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TABLE OF CONTENTS

Table of Contents (Cont'd)

EXECUTIVE SUMMARY

This inspection involved a review of Seabrook's implementation of 10 CFR 50.65, the maintenance rule. The report covers a one week on site inspection by regional and NRR inspectors during the week of January 27, 1997.

MAINTENANCE

Overall, the team judged the Seabrook maintenance rule program to be strong.

Generally, NAESC had correctly identified the SSCs that were required to be within the scope of the rule. The method of scoping by individual functions was an acceptable technique and had been, in large part, performed excellently. However, three functions that were required to be scoped into the maintenance rule program were not and this was a violation. Also, the basis for not including seven functions was not clear to the team and this was described as an unresolved item.

Unavailability performance criteria were well developed and related to the PRA. However, reliability performance criteria was not related to safety and were cited as a violation.

The level of detail and quality of the probabilistic risk analysis (PRA) and the truncation limits were acceptable to perform risk ranking for the maintenance rule. The use of a full scope PRA and the active participation of the PRA group in the maintenance rule program activities were considered a strength.

The expert panel process was generally effective, however, two issues identified by the team could have been identified and resolved by the panel, i.e., the scoping of fire protection functions and the risk significance of fission product barriers.

The team determined that the approach to balancing reliability and unavailability would not accomplish the objective of preventing failures of SSCs while also minimizing unavailability. This issue will be re-examined after the periodic assessment is performed.

Station procedures provided sufficient controls for safe online maintenance. The PRA group was very active in the online maintenance program for planned and emergent work activities. Based upon discussions and procedures review, the team determined that shutdown risk management was also well controlled and monitored. The program for safety assessments for online maintenance was considered a strength.

The team found weak goals and trending of the emergency electrical distribution system.

The team found that a clearly defined process and criteria for placing degraded structures into the (a)(1) category was missing from the NAESC program.

The team found that use of industry operating experience had been effectively incorporated into the maintenance rule program and this was considered a program strength.

The material condition of the systems examined was generally excellent.

The team concluded that the self assessments provided some good findings, but the findings were not always adequately addressed and corrected by NAESC.

DETAILS

II. MAINTENANCE

M1 Conduct of Maintenance (62706)

The primary focus of the inspection was to verify that the North Atlantic Energy Service Corporation (NAESC) had implemented a maintenance monitoring program, which satisfied the requirements of the maintenance rule (10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants.") The inspection was performed by a team of six inspectors. Assistance and support was provided by one member of the Quality Assurance and Maintenance Branch, NRR.

The team used Inspection Procedure 62706, "Maintenance Rule," NUMARC 93-01, Rev. 1, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," and Regulatory Guide 1.160, Rev. 1, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants" as references during the inspection.

M1.1 SSCs Included Within the Scope of the Rule

a. Inspection Scope

The team reviewed the Seabrook scoping documentation to determine if the appropriate structures, systems, and components (SSCs) were included within the maintenance rule program in accordance with 10 CFR 50.65(b).

b. Observations and Findings

NAESC used the system engineers of the technical support department to identify the SSCs which were required to be within scope of the maintenance rule. The scoping effort was completed in mid-1995. The engineers developed function descriptions for each SSC which had the potential to be within scope and prepared a Maintenance Rule Performance and Scope Report for each of those SSC functions. The reports also contained a scoping basis remarks section where scoping bases were documented. If the function was determined to be within scope, then performance criteria were developed and documented. Scoping decisions were reviewed by the maintenance rule coordinator and reviewed and approved by the expert panel.

The team reviewed various site-specific references, including the updated final safety analysis report (UFSAR), Technical Specifications, and work control system lists, to determine the completeness of the system and function lists used by NAESC. The team determined that the NAESC lists of SSCs and functions were complete.

The team reviewed the complete list of system functions in order to verify that all appropriate functions were included within scope. The team found that NAESC had done an excellent job in scoping system functions. The complete list of functions contained 427 separate functions, and the team asked NAESC to explain the basis for not including 32 of the listed functions. Based on the NAESC response, the team identified three functions that were improperly omitted from the scope and seven functions where the response was not clear enough to justify excluding the function from the program. The three functions which had been improperly omitted from the scope of the maintenance rule program were:

- Rod control function CP-04, to "maintain Tavg within limits and minimizes reactor power transients, based on inputs from various systems," is a function whose failure would cause a reactor trip. The circuit which controls automatic rod motion can fail and cause outward rod motion, resulting in the exceeding of reactor trip setpoints.

