in Connecticut. The card, however, was not an exact one-for-one replacement, but would be identical in form, fit, and function

once modified. The circuit card from the fossil station had an extra capacitor and resistor. Design engineers prepared a minor modification package (MMOD 97-0622) to remove the capacitor and resistor, and revise the vendor manual. The MMOD package was of high quality. The engineers discussed the circuit card changes with a vendor representative and performed a safety evaluation (10CFR50.59) to evaluate the modification.

Several performance problems occurred during the troubleshooting and repair activities of the second MFP event, which collectively resulted in the A MFP failing to trip during the post-maintenance trip test. The problems included:

- I&C supervision did not provide an adequate pre-job brief and oversight. Neither the I&C supervisor nor the technicians recognized that the clearance order to block the MFP had created an electrical turbine trip signal that required defeating the trip by lifting lead (D4).

- Procedure IN1640.910 was inappropriately annotated to perform the specified activity. I&C supervision allowed the technicians to reuse the same copy of the procedure that had been used for troubleshooting activities during the initial MFP event. During that event, no electrical trip signals existed; therefore, the two procedure steps for lifting and terminating lead (D4) (to remove the electrical trips), were deleted. During the second event, the electrical trip signals were present; however, the technicians did not lift lead (D4) since the procedure steps were annotated as deleted. The procedure did not work as expected and the technicians determined that lead (D4) needed to be lifted and performed the action.

- I&C technicians demonstrated a lack of self-check and questioning attitude. The technicians did not stop work activities or bring the procedure discrepancy to the attention of their supervision. Further, the technicians reported to the job with the procedure, but had forgotten to bring the detached data record sheets. They did not take the time to retrieve the data record sheets from the shop when they realized that they had forgotten them, but continued with the procedure without the data sheets present.

- I&C technicians lifted electrical lead (D4) without documenting this action as required by procedure IN1640.910, step 8.9.1. The failure to document lifting lead (D4) resulted in the MFP being reassembled and tested unsatisfactorily without terminating lead (D4), defeating the electrical trip capability of the MFP. Technical Specification 6.7.1.a specifies that written procedures recommended in Appendix A of Regulatory Guide 1.33, shall be implemented. This is a violation of this TS. **(NOV 50-443/97-06-05)**

Seabrook management implemented several corrective action to prevent recurrence of this event. Procedure IN1640.910 was revised to incorporate the data record sheet with the body of the procedure. Further, I&C management coached the I&C technicians involved with lifting the lead and reviewed the incident with the entire department.

c. Conclusion

Several performance problems occurred during the troubleshooting and repair activities for the A MFP that collectively resulted in the A MFP failing to trip during the post-maintenance trip test. A lack of self-check and questioning attitude on the part of supervision and technicians resulted in the use of an inadequate procedure, poor configuration control (failure to document lifting electrical leads) during corrective maintenance, and adherence to procedures.

M1.3 Circulating Water Leak Activities

a. Inspection Scope

On August 19, a roving security guard notified the control room operators of a through-wall leak in the outlet piping of the "C" main condenser waterbox. An NSO was sent to investigate and reported that a steady stream of water (like a garden hose) was flowing from the one-inch diameter leak located downstream from the waterbox outlet isolation valve (CW-V29). The inspector observed work and troubleshooting activities in the field and reviewed the Operability Determination (OE4.5) issued to address an non-conforming condition with the UFSAR.

b. Observations and Findings

Maintenance technicians stopped the leak by installing a temporary repair (nylon belt with rubber gasket material) under an emergency work order. Further investigation determined that the leak was unisolable. Ultrasonic testing performed indicated significant wall thinning and two other weeping leaks. Further, on August 20, a system engineer identified a similar through-wall leak on the "A" waterbox outlet piping downstream of the waterbox outlet isolation valve (CW-V33). A steady stream developed from the "A" waterbox leak and maintenance banded the pipe to stop the leak.

The Assistant Operation Manager issued a Standing Operating Order (SOO 97-024) which outlined contingency actions for the operators to take in the event the leak became worst or if a catastrophic failure occurred. The unit remained at 100% power throughout the entire event with no challenge toward reactor safety.

