

REGION I

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Report No.: 50-443/99-06

Licensee: North Atlantic Energy Service Corporation

Facility: Seabrook Generating Station, Unit 1

Location: Post Office Box 300
Seabrook, New Hampshire 03874

Dates: August 2 - September 12, 1999

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EXECUTIVE SUMMARY

Seabrook Generating Station, Unit 1
NRC Inspection Report 50-443/99-06

This integrated inspection included aspects of licensee operations, engineering, maintenance, and plant support. The report covers a 6 week period of resident inspection and includes the results of a safeguards specialist inspection in the plant support area.

Operations:

- Based on observations made by the inspectors throughout the inspection period, the operators performed routine activities well (Section O1). Plant material conditions were acceptable (Section O2).
- The common cause analysis was a good initiative to assess and correct a recent adverse trend involving the frequency of component mis-positioning events (Section O4.1).
- The Seabrook plant design is not vulnerable to a total loss of cooling to the reactor coolant pump seals following the loss of a 4kV bus. The licensee is reviewing its operating procedures to enhance operator response to a loss of a 4kV bus. Additionally, the licensee is reviewing the operating experience program requirements to ensure that items of potentially higher significance are promptly identified for review (Section O4.2).

Maintenance:

- The licensee successfully performed the leak seal injection repair of an extraction steam valve. Procedures were adhered to and the licensee maintained positive oversight of vendor personnel (Section M1.1).
- The inspector noted proper controls and coordination, including system engineering involvement and management oversight, during replacement of the "B" EDG temperature instrumentation. Field personnel alertly identified a discrepancy between the work instructions and the design drawing, and obtained proper engineering involvement to resolve this issue (Section M1.2).
- Instrument and controls technicians performed the surveillance tests for the PCCW pump motor trip check and quarterly flow testing of the 'B' charging pump well. The inspector identified that the pre-job risk assessment performed by the reliability and safety engineering group for the 'B' charging pump flow test did not accurately model the steam inlet valve position (Section M1.3).

Executive Summary (cont'd)

Engineering

- The licensee actions following the failure of an auxiliary steam system motor operated isolation valve during testing were appropriate (Section E2.1).
- The licensee appropriately placed the 'B' service water pump into an "alert" status after in-service testing indicated an elevated vibration reading. The licensee's operability determination was appropriate (Section E2.2).
- The inspector noted a corrective action program deficiency involving the disposition of an adverse condition report for a repeat valve failure problem. Additionally, the inspector noted that the system engineer was not informed following the third valve failure (Section E8.1).

Plant Support:

- Proper radiological work practices were observed (Section R1.1).
- The licensee was conducting its testing and maintenance activities of security equipment in a manner that protected public health and safety. The inspector concluded that this portion of the program, as implemented, met the licensee's commitments and NRC requirements (Section S1.1).
- The security force members adequately demonstrated that they had the requisite knowledge necessary to effectively implement the duties and responsibilities associated with their position. The proposed training for the augmentation force met the requirements of the training and qualification plan (Section S2).

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ATTACHMENTS

- Attachment 1- Partial List of Persons Contacted
- Inspection Procedures Used
 - Items Opened, Closed, and Discussed
 - List of Acronyms Used

Report Details

Summary of Plant Status

Seabrook Station operated at approximately 100 percent power for the duration of the inspection period.

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, routine operations were performed in accordance with station procedures and plant evolutions were completed in a deliberate manner with clear communications and effective oversight by shift supervision. Control room logs accurately reflected plant activities and observed shift turnovers were comprehensive and thoroughly addressed questions posed by the oncoming crew. Control room operators displayed good questioning perspectives prior to releasing work activities for field implementation. The inspectors found that operators were knowledgeable of plant and system status.

O2 Operational Status of Facilities and Equipment (71707)

The inspectors routinely conducted independent plant tours and walkdowns of selected portions of safety-related systems during the inspection report period. These activities consisted of the verification that system configurations, power supplies, process parameters, support system availability, and current system operational status were consistent with Technical Specification (TS) requirements and UFSAR descriptions. Additionally, system, component, and general area material conditions and housekeeping status were noted. The inspectors found that the plant conditions were acceptable, but identified some minor material deficiencies that were appropriately addressed by the licensee.