- Containment air handling function CAH-02, to "maintain the normal ambient air temperature in the containment structure within design limits," is a function whose failure could prevent safety related SSCs from fulfilling their safety-related function. The Seabrook UFSAR accident analysis assumes an initial maximum containment air temperature in order for safety-related equipment to function under accident conditions (steam line break accident).

- Sample system function SS-03, to "provide grab samples of steam generator blowdown for each steam generator," is a function used in the plant emergency operating procedures (EOPs).

The omission of these three functions from the Seabrook maintenance rule monitoring program is a violation of 10 CFR 50.65(b). **(VIO 50-443/97-80-01)**

The team could not determine if the following functions were in scope because the available information was incomplete:

- Auxiliary steam heating function ASH-02, to "provide fire protection tank heating," is a function which directly affects the fire pumps that are used in plant EOPs.

- Fuel oil function FO-01, to "store and transfer fuel oil for the diesel driven fire pumps," is a function which directly affects the fire pumps.

- Lube oil function FO-04, to "supply oil to main feedpumps and turbine driver bearings," is a function whose failure could cause a reactor trip.

- Fire protection function FP-02, to "supply water for suppression," is a function important for accident mitigation.

- Fire protection function FP-03, to "initiate suppression, including door and damper closure," is a function important for accident mitigation.

- Fire protection function FP-04, to "control and extinguish fires," is a function important for accident mitigation.

- Fire protection function FP-05, to "provide detection and alarm capability," is a function important for accident mitigation.

The team determined that some of the above functions were examples where NAESC, as a result of scoping by function, had relied on system redundancy or system monitoring as a basis for not monitoring the support system functions; i.e., monitoring the fire pump water or fuel supply was not necessary if the fire pumps themselves were being monitored. Pending further explanation from NAESC, the issue of proper function/system boundary definition per 10 CFR 50.65(b) for the above functions is an unresolved item. **(URI 50-443/97-80-02)** If these functions are determined to be in scope of the rule, they would have been considered part of the above cited violation.

c. Conclusions

The team concluded that NAESC had correctly identified the SSCs that were required to be within the scope of the rule. The method of scoping by individual functions was an acceptable technique and had been, in large part, performed excellently. However, three functions that were required to be scoped into the maintenance rule program were not and this was a violation. Also, the basis for not including seven additional functions was not clear and this was carried as an unresolved item.

M1.2 Safety (Risk) Determination, Risk Ranking, and Expert Panel

a. Inspection Scope

Paragraph (a)(1) of the rule requires that goals be commensurate with safety. Additionally, implementation of the rule using the guidance contained in NUMARC 93-01, requires that safety be taken into account when setting performance criteria and monitoring under Paragraph (a)(2) of the rule. This safety consideration would be used to determine if the SSC should be monitored at the system, train or plant level. The team reviewed the methods and calculations that NAESC had established for making these safety determinations. The team also reviewed the safety determinations that were made for the specific SSCs reviewed during this inspection.

b. Observations and Findings

A plant specific PRA was used to rank SSCs with regard to risk significance. NAESC followed NUMARC 93-01 recommendations in providing their expert panel with information on three importance measures, risk reduction worth (RRW), risk achievement worth (RAW), and core damage frequency (CDF) contribution. Specific information was developed for each system function that defined its value of RAW, RRW, and appearance in the top 90% of the CDF sequences. The information was quantified from the Seabrook full scope PRA. The assessment examined both internal and external events for both CDF and containment performance with the reactor at power and also while shutdown.

The PRA used for maintenance rule risk ranking was an update of an earlier version used to support the March 1991 Individual Plant Examination (IPE) and was the fourth substantial update to the Seabrook Station PRA.

NAESC used generic data for initiating event frequency, basic event failures and common cause failures. The IPE modeled 72 initiating events, of which 36 were identified as internal events. Actual plant data was used for maintenance surveillance unavailability, high frequency initiating events and basic event failure rates for pumps and emergency diesel generators. Each accident initiating event was included in an appropriate class of initiating events, and each class of initiating events was modeled with an event tree. The PRA modeled support system dependencies. The team noted that NAESC was tracking the initiating event frequency to confirm the PRA assumptions.