The circulating water (CW) piping is an 84 inch, carbon steel, concrete-lined pipe. The CW system is a low pressure, high flow system with a system pressure of about 60 psig. The leaks developed in the transition piece weld area between the concrete-lined pipe and the lower isolation valve flange. The pipe and transition piece are welded together then the weld area is grouted over to seal and prevent degradation of the pipe from seawater. However, a flaw developed in the grout allowing seawater to come in contact with and attack the carbon steel pipe wall. A similar problem occurred and was corrected in the service water (SW) system 10-years earlier. Seabrook established a program to routinely inspect the SW system piping to ensure it's integrity.

Seabrook performed ultrasonic testing of all of the outlet and inlet waterbox piping and determined that the piping was intact to allow continued plant operation until the next outage, during which repairs could be properly made. The engineers noted during their evaluation, however, that the UFSAR took credit for scuppers in the turbine building wall to provide a drain path in the event of a design break in the CW piping. A walkdown of the turbine building confirmed that the scuppers were not present. Also, the engineers found that a high level alarm in the condenser pit that would alarm in the control room was deleted from the UFSAR in 1985.

Engineering performed an Operability Determination (OD No. 97-14) to address the non-conforming condition. The OD concluded that the system was operable due to several factors including, both turbine building doors remained open at least 18 inches and that management heighten the operator's awareness to respond to a turbine building sump high level alarm by dispatching an NSO to the condenser pit. The long term resolution to correct this issue required a design change to install an alarm in the condenser pit, and to initiate an UFSAR change to delete the requirement for scuppers and reinstate the requirement for the condenser pit alarm. The OD stated that the turbine building doors would remain open until the installation of the condenser pit high level alarm in October 1997.

The inspector determined that the OD fully addressed the circumstances concerning the UFSAR non-conformance and that the consequences of the issue were small. This non-repetitive licensee-identified and corrected violation is being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the NRC Enforcement Policy. **(NCV 50-443/97-06-06)**

c. Conclusions

The plant staff demonstrated good plant awareness in identifying the leak in the circulating water piping. Maintenance technicians responded well to stop the leaks. Engineering's evaluation of the issue was very good, in that, it identified a non-conformance between the plant's configuration and the UFSAR. Comprehensive corrective actions were implemented to address the issue.

III. Engineering

E1 Conduct of Engineering

E1.1 Follow-up Inspection of Failed Fuel Rods and Fuel Assemblies

a. Inspection Scope (37551)

Between August 14 and August 28, Seabrook conducted a two-week follow-up inspection of the four fuel assemblies that failed during Cycle 5. Reactor Engineers (RE) and the fuel vendor collected data to assist in determining the root cause for the failures. The inspector observed portions these activities and the licensee's controls in applicable areas such as, radiological work practices, foreign material exclusion (FME) and industrial and personnel safety. The inspector also examined the licensee process for reviewing vendor procedures.

b. Observations and Findings

Reactor Engineers inspected 10 intact fuel rods that were systematically removed from the failed fuel assemblies as part of a corrective action specified in the root cause analysis from ACR 97-1401, dated 6/6/97. Overall, the inspection activities were performed well and included:

- visual and boroscopic examinations;
- eddy current testing before and after crud scraping;
- oxide measurements on 5 of the 10 fuel rods, before and after crud scraping;
- profilometry (external profile inspection) on 4 of the 10 intact fuel rods;
- crud sampling for laboratory analysis on 1 rod of each phase of the 4 failed assemblies.

During inspection activities, several non-safety related problems occurred. These issues had no impact on the safe performance of the inspections, were immediately addressed by the licensee, and were subjects of ACRs. One noteworthy issue involved an attempt to inspect a broken fuel rod. The evolution would require moving the broken rod a few feet to the inspection station. The inspector noted that no precautionary measures were being taken to prevent the possible dropping of fuel pellets out of the broken fuel rod into the spent fuel pool during transport. As a result, the licensee decided not to perform further fuel inspection after considering the inspector's concern and due to having previously completed visual and boroscopic inspections on the broken rods.