O4 Operator Knowledge and Performance

O4.1 Component Mis-Positioning Review (71707)

a. Inspection Scope

The inspector reviewed the common cause analysis that had been developed by the licensee to address a negative trend involving the frequency of component mis-positioning events.

b. Observations and Findings

The common cause review selected mis-positioning events that occurred between October 1998 and July 1999, and identified several potential causal factors for these events including: quality verification, place keeping, self-checking practices, and

procedural/process issues. Several actions were identified to prevent and better assess future mis-positioning events including: requiring an apparent cause analysis for all future events, procedural enhancements, expanded use of peer checking, and training personnel on the common cause.

c. Conclusions

The common cause analysis was a good initiative to assess and correct a recent adverse trend involving the frequency of component mis-positioning events.

O4.2 Vulnerability to Total Loss of Cooling to Reactor Coolant Pumps (71707)

a. Inspection Scope

The inspector reviewed Seabrook's potential vulnerability to an event which recently occurred at another facility involving the total loss of seal cooling to two of the three operating reactor coolant pumps (RCPs). The event was caused by the loss of a 4kV safety bus which resulted in a loss of seal injection and the RCP thermal barrier heat exchanger cooling flows.

b. Observations and Findings

The licensee received a significant event notification (SEN) report dated August 24, 1999. This report highlighted several factors which contributed to the significance of the event including:

- The absence of an integrated abnormal operating procedure to respond to the loss of a 4kV emergency bus;
- Inadequate operator training to respond to a simultaneous loss of seal injection and RCP thermal barrier cooling; and,
- Design challenges caused by the closure of the RCP thermal barrier component cooling water return valves on the loss of the 4 kV bus.

The inspector reviewed documentation, interviewed the system engineer, and determined that Seabrook was not vulnerable to this type of event due to an independent thermal barrier subsystem design, and since the thermal barrier isolation valves are maintained de-energized in the open position.

The inspector questioned whether the licensee had an integrated operational procedure to address the expected operator actions following the loss of a vital 4kV bus. The licensee determined that while several procedures were available to provide guidance for the loss of individual components powered by the bus, an integrated response procedure did not exist. The licensee promptly initiated adverse condition report (ACR) 99-3649 to evaluate the need to develop a specific abnormal procedure to cover the loss of an emergency bus at power.

The Operating Experience Review (OER) Program is designed to evaluate industry information, and to make appropriate recommendations to station management. The nuclear safety engineering group performs an initial screening as part of the review

process, and assigns a due date for completion of a more extensive review based on the significance of the item. This particular event notification was initially screened and assigned a "moderate" priority which allowed six months to complete the final review.

The initial screening did not identify that the station did not have an integrated procedure for the loss of a 4kV bus, and the inspector questioned whether the initial screening should have identified this issue. The OER supervisor indicated that the initial screening was designed to identify station applicability and to assign a review completion time, and would not necessarily identify any specific recommendations prior to completion of the final review. The inspector was concerned that the initial screening process would not identify any interim corrective actions prior to completion of the final review, which could take an extended period of time to complete. The licensee initiated an adverse condition report (ACR) to review this concern, and the OER supervisor planned to develop enhanced program guidance to better clarify the review priorities assigned to industry experience.

c. Conclusion

The Seabrook plant design is not vulnerable to a total loss of cooling to the reactor coolant pump seals following the loss of a 4kV bus. The licensee is reviewing its operating procedures to enhance operator response to a loss of a 4kV bus. The licensee is reviewing the operating experience program requirements to ensure that items of potentially higher significance are promptly reviewed, and to develop interim corrective actions.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Seal Injection to Repair Extraction Steam Valve Body Leakage (62707)

On August 17 and 18, the inspector reviewed the seal injection activities performed to repair two minor non-isolable steam leaks on the extraction steam supply valve (EX-V7) from the high pressure turbine to the five point feedwater heater (1-CO-E-25B). The inspector reviewed work package documentation, interviewed personnel, attended the pre-evolution brief, and observed a portion of the work activities. The job planning and evaluation activities for this job were previously reviewed in Inspection Report 99-05.