NAESC quantified the core damage accident sequences using the large event tree/ small/fault tree technique. A sequence truncation value of 1E-11 was used for quantification of all initial events. The team found this truncation level to be acceptable. The PRA results for the mean value of CDF was 7.2E-5 per reactor year, and the large early release frequency was 1.4E-8 per reactor year. Transients contributed 77% to the CDF, anticipated transient without scram (ATWS) contributed 14%, and loss of coolant accidents (LOCA) contributed 9%.

The team found that diesel generator function DG-02, "Provide and receive process signals to initiate and satisfy diesel engine starts, load sequencing, and load shedding," was not designated as risk significant. The function DG-01, "Provide an independent onsite power supply to train-related vital busses if preferred power sources are interrupted," was properly designated as risk significant. When this was brought to NAESC's attention they re-examined their database for function DG-02 and agreed to designate it as risk significant.

The team noted that NAESC does not consider fire detection and suppression as within the scope of the rule. However, the team observed that the IPE identifies fires in certain plant areas as contributing to approximately nine percent of the total CDF. For example, a fire in the primary component cooling water (PCCW) pump area or the electrical switchgear area affecting power to the PCCW pump motors is an initiating event that may lead to core damage. Fire protection functions FP-02, FP-03, FP-04, and FP-05 deal with fire detection and suppression and mitigate a core damage accident in certain plant areas. These functions should have been within the scope of the rule. This issue is part of the unresolved item discussed in M1.1.

NUMARC 93-01 recommends the use of an expert panel to establish risk significance of SSCs by combining PRA insights with operations and maintenance experience to compensate for the limitations of PRA modeling and importance measures. NAESC used an expert panel process in conjunction with PRA ranking methodology to determine the risk significance of SSCs within the scope of the rule. The team reviewed the expert panel process and the information available which documented the decisions made by the panel. The team found that the expert panel had deferred the risk significance determination process totally to the PRA group.

The team found that fission product barrier functions for the reactor fuel clad, reactor pressure vessel (primary coolant system integrity), and the containment structure were not identified as risk significant. The team concluded that although these functions were not specifically modeled in the PRA, they should have been designated as risk significant by the expert panel.

c. <u>Conclusions</u>

The team concluded that the level of detail in the PRA, the data and the truncation limits were acceptable to perform risk ranking for the maintenance rule.

The use of the full scope PRA, which accounts for both internal and external events, was considered a program strength. The team also concluded that the PRA group had a strong positive impact on the implementation of the maintenance rule at Seabrook.

The team also concluded that the expert panel process was generally effective; however, two issues identified by the team could have been identified by the panel, i.e., the scoping of fire protection functions and fission product barrier risk ranking determinations.

M1.3 <u>(a)(3) Periodic Evaluations</u>

a. <u>Inspection Scope</u>

Section (a)(3) of the rule requires that performance and condition monitoring activities and associated goals and preventive maintenance activities be evaluated, taking into account where practical, industry-wide operating experience. This evaluation is required to be performed at least one time during each refueling cycle, not to exceed 24 months between evaluations. The team reviewed the procedural guidelines for these evaluations, since no periodic evaluation had been performed.

b. Observations and Findings

The technical support group instructions (TSGI-25), "Maintenance Rule Periodic Assessment," provided adequate guidelines for the areas to be evaluated in the periodic assessment.

c. Conclusions

The procedure for performing the periodic evaluations appeared to meet the requirements of the rule. However, the periodic evaluation had not been completed.