The inspector reviewed Seabrook's safety evaluation (10CFR50.59) performed for the vendor procedures and processes. A station qualified reviewer (SQR) performed the review, which was in accordance with the site procedures and Technical Specifications (TS). The inspector noted a minor weakness in that the Quality Assurance Manual (NAQA) did not address use of the SQR. Station management initiated an ACR to review Seabrook's vendor procedure review policy, to ensure consistency among station programs and manuals, and to determine why the SQR process was not defined in the NAQA manual.

c. Conclusion

Overall, Seabrook performed the fuel inspection activities well. The inspector observed adequate Reactor Engineering supervisory and vendor oversight on the job. Further, there was excellent HP coverage and radiation controls, good FME program implementation, adequate Operations support, and adequate self-assessment by the QA Department. The inspector concluded that several minor issues had no effect on the safe implementation of the fuel inspections, and that they were promptly and adequately evaluated and addressed. The station's procedure review was completed in accordance with Technical Specifications.

E8 Miscellaneous Engineering Issues

E8.1 (Closed) Unresolved Item 50-443/97-04-04:Engineering Evaluation of Dissimilar Replacement Components

a. Inspection Scope

During refueling outage (OR05), the nitrogen fill line check valves NG-V22 and NG-V24, to the "C" and "D" safety injection accumulator tanks, were disassembled and rebuilt. The springs in both valves were replaced with new springs supplied from the valve vendor. The springs, however, were dimensionally longer than the original springs. The engineer considered the springs to be acceptable since they were supplied by the vendor, and had been stored in the warehouse since 1985, and these springs had been used in other applications without any problems noted. The inspector was concerned that the lack of an engineering evaluation for dissimilar components created the potential for an unauthorized modification of the check valve. This item was left unresolved pending review of the ACR (ACR 97-1671) evaluation for root cause and corrective actions.

b. Observation and Findings

The ACR concluded that the wrong springs had been supplied by the vendor in 1985. The receipt inspection did not identify the difference in spring size because no spring dimensions were provided with the stock number. Further, maintenance procedure, MA 3.0, Work Practices, required the in-field maintenance foreman to notify Procurement Engineering (PE) if the replacement part looked different than the original part installed. Procurement Engineering would then write an engineering work request (EWR) and Design Engineering would evaluate whether the spring was a suitable replacement component. This activity did not occur due to the process being bypassed.

The inspector discussed the maintenance/PE interface with the lead procurement engineer and with several maintenance supervisors. Procurement has three major barriers to ensure that the correct component is used in the plant. Having approved vendors (to send the correct part), receipt inspection (to verify that the right part was received), and feedback from technicians in the field identifying dis-similar components. All maintenance foremen and technicians are trained and acquainted with management's expectation to notify the PEs as per the MA 3.0 procedural step. In this case, a system engineer was acting in the role of maintenance foreman during the refueling outage to oversee contractors performing valve work. The system engineer made the decision to use the wrong size spring, which bypassed the PE process. Technical Specification 6.7.1.a requires that procedures be implemented, and the failure to properly implement MA 3.0 is a violation of this TS. **(NOV 50-443/97-06-05)**

The problem with the spring was self-disclosing when NG-V22 failed to operate during the nitrogen charging attempt to the "C" accumulator. As a result of the valve failure, both NG-V22 and NG-V24 were disassembled, the wrong size springs were discovered and replaced with the original springs. The valves were tested satisfactorily with no further problems noted.

Following the repair of the check valves, Support Engineering measured the springs in the warehouse and sent the dimensions to the vendor, who responded that the springs in inventory were incorrect. A review of maintenance records identified that seven of these springs had been issued into the field, some were installed into check valves. The inspector verified that the springs had been removed from all vital applications.

As corrective actions, Seabrook removed the incorrect size springs from the warehouse, initiated an EWR for design change documentation to evaluate the applications that have used the issued springs, revise the in-field maintenance procedure to require additional measurements of the spring and valve body cavity, and add dimensions to the procurement documents.

c. Conclusions

A weakness existed in the maintenance/procurement engineering (PE) interface, such that a contorl measure in ensuring the use of the correct replacement component was not met. The maintenance technician performing the work identified the wrong component in the field, but that information was never related to PE contrary to the guidance in MA 3.0.