The licensee performed work activities well, and in accordance with the station procedures and NRC inspection guidance. The repair was effective and isolated the leaks. Additionally the inspector noted that the licensee maintained positive oversight over vendor personnel.

M1.2 Replacement of "B" EDG Temperature Instrumentation 62707, 37551)

a. Inspection Scope

On August 25, the inspector observed maintenance activities to replace the 'B' emergency diesel generator (EDG) temperature indicators per minor modification, MMOD 98-554. The inspector reviewed applicable documentation, performed a field walkdown, and interviewed personnel.

b. Observations and Findings

The EDGs provide sufficient, reliable, standby electrical power to shutdown the reactor and maintain it in a safe shutdown condition. The temperature indicators that were replaced are sub-components of the EDGs, and provide only local indication for performance monitoring, but do not perform any safety-related functions. The temperature instruments were replaced because they had become obsolete.

The inspector noted proper controls and coordination including system engineering involvement and management oversight during the work activities. Field personnel identified a discrepancy between the "at-risk" drawing and the work request instructions which described the landing of wire in the left and right bank manifolds. The workers contacted design engineering and obtained resolution prior to landing the leads. During a subsequent resistance check the technicians identified that two of the wires had been incorrectly labeled. The wires were properly re-labeled and the resistance test was completed satisfactorily.

During the post-installation acceptance test, the technicians determined that the resistance readings on three of the five connections were higher than the vendor specified values (i.e. > 10 ohms). The licensee determined that this was due to the incorrect sizing of the thermocouple wires during the design process. The licensee noted that the instruments did not interact with any safety function of the EDG and concluded that this was an acceptable interim EDG condition. The licensee planned to replace the wires in the near future to ensure adequate long term instrument performance. The inspector categorized the incorrect sizing of the temperature instrumentation wires as a engineering deficiency.

c. Conclusion

The inspector noted proper controls and coordination, including system engineering involvement and management oversight, during replacement of the "B" EDG temperature instrumentation. Field personnel alertly identified a discrepancy between the work instructions and the design drawing, and obtained proper engineering involvement to resolve this issue.

M1.3 Breaker Trip Checks of 'C' Primary Component Cooling Water (PCCW) and Train 'B' Charging Pump Quarterly Flow Test (61726)

a. Inspection Scope

On August 20 and 24, the inspector observed portions of two separate surveillance tests conducted by instrumentation and control technicians (I&C) regarding the 'C' primary component cooling pump motor trip check and the quarterly flow test of the 'B' charging pump. The inspector reviewed the surveillance procedures, performed field walkdowns during the evolutions, and interviewed field personnel.

b. Observations and Findings

The pre-evolution job brief performed by operations was good. Control room operators and field personnel communicated and coordinated the activities well. The I&C technicians performed the evolutions well and exercised excellent peer checking and independent verification of their activities. The surveillance procedures were performed satisfactorily and the TS acceptance criteria were met.

During the pre-evolution job brief for the 'B' charging pump, the operations shift manager adequately discussed ongoing plant activities that needed to be completed prior to starting the charging pump surveillance. The activities included completion of the train 'B' emergency safety features (ESFAS) slave relay testing, which rendered the turbine driven emergency feedwater system pump inoperable due to a recent procedural change that required isolation of the turbine steam inlet valve MS-V95.