M1.4 (a)(3) Balancing Reliability and Unavailability

a. Inspection Scope

Paragraph (a)(3) of the rule requires that adjustments be made where necessary to assure that the objective of preventing failures through the performance of preventive maintenance is appropriately balanced against the objective of minimizing unavailability due to monitoring or preventive maintenance. The team reviewed the facility's plans to conduct this evaluation as required by the rule.

b. Observations and Findings

The methods for balancing unavailability and reliability are provided in TSGI-24 and TSGI-25. The facility's approach was to compare actual performance to the SSC performance criteria. These comparisons are made during goal setting and periodic assessments. If the actual performance for both unavailability and reliability is outside the performance criteria, then an evaluation of the adequacy of the performance criteria is made. If actual performance for either reliability or unavailability is outside its performance criteria, then an evaluation of actions to make the actual performance meet the performance criteria is made. It was not clear to the team that the method for balancing allows one to optimize reliability and availability as long as the performance criteria are met. In addition, the reliability performance criteria were not clearly related to safety and often did not specify demands or operating time. The team noted that reliability performance criteria should be correctly specified and balancing should be performed even if the performance criteria are met. The issue of balancing will be carried as an inspector followup item until the periodic assessment is performed. **(IFI 50-443/97-80-03)**

c. Conclusions

The team concluded that the approach to balancing reliability and unavailability may not accomplish the objective of preventing failures of SSCs while also minimizing unavailability as required by the rule.

M1.5 (a)(3) Plant Safety Assessments Before Taking Equipment Out of Service

a. Inspection Scope

Paragraph (a)(3) of the rule states that the total impact on plant safety should be taken into account before taking equipment out of service for monitoring or preventive maintenance. The team reviewed the applicable procedures and discussed the process and procedures with appropriate Seabrook personnel, including outage planners and licensed operators. The team reviewed the process used for shutdown risk management. Licensed operator knowledge of the general requirements of the maintenance rule and their particular duties and responsibilities under the rule were assessed.

b. Observations and Findings

Station procedure SM7.10, "Maintenance Rule Program," section 4.6, specified that SSCs be taken out of service through the implementation of the systems week and OnLine Maintenance Process in the Station Planning and Scheduling Manual. The online maintenance program specifies risk evaluation of SSCs and this is to be accomplished through the implementation of station procedure RSED-06, "Risk Evaluation Process for OnLine Maintenance (OLM)."

Work activities are planned on a 48-week rolling schedule, based on system weeks and protected trains. System weeks are organized such that the work load is distributed among the 48 weeks, while maintaining availability of the key plant safety functions. The 48-week schedule received risk analysis during inception to eliminate peaks in the relative risk caused by combinations of activities planned during any of the weeks. The work week is planned and controlled for train separation and risk reduction six weeks before the performance of maintenance during the system week. The team reviewed a representative sample of the system weeks that were completed and all were found to be performed as directed by station procedures and guidelines.

The team reviewed the work planning and analysis for the week that the team was onsite. This week received PRA evaluation as depicted in the normal PRA department weekly memorandum dated January 22,1997. This weekly memorandum listed the activities that were risk significant or risk related, the start date of the work activity, and the projected time out of service for each activity. The risk significance for each item on the week schedule was discussed, and recommendations were made when activities should not be accomplished concurrently. Activities that required close monitoring were also identified. The memorandum also provided a matrix of the risk related activities for the week with respect to when the work was to be accomplished.

The team reviewed the station OLM process for emergent work after the system week schedule is finalized. The team judged the requirement for a risk assessment for emergent work identified during back shifts to not be clearly proceduralized. Nonetheless, the team could find no examples of where a risk analysis was needed but not done. Facility personnel stated that a revision to the planning and scheduling manual was being developed to clarify this requirement.

The team reviewed shutdown risk management and found in place controls to be appropriate. Shutdown risk is administratively controlled by the Station Planning and Scheduling Manual. During planned and unplanned outages, safety functions are maintained by maximizing safety system availability, reactor coolant system (RCS) inventory, and maintaining containment closure as much as practical. Outage planning is based on insights from the Seabrook Station Shutdown Study, a plant specific PRA of shutdown events. The station outage control center is manned around the clock with a member of the plant PRA group normally assigned to provide assistance when emergent work develops that is outside of the approved daily work schedule.

In addition, on-shift operations personnel complete an outage safety assessment work sheet once per shift. The outage work sheet assigns a minimum required value to each of the key safety functions. The key safety functions include decay heat removal, inventory control, power availability, reactivity control and reactor containment integrity. Depending on the status of each key safety function, a color is assigned. Green indicates there is significant defense in depth. A yellow path indicates a reduced but acceptable level of defense in depth for key safety functions. An orange path denotes mid-loop operations. A red path denotes an unacceptable level of defense in depth for a key safety function. If an actual score for each key safety function is less than the minimum needed, outage management or PRA personnel are consulted to verify that the plant configuration matches the scheduled plant configuration.