IV. Plant Support

R8 Miscellaneous RP&C Issues

R8.1 (Closed) LER 50-443/94-04-00: "Missed Surveiliance - Technical Specification 3.3.3.10, Radioactive Gaseous Effluent Monitoring Instrumentation".

On March 25, 1994, a required source check of the station wide range gas monitor had not been performed prior to placing the monitor in service as required. The station revised the station procedure for design change implementation and post modification testing to require verification that outstanding Technical Specification surveillance tests have been performed prior to returning the affected equipment to operable status. The inspector reviewed the licensee's corrective actions to prevent recurrence and determined that they were appropriate to prevent recurrence.

R8.2 (Closed) LER 50-443/97-13-00: Inoperable Turbine Gland Seal Condenser Exhaust Radioactive Gaseous Effluent Monitor.

On August 12, 1997, Seabrook determined that the Turbine Gland Seal Condenser Exhaust radioactive gaseous effluent monitor particulate sampler was inoperable on two separate occasions. The particulate filter paper was found torn during the routine filter paper replacement on July 28 and August 4. This resulted in a minor effluent release via this pathway without the required collection of a representative particulate sample. The effluent pathway was required to be continuously monitored while sampler was inoperable.

Technicians found no radioactive particulate present from a limited particulate sample taken from the a torn filter paper. Also a particulate analysis of the in-line iodine charcoal cartridge, which is capable of capturing radioactive particulate, identified no radioactive

particulate. The radioactive gaseous samples (noble and iodine) for the period in question were found to be less than minimum detectable. A steam generator primary to secondary leak is necessary for the Turbine Gland Seal Condenser Exhaust radiation monitor to indicate radioactivity. No primary to secondary leakage has been identified during the current operating cycle.

The licensee determined that the root cause of the event was due to the station chemistry technicians being unaware that the sampler o-rings had been recently replaced, thereby necessitating a different technique when installing the sampler due to tighter fitup tolerances. The station corrective actions included training chemistry department personnel on the proper method of aligning and installing the sampler to preclude tearing the particulate paper and the sampler outlet line was replaced with flexible tubing to facilitate sampler alignment and installation. The inspector determined that the licensee promptly implemented adequate corrective actions to the event. This non-repetitive licensee-identified and corrected violation is being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the NRC Enforcement Policy. **(NCV 50-443/97-06-07)**

S1 Conduct of Security and Safeguards Activities

S1.1 Security Badge Failures

a. Inspection Scope

On August 25 and August 26, the inspector encountered difficulty in attempting to gain access to various vital areas in the plant. Specifically, the security computer failed to recognize and log-in the inspector's security access card when entering a vital area. The inspectors interviewed security personnel, reviewed access and alarm records, visited the Primary and Secondary Alarm Stations (CAS and SAS), and consulted NRC regional inspectors.

b. Observations and Findings

The security computer denied the inspector access to several vital areas due to the security card readers inaccurately reading the identity code on the security card. This resulted in the computer mis-reading the card and identifying the inspector as another individual who had been previously terminated from the site. The computer did not authorized the entry and initiated a security alarm in the CAS. A security officer promptly responded to each alarm and the inspector was requested to replace his badge as soon as possible.

The inspector determined that the security force appropriately responded to each alarm. Due to the combination of age and wear of various card readers in high traffic areas and a weak magnetic strip on the security access card, errors in reading security access cards were determined to occur at a frequency of two to three times per week. The security supervisor stated that security officers responded to each alarm and confirmed them as nuisance alarms. The inspector reviewed security alarms over a seven day period and confirmed that each alarm was appropriately addressed. Further, no entries into vital areas by unauthorized personnel occurred.