The inspector noted that the risk profile evaluation, performed by the reliability and safety engineering group, did not identify MS-V95 as being closed. The risk assessment performed by the operations shift supervisor did properly consider this configuration. The reliability and safety engineering group manager issued an ACR to review this issue, and indicated that the overall risk assessment did not change significantly when updated to include closure of the MS-V95 valve. The licensee's preliminary evaluation determined that this group was not aware of the new procedural requirement to close the valve. The inspector verified that adequate corrective actions were being implemented to address this concern.

c. Conclusion

Instrument and controls technicians performed the surveillance tests for the PCCW pump motor trip check and quarterly flow testing of the 'B' charging pump well. The inspector identified that the pre-job risk assessment performed by the reliability and safety engineering group for the 'B' charging pump flow test did not accurately model the steam inlet valve position.

III. Engineering

E2 Engineering Support of Facilities and Equipment

E2.1 Motor Operated Valve Pinion Key Failure (37551, 40500)

a. Inspection Scope

The inspector reviewed the licensee's actions following the August 21, 1999 failure during testing of a motor operated isolation valve in the non-safety related auxiliary steam system.

b. Observations and Findings

Valve 1-AS-V-175 performs a high energy line break isolation function to protect safety related components from a potential break in the non-safety related auxiliary steam system. The licensee performed an investigation and attributed the valve malfunction (failure to operate) to a failure of the motor pinion key. The licensee replaced the key with a vendor approved key made of a higher strength material, and successfully retested the valve.

The licensee sent the failed motor pinion key to an external laboratory for a failure analysis. The licensee was not aware of any industry experience regarding failures of this type of motor pinion key, and indicated that they would consider the event for Part 21 applicability after review of the failure analysis report. The licensee initiated a work request to inspect the other motor operated valve that has this type of key.

c. Conclusion

The licensee actions following the failure of an auxiliary steam system motor operated isolation valve during testing were appropriate.

E2.2 Service Water Pump Vibration (37551, 40500)

a. Inspection Scope

The inspector reviewed the licensee's response to a high vibration reading on the 'B' service water pump (SW-P41B) during in-service testing (IST).

b. Observations and Findings

The 'B' service water (SW) pump is one of four ocean pumps designed to provide cooling water to safety related components. The pump performance is periodically monitored per the IST program. During the testing, required pump operating characteristics such as flow, discharge pressure, and vibration levels are measured and compared to reference pump values to ensure proper pump performance.

The most recent 'B' SW pump testing identified an apparent elevated vibration reading at one of the vibration monitoring points. The vibration reading placed the pump into the

“alert” category per the IST program. The inspector observed that all other pump operating parameters were acceptable, and noted that the licensee determined that the pump was currently operable and planned to conduct follow-up testing per the IST program requirements.

c. Conclusions

The licensee appropriately placed the ‘B’ service water pump into an “alert” status after in-service testing indicated an elevated vibration reading. The licensee’s operability determination was appropriate.

E8 Miscellaneous Engineering Issues

E8.1 Primary Component Cooling System Flow Reductions (37551, 40500)

a. Inspection Scope

The inspector reviewed the licensee’s corrective actions for three primary component cooling water (PCCW) system flow transients, involving a reduction of about 400 gpm, that occurred over an approximate one month period. The transients were caused by the failure of a non-safety related system valve.

b. Observations and Findings

The normal PCCW system flowrate is about 7000 gpm, and the flow reduction caused by the non-safety valve failure was approximately 400 gpm. The section of the PCCW system affected by the valve failure would be automatically isolated during an accident condition, however, the inspector was concerned that the operators were being unnecessarily challenged to investigate and correct these repeat PCCW flow reduction transients.

The licensee repaired the valve after each of the initial two valve failures. The ACR disposition following the third failure only discussed initiating a work request to repair the valve but did not address identifying the reason for the repeat valve failures. The inspector questioned the system engineer (SE) regarding the plans to prevent the repeat valve failures and learned that the SE was not aware of the ACR or the third valve failure event. The SE committed to review the history of this problem and ensure that appropriate actions would be taken to prevent recurrence of the valve failures.

c. Conclusions

The inspector noted a corrective action program deficiency involving the disposition of an adverse condition report for a repeat valve failure problem. Additionally, the inspector noted that the system engineer was not informed following the third valve failure.