The team interviewed a cross section of operations personnel from auxiliary operators to department supervisors. A brief training session was recently given to all operations personnel. The training enabled the operators to adequately understand their responsibilities associated with the rule. All operators indicated that their primary maintenance rule duty was to minimize equipment unavailability. However, several operators had difficulty correlating the maintenance rule to plant risk reduction.

c. <u>Conclusions</u>

The team concluded that station procedures provided sufficient controls for safe online maintenance. The facility evaluated the 48 week schedule for risk at its inception and six weeks before the work begins. The PRA group was very active in the online maintenance program for planned and emergent work activities. The team concluded that the program at Seabrook was strong.

The team concluded that based upon discussions and procedure review, shutdown risk management was well controlled and monitored.

Operator knowledge of the rule was at a level that allowed them to carry out their responsibilities.

M1.6 (a)(1) Goal Setting and Monitoring and (a)(2) Preventive Maintenance

a. Inspection Scope

The team reviewed program documents in order to evaluate the process established to set goals and monitor under (a)(1) and to verify that preventive maintenance was effective under (a)(2) of the rule. The team also discussed the program with appropriate plant personnel. The team reviewed the following systems:

(a)(1) Systems

- Process radiation monitors
- Airborne radiation monitors
- Main steam
- Emergency electrical distribution

(a)(2) Systems

- Emergency feedwater
- Primary component cooling water
- Service water
- Control rods
- Control building ventilation
- Structures

The team reviewed each of these systems to verify that goals or performance criteria were established in accordance with safety, that industry-wide operating experience was taken into consideration where practical, that appropriate monitoring and trending were being performed, and that corrective actions were taken when an SSC failed to meet its goal or performance criteria or experienced a maintenance preventible functional failure (MPFF) or as used by NAESC, maintenance rule functional failures (MRFF). The team also reviewed performance criteria for various SSCs in addition to those listed above.

b. Observations and Findings

(a)(1) Systems

The maintenance rule, as implemented using the guidance in NUMARC 93-01, specifies that industry-wide operating experience be taken into consideration, where practical, when establishing goals or performance criteria.

Based upon reviews of documentation and discussions with NAESC personnel, the team determined that Seabrook had established programs for reviewing and evaluating operational experience. The system engineers reviewed industry experience to assess the effect on their systems and to implement corrective actions as appropriate. The team found that system engineers were able to identify system improvements implemented from use of industry operating experience.

Four of the six SSCs that had been placed into the (a)(1) category were reviewed by the team. The team's review of these SSCs is discussed below.

Process and Airborne Radiation Monitors

Both process and airborne radiation system monitors had been placed in the (a)(1) category as a result of numerous failures. The frequent failure of two different monitors, condenser air evacuation monitor, RM-6505, and waste release gas monitor, RM-6528, resulted in the placement of system functions RM-02A and RM-03B into the (a)(1) category. Both functions had exceeded their performance criteria of <3 MPFFs.

The rad monitor system engineer indicated that efforts were ongoing to identify and correct the cause(s) of the repeat failures for both monitors. A temporary modification on RM-6505, if successful, would allow reclassification of this system to (a)(2) by August 1997. For RM-6528, a power supply degradation problem had been identified, but the modification to correct the problem had not been completed. Based upon a review of performance trending charts for both system functions, the team determined that the system engineer, together with the maintenance rule coordinator, were adequately tracking the system performance.

The established goals appeared acceptable and appropriate. These goals were being trended. Also, when trending, the facility utilized a tool entitled "glide slope" in their analyses of SSC unavailability while in the (a)(1) category. SSC performance must be below and to the left of the "glide slope" which indicates that over a period of time, the unavailability is decreasing and corrective action was appropriate. Should a SSC trend go above and to the right of the glide slope then the corrective action would be reevaluated. For those SSCs reviewed, the team did not identify any SSC trending outside the glide slope trend line.