Seabrook's security management demonstrated to the inspector that the station contingency plans, surveillance tests, and periodic card reader maintenance were adequate. In addition, security performed a test where 35 randomly selected spare security cards with a lower access level, were tested to attempted to gain access to vital areas. Out of a total of 105 attempts made, access was denied in all cases by the system. Further, Seabrook management initiated actions to heighten the awareness of station personnel of proper card reader operation via an advisory in the daily news letter.

c. Conclusion

Security personnel properly responded to alarms caused by card readers inaccurately reading security access cards. The security staff adequately demonstrated that the security system appropriately alarmed and identified errors in access control.

F1 Control of Fire Protection Activities

F1.1 Control Room Fire Suppression

a. Inspection Scope (71750)

In response to a recent inadvertent actuation of an automatic Halon fire suppression system in the control room at another facility, the inspector reviewed the fire suppression capability for the control room and the requirements for control room personnel use of self contained breathing apparatus (SCBA). The inspector compared the control room configuration with the UFSAR and Fire Protection Plan, and reviewed applicable procedures. Further, the inspector interviewed operators, the fire protection engineer, and the health physics supervisor.

b. Observations and Findings

The control room configuration meets the requirements described in the UFSAR and Fire Protection Program Manual. An automatic fire suppression system does not exist in the control room at Seabrook Station. Fire suppression in the control room is accomplished by portable hand held Halon fire extinguishers that are strategically located. With no automatic Halon system in the control room, the negative implications caused by an inadvertent initiation or release of Halon into the control room do not apply.

The nearest automatic Halon system to the control room is located in the adjacent main computer room. The main computer room is separated from the control room by a normally closed fire protection door. Ventilation units and dampers interlinking the two rooms are automatically isolated by a smoke detector alarm signal to prevent Halon from entering the control room. Additionally, administrative controls are provided, such as disabling the automatic Halon system when the door is opened for extended periods of time.

The inspector verified that a sufficient number of SCBAs were provided in the control room to properly support control room operations. The SCBAs were properly inspected and maintained. The inspector, however, identified that very little guidance for SCBA use

existed in any normal, abnormal, or emergency procedures. The need to use SCBAs was being determined on a case by case basis by the applicable department (ie; Fire Protection, Heath Physics, etc). Seabrook management agreed with the inspectors findings and initiated an ACR to address the issue.

Seabrook management initiated corrective actions to review and revise applicable abnormal operating procedures and the procedure for safe and from the remote safe shutdown facilities (OS 1200.02). Operations management performed a review to verify that all licensed operators were currently SCBA qualified, and revised the existing Licensed Operator Requalification Program to ensure that licensed operators maintain their SCBA qualification. Further enhancements included ensuring that individuals with restricted licenses for corrective lenses had the required eyeglasses kit. In the interim, management directed the operators to wear the SCBA during any hazardous condition inside the control room.

c. Conclusions

The fire suppression system configuration in the main control room meets the requirements of the station's fire protection program. With no automatic Halon system in the control room, the negative implications caused by an inadvertent initiation or release of Halon into the control room do not apply. Seabrook management adequately evaluated and implemented corrective actions to provide adequate guidance for operations personnel use of SCBAs.

F2 Status of Fire Protection Facilities and Equipment

F2.1 Design of Fire Suppression Systems

a. Inspection Scope

The inspector reviewed Seabrook Station's ability to meet General Design Criterion 3, Fire Protection, regarding inadvertent actuation of the fire suppression systems. The requirements of General Design Criterion 3, state, in part, that "fire fighting systems shall be designed to assure that their rupture or inadvertent operation does not significantly impair the safety capability of structures, systems, and components." The inspector visually inspected the fire suppression systems for the emergency diesel generators, emergency feedwater system, emergency air handling system, and the emergency switchgear. The inspector also interviewed design engineers and reviewed design basis documents.

b. Observations and Findings

The inspector determined that the fire suppression system did not adversely impact the associated safety-related systems. For the diesel generators, an inadvertent fire system actuation through a seismic or other event would not result in actual deluge of the diesel generators. The diesel generator fire suppression system utilizes pre-action sprinklers. The fire piping is maintained dry with closed head sprinklers. The closed head sprinklers open at designated temperatures controlled by fusible links in the sprinklers flooding the pipe.