IV. Plant Support

R1 Radiological Protection and Chemistry Controls

R1.1 General Comments (71750)

During the period the inspectors frequently toured the radiologically controlled area (RCA) and observed radiological work practices. The radiological controls technicians were observed to be attentive, and provided high quality assistance to plant workers. Plant workers were observed to be following proper radiological work practices including the use of dosimetry and protective equipment.

S1 Conduct of Security and Safeguards Activities

S1.1 Adequacy of Testing and Maintenance Programs

a. Inspection Scope (81042)

The inspector reviewed the program for the testing and maintenance of security equipment to ensure that the program conformed to the physical security plan (the Plan), approved licensee procedures, regulatory requirements, and manufacturer's specifications. The following areas were inspected: testing and maintenance records, procedures, and compensatory measures.

b. Observations and Findings

The inspectors reviewed the testing and maintenance records for security-related equipment for the previous six months and found that documentation was on file to demonstrate that the equipment was tested and maintained as committed to in the Plan. Additionally, the inspector noted that equipment being installed as part of the ongoing security system upgrade is being tested in a manner to ensure that system reliability is maintained.

c. Conclusions

The licensee was conducting its testing and maintenance activities of security equipment in a manner that protected public health and safety. The inspector concluded that this portion of the program, as implemented, met the licensee's commitments and NRC requirements

S2 Security and Safeguards Staff Knowledge and Performance

a. Inspection Scope (81501)

The inspector interviewed selected security force members (SFMs), and observed them perform routine activities.

b. Observations and Findings

The inspector observed a number of SFMs perform routine duties. These observations included alarm station operations and exterior patrol alarm response. The inspector interviewed the SFMs, and determined that the SFMs were knowledgeable of their responsibilities and duties, and could effectively carry out their assignments. In addition, the training program and schedule for the augmentation force was reviewed. The augmentation force will be used as a compensatory measure for equipment that will be taken out of service during the security upgrade project.

Contingency response drill and critique documentation was reviewed and indicated that the licensee is exercising this portion of the program. Enhanced training and "force on force" exercises have been scheduled in preparation for the upcoming Operational Safeguards Response Evaluation that will be conducted in January 2000.

c. Conclusions

The Security Force Members adequately demonstrated that they had the requisite knowledge necessary to effectively implement the duties and responsibilities associated with their position. The proposed training for the augmentation force met the requirements of the training and qualification plan.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management, following the conclusion of the inspection period, on September 21, 1999. The licensee acknowledged the findings presented.

ATTACHMENT 1

PARTIAL LIST OF PERSONS CONTACTED

Licensee

W. Diproffio, Unit Director
J. Grillo, Assistant Station Director
J. Hill, Operations Supervisor
G. StPierre, Operations Manager
B. Seymour, Security Manager
T. Nichols, Technical Support Manager
D. Sherwin, Maintenance Manager
J. Ellis, Security Supervisor
R. Messina, Security Supervisor
P. Ryan, Security Supervisor
C. Goodnow, Security Chief, GMSS
M. Ossing, Senior Project Engineer

U.S. NUCLEAR REGULATORY COMMISSION - REGION I

J. Brand Resident Inspector

INSPECTION PROCEDURES USED

IP 37551: Onsite Engineering
IP 61726: Surveillance Observation
IP 62707: Maintenance Observation
IP 71707: Plant Operations
IP 71750: Plant Support Activities
IP 81042: Testing and Maintenance
IP 81501: Personnel Training and Qualifications

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened/Closed: None

LIST OF ACRONYMS USED

ACR	Adverse Condition Report
EDG	Emergency Diesel Generator
EFW	Emergency Feedwater
ESFAS	Emergency Safety Features
GPM	Gallons Per Minute
I&C	Instrumentation and Controls
IST	In-Service Testing
kV	Kilovolt
MOV	Motor operated valve
OER	Operating Experience Review
PCCW	Primary Component Cooling Water
RCA	Radiologically Controlled Area
RCP	Reactor Coolant Pump
SFM	security force member
SW	Service Water
T&Q	training and qualification
WR	Work request