Main Steam

The main steam system was placed in (a)(1) due to one of the functions experiencing an MPFF. The failure had been properly documented as an MPFF. The system engineer had performed a very good root cause investigation, and had considered industry operating experience. The corrective action plan was well developed and was under review by the expert panel. The team found the plan had established proper goals and met the requirements for disposition to (a)(2). The team found the system engineer to be very knowledgeable of the system and its problems.

Emergency Electrical Distribution

NAESC placed the vital 480 VAC distribution system into (a)(1) based on several abnormal condition reports (ACRs) to report intermittent problems with motor operated valve (MOV) unitized starter cubicles. Two problems were identified with the starters. The first problem was a contact carrier auxiliary contractor tab that was binding in the unitized starter for safety injection valve SI-V-3. This binding prevented the open stroke seal-in circuit from engaging, thereby preventing valve movement in the open direction when the control switch was released. Valve SI-V-3 was reworked and the binding eliminated. The second problem involved mechanical interlock binding in the unitized starters for valves SI-102 and CC-V-145. Striker plates were found on several of the contractors to have contact (no gap) in a de-energized state, thereby causing intermittent interlock problems. The bent striker plates were corrected. A NAESC inspection of 25% of the safety related or risk significant MOV unitized starters found them to be satisfactory. The system engineer established a formal trending program for the MOVs that undergo routine surveillance testing to ensure the corrective actions are effective.

The goal that was established for the vital 480 VAC distribution system was less than two MPFFs per 24 months through June 30, 1998. However, the team was concerned that the time period of the goal was not sufficient to ensure that affected MOVs would be tested (some MOVs with once per operating cycle surveillance tests). Further, as the goals were not specific to the affected MOVs or the identified problems, the team noted that any additional MPFFs (at the system level) could have resulted from ineffective corrective actions or ineffective maintenance unrelated to the corrective actions. The team determined that NRC should review evaluations related to this goal and reclassifying this system from (a)(1) to (a)(2). (IFI 50-443/97-80-04).

(a)(2) Systems

The maintenance rule as implemented in the NUMARC guidance requires that safety (risk) be taken into consideration when establishing goals under (a)(1) or performance criteria under (a)(2). In accordance with the NUMARC guidance, system or train level performance criteria are established for all risk-significant SSCs and those nonrisk-significant SSCs that are used in standby service. For risk-significant SSCs, the performance criteria includes both unavailability and reliability. Plant level performance criteria may be established for all remaining nonrisk-significant, normally-operating SSCs. NAESC used the NUMARC guidance to risk rank SSCs and to establish performance criteria. However, most SSC reliability performance criteria were set at 2 MPFFs per 24 months with no connection to safety or the reliability numbers used in the PRA. The team noted that for some functions the allowed number of MRFFs appeared to be excessive. For example, function CP-01, "Interrupt power to the CRDMs during a reactor trip, based on inputs from various reactor protection circuits," and solid state protection function SSPS-01, "Provide for actuation of an engineered safety feature or reactor trip," are less than 2 MRFFs per rolling 24 month period per train; and solid state protection function SSPS-02, "Provide for detection of an engineered safety feature or reactor trip signal," is set at less than three MRFFs per 24 month rolling period. The team found that NAESC did not account for the number of demands or running time over the rolling two year period, in establishing the reliability performance criteria. Establishing reliability performance criteria without considering safety is a violation of the rule **(VIO 50-443/97-80 05)**.

NAESC established performance criteria for system and train unavailability that were derived directly from the current PRA basic event failure data. Additionally, NAESC evaluated the unavailability performance criteria through a sensitivity study. In the sensitivity study, the PRA base case failure event data was replaced with unavailability performance criteria data for all plant systems modeled. The PRA model was requantified and the resultant CDF increased from 5.55E-5 to 7.70E-5 per reactor year. The team found that NAESC had established conservative performance criteria for unavailability. There was only a small increase in CDF with all systems operating at their performance criteria.

The team reviewed six SSCs that were placed in the (a)(2) category. These are discussed below.

Control Building Ventilation (CAB)

The control building ventilation (CAB) system was properly scoped to meet the requirements of the rule, including one subsystem which was safety related and risk significant. The performance criteria for unavailability were appropriate and based on PRA. However, the reliability performance criteria were not based on safety or risk. Inadequate reliability performance criteria is a violation as described above. The team noted that all equipment associated with this system was in excellent condition. Several modifications were planned to improve system performance. For example, a third control room air conditioning compressor is planned to improve reliability. The team determined that the system engineer was knowledgeable of his system and the maintenance rule.