The emergency feedwater system, emergency air handling system, and emergency switchgear fire protection systems are detection only systems requiring manual fire-fighter actions in respond to a fire. The inspector evaluated additional fire suppression system and the inadvertent actuation of these system and determined that no impact safety-related components existed. The inspector determined that the design engineer was knowledgeable regarding the fire suppression systems and the design basis documents were of high quality.

c. Conclusion

Seabrook Station's fire suppression systems meet General Design Criterion 3 with respect to inadvertent operation of fire suppression systems.

V. Management Meetings

X1 Exit Meeting Summary

The regional Engineering Specialist presented the inspection results from the two-week engineering inspection to members of the station's management, following the conclusion of the inspection on October 3.

The inspectors presented the inspection results to members of the station's management, following the conclusion of the inspection period, on October 7, 1997. The Station Director acknowledged the findings presented.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

X3 Other NRC Activities

On August 20, Commissioner Greta Dicus visited Seabrook Station. During her four-hour visit, the Commissioner met with senior plant management and toured the plant. General observations of the plant and topics regarding current plant events and industry concerns were discussed at the meeting.

On August 20 and on October 7, Larry Nicholson, Deputy Director, Division of Reactor Safety, visited the site. The visit was primarily to allow Mr. Nicholson the opportunity to interface with plant management and to tour the facility.

PARTIAL LIST OF PERSONS CONTACTED

Seabrook

B. Beuchel, Engineering Performance Manager
R. Cooney, Assistant Station Director
W. DiProfio, Station Director
B. Drawbridge, Director of Services
G. Kline, Technical Support Manager
W. Leland, Chemistry/Health Physics Manager
M. Makowicz, Corrective Action Manager
R. Messina, Security Supervisor
G. McDonald, Nuclear Quality Manager
J. Peschel, Regulatory Compliance Manager
J. Peterson, Maintenance Manager
T. Pucko. NRC Coordinator, Regulatory Compliance
E. Soretsky, Technical Projects Supervisor
G. StPierre, Operations Manager
R. White, Mechanical Engineering Manager

NRC

F. Paul Bonnett, Senior Resident Inspector (acting)
Javier Brand, Resident Intern
William T. Olsen, Resident Inspector

INSPECTION PROCEDURES USED

IP 37551:	Onsite Engineering
IP 40500:	Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems
IP 61726:	Surveillance Observation
IP 62707:	Maintenance Observation
IP 71707:	Plant Operations
IP 71750:	Plant Support Activities
IP 82205:	Shift Staffing and Augmentation
IP 82701:	Operational Status of the Emergency Preparedness Program
IP 92700:	Onsite Followup of Written Reports of Nonroutine Events at Power Reactor Facilities
IP 92902:	Followup - Engineering
IP 92903:	Followup - Maintenance
IP 93702:	Prompt Onsite Response to Events at Operating Power Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

URI 50-443/97-06-01	Review ACR findings to evaluate performance during the "A" MFP piping vibration event (Section O1.2).
NCV 50-443/97-06-02	Failure to perform the required testing prior to relocating components in the spent fuel pool (Section O8.4).
NCV 50-443/97-06-03	Failure to perform surveillance testing as required (Section O8.3).
URI 50-443/97-06-04	Determine if further examples of the wrong part with the correct part number being used in the plant (Section M1.2)
NOV 50-443/97-06-05	Failure to document lifting electrical leads (Section M1.2), and to comply with maintenance procedure MA 3.0 (Section E8.1) .
NCV 50-443/97-06-06	Non-conformance between plant configuration and UFSAR (Section M1.3)
NCV 50-443/97-06-07	Failure to properly monitor an effluent stream (Section R8.2).

Closed

URI 50-443/97-02-02	Temporary Installation of Portable Heaters in the Cooling Tower Pump Room (Section O8.1)
URI 50-443/97-04-04	Engineering Evaluation of Dissimilar Replacement Components (Section E8.1) **(NCV 50-443/97-06-07)**
NCV 50-443/97-06-02	Failure to perform the required testing prior to relocating components in the spent fuel pool (Section O8.4).
NCV 50-443/97-06-03	Failure to perform surveillance testing as required (Section O8.3).
NCV 50-443/97-06-06	Non-conformance between plant configuration and UFSAR (Section M1.3)
NCV 50-443/97-06-07	Failure to properly monitor an effluent stream (Section R8.2).
LER 50-443/94-02-00 and Supplement 01:	Inadequate Slave Relay Testing (Section O8.2)
LER 50-443/94-04-00	Missed Surveillance - Technical Specification 3.3.3.10, Radioactive Gaseous Effluent Monitoring Instrumentation (Section R8.1)
LER 50-443/94-06-00	Unanalyzed Tornado Loading on Ventilation Damper/Ductwork and Metal Partitions (Section O8.3)
LER 50-443/94-08-00 and Supplement 01:	Non-Compliance with Technical Specification 3.8.4.2 Action Requirements (Section M8.4)
LER 50-443/94-10-00 and Supplement 01:	Potential Fuel Damage Due to RCP Turning Vane Capscrew Nut Failure (Section O8.2)
LER 50-443/94-11-00 and Supplement 01:	Non-compliance with High Radiation Area Controls (Section O8.2)
LER 50-443/94-12-00	Non-compliance with High Radiation Area Controls (Section O8.2)
LER 50-443/94-13-00	Non-compliance with Technical Specification 3.9.12 Action Requirements (Section O8.4) **(NCV 50-443/97-06-03)**
LER 50-443/94-14-00	Missed Technical Specification Surveillance on Containment Air Locks (Section O8.2)
LER 50-443/94-15-00	Missed Technical Specification 4.0.5 Surveillance (Section O8.5) **(NCV 50-443/97-06-03)**
LER 50-443/94-16-00	Non-compliance with Technical Specification 3.3.2 Action requirements (Section O8.2)
LER 50-443/97-13-00	Inoperable Turbine Gland Seal Condenser Exhaust Radioactive Gaseous Effluent Monitor (Section R8.2) **(NCV 50-443/97-06-08)**

LIST OF ACRONYMS USED

ACR	Adverse Condition Report
AFD	Axial Flux Differential
ASME	American Society of Mechanical Engineers
BWST	Borated Water Storage Tank
CAS	C Alarm Station
CFR	Code of Federal Regulations
CRS	Control Room Supervisor
CW	Circulating Water
DCR	Design Change Record
DT	Deficiency Tag
DG	Diesel Generator
EFW	Emergency Feedwater
ESF	Engineered Safety System
EWR	Engineering Work Request
FME	Foreign Material Exclusion
FRV	Feed Regulating Valve
FSB	Fuel Storage Building
gpd	Gallons per day
gpm	Gallons per minute
HP	Health Physics
I&C	Instrument and Controls
IFI	Inspector Followup Item
LER	Licensee Event Report
LCO	Limiting Condition for Operation
LP	Low Pressure
LVDT	Linear Voltage Differential Transformer
MFP	Main Feed Pump
MMOD	Minor Modification
MNPR	Manual and Procedure Manual
MRT	Management Review Team
NAPA	North Atlantic Procedure Administration
NAQA	North Atlantic Quality Assurance
NCV	Non-Cited Violation
NI	Nuclear Instrument
NRC	Nuclear Regulatory Commission
NSARC	Nuclear Safety and Audit Review Committee
NSO	Nuclear Shift Operator
NSSS	Nuclear Steam Supply System
OPMM	Operations Management Manual
ppm	Parts-per-million
PAB	Primary Access Building
PDT	Primary Drain Tank
psia	Pounds per square inch absolute
psig	Pounds per square inch gauge
RCS	Reactor Coolant System
RHR	Residual Heat Removal

RTS	Repetitive Task Sheet
RWST	Refueling Water Storage Tank
SAS	Secondary Alarm Station
SCBA	Self-contained Breathing Apparatus
SG	Steam generator
SI	Safety Injection
SFP	Spent Fuel Pool
SOO	Standing Operating Order
SORC	Station Operations Review Committee
ST	Surveillance Test
TDEFW	Turbine Driven Emergency Feedwater Pump
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
VCT	Volume Control Tank
VIO	Violation
WR	Work Request