Structures

The team reviewed the structures that were scoped into the rule and walked down several structures. The structures were properly scoped into the rule. The team noted that reactor containment was not designated as risk significant. The facility agreed to review this determination.

The team noted that several structures were having problems with seepage of ground water through the walls or floors. Structures with ground water problems included the RCA Tunnel, Primary Auxiliary Building, Waste Processing Building and the Diesel Generator Building. These areas were routinely monitored by the system engineer, and plans have been made to solve the water seepage problem. Several structures have recently had roof repairs with several more slated in the near future. The team found the system engineer knowledgeable of his system and the rule.

The team noted that the performance criteria for structures was 1 MPFF, which indicated that the design function would be lost before consideration for classifying the structure as (a)(1). The team considered this threshold to be too high. Also, there was no guidance for placing degraded structures into the (a)(1) category. This is a generic issue and will be reviewed after industry guidance is provided and NAESC revises their program. **(IFI 50-443/97-80-06)**

Service Water

The service water functions were properly scoped in the maintenance rule program. Performance criteria for the service water system, which had two risk significant functions (out of three in-scope functions) included; pump unavailability and train reliability. The train reliability performance criteria was given as 2 MPFFs with no relation to safety described. This is another example of the violation described above on inadequate reliability performance criteria. In addition, when the process of balancing reliability and availability is used, the components used in balancing are not the same for reliability (train) and availability (pump). Discussion with the maintenance rule coordinator revealed that the unavailability performance criteria was being changed to include both train and component level criteria which would allow the comparison between unavailability and reliability.

Based upon a review of documents and discussions with the system engineer, the team determined that for the specified performance criteria, the system was being adequately monitored. The system engineer was knowledgeable of the rule, his system, and related industry operating experience. However, his knowledge of the basis for the performance criteria was limited.

Rod Control

Seabrook listed eight rod control functions of which three were included in the scope of the rule. The team found two additional functions that should have been included in the scope. This included an EOP function of verifying a reactor trip with rod bottom lights lit on the digital rod position indication system, which was also identified by the system engineer the week before the team arrived. The team found a function (CP-04) that could cause a reactor trip that was missing from the scope. This last function was part of the scoping violation.

Discussions with the system engineer revealed that his knowledge of several maintenance rule areas was limited. These areas included performance criteria and differences between (a)(1) and (a)(2) systems.

The system engineer was collecting and trending performance data and had prepared an annual report. The team found the report to be an effective tool for trending performance.

The team walked down the accessible portions of the system and found the material condition to be very good.

Primary Component Cooling Water (PCCW)

This system has eight functions; six of which were scoped into the rule. The team determined that the equipment relating to the in-scope functions was defined and included in the maintenance rule program.

There were no MRFFs identified for the PCCW system.

Daily and weekly performance monitoring was performed to assess the system. PCCW heat exchanger trends are monitored via EXCEL (an online monitoring system) to assess the thermal performance of the heat exchangers. The Seabrook predictive maintenance program determined that PCCW heat exchanger degradation warranted replacement of both heat exchangers with materials less susceptible to corrosion. PCCW heat exchanger replacement is scheduled for the next refueling outage.

The team determined that the system engineer was knowledgeable of his system, related industry operating experience and the maintenance rule. Monitoring and trending system performance has been a common practice for a number of years.

c. Conclusions for (a)(1) Goal Setting and Monitoring and (a)(2) Preventive Maintenance

The team concluded that the goals established and the trending planned for the emergency electrical distribution system was weak.

Unavailability performance criteria were well developed and directly related to the PRA. However, the reliability performance criteria were not commensurate with safety and were cited as a violation.

The structures monitoring program did not have a process for placing degraded structures into the (a)(1) category until failure, an undesirable approach.

The team found that system engineers were effectively using industry operating experience in their maintenance rule activities. This was considered a program strength.

M2 Maintenance and Material Condition of Facilities and Equipment

a. Inspection Scope

In the course of verifying the implementation of the maintenance rule using IP 62706, the team performed walkdowns to examine the material condition of the following systems:

Structures (limited)
Process and Airborne radiation monitors
Emergency electrical distribution
Emergency feedwater
Primary component cooling water
Service water
Control rods
Control building ventilation

b. Observations and Findings

Except as noted in the discussions on the specific systems, the systems were free of corrosion, oil leaks, water leaks and trash, and based upon external condition, appeared to be very well maintained.

c. Conclusions

In general, the material condition of the systems examined was excellent.

M3 Engineering Support of Facilities and Equipment

E2.3 Review of Updated Final Safety Analysis Report (UFSAR) Commitments

A recent discovery of a licensee operating their facility in a manner contrary to the UFSAR description highlighted the need for a special focussed review that compares plant practices, procedures, and parameters to the UFSAR descriptions. While performing the inspection discussed in this report, the team reviewed selected portions of the UFSAR. The team verified that the UFSAR was consistent with the observed plant practices, procedures and parameters.

M4 Staff Knowledge and Performance

M4.1 Knowledge of the Maintenance Rule

a. Inspection Scope (62706)

The team interviewed engineers and engineering managers to assess their understanding of the maintenance rule and associated responsibilities.

b. Observations and Findings

The system engineers were very knowledgeable of their systems and were familiar with related industry operating experience. System engineers and other engineers and managers were familiar with the maintenance rule requirements. However, as noted above, they were frequently not familiar with the SSC performance criteria basis.

c. Conclusions

All engineers and engineering managers were knowledgeable of their assigned systems and demonstrated sufficient knowledge to adequately implement their responsibilities under the maintenance rule. However, some weaknesses in knowledge of the basis for performance criteria were noted.

M7 Quality Assurance (QA) in Maintenance Activities

M7.1 Self-Assessments of the Maintenance Rule Program

a. Inspection Scope

The team reviewed two self assessments and an audit which were conducted to determine if the maintenance rule was properly implemented. These assessments were:

- Self Assessment conducted September 25-29, 1995
- Periodic Assessment conducted May 20-24, 1996
- Audit No. 96-All-03, "Maintenance Rule," conducted December 16, 1996 to January 14, 1997

b. Observations and Findings

All three assessments had some common findings or observations. Maintenance rule related training was an issue in each assessment. The team found training to be an issue during this inspection also. Strengthening the expert panel's role was another common issue. Finally, all of the assessments addressed the need to develop, revise, or enhance procedures relating to the maintenance rule.

The team noted that in a fairly short time period (1995-6) the maintenance rule program procedures had undergone several major rewrites. The program was described as "well defined" in the Maintenance Rule Implementation Plan (MRIP) in 1995. The program procedures were converted to Northeast Utilities performance monitoring guidelines (PMGs) which were common among all five units, when the "Power of Five" was implemented. The procedures were recently changed to Technical Support Group Instructions (TSGIs). The recent audit concluded that the procedures should be station level procedures to indicate wider ownership of the maintenance rule.

Worker knowledge of the maintenance rule was assessed as good in mid 1996 but weak at the end of the year. System engineer knowledge of the rule was described as weak. The system engineers were unfamiliar with the local area network (LAN) stored computer data bases, scoping, PRA modeling, system functions, and performance criteria. The team noted some of these weaknesses during its inspection.

The team noted that the mid-1996 assessment contained several misleading statements. For example, the assessment states that "no structures were found to be in a degraded condition". However, the team noted that water inleakage was occurring in a number of in-scope structures. Also, roofs were being replaced on structures which would also indicate some degradation. The assessment also states "The performance of most risk significant SSCs is monitored against reliability and unavailability performance criteria which were established insofar as possible based on consideration of risk." As noted by the team, the reliability performance criteria was not based on consideration of risk.

The mid-1996 assessment noted that the process for monitoring structures under the maintenance rule needed to be better defined. The solution to this finding was to issue TSGI-04. The team found the process for monitoring structures still needed improving. Degraded conditions necessary to place a structure in (a)(1) appeared to require a functional failure. This is an unacceptably high threshold for moving a structure to (a)(1).

One finding of the mid-1996 assessment dealt with inadequate trendable goals for the (a)(1) 480 VAC motor control center (MCC). The EDE-02B action plan and goals document were rewritten to address this finding. However, the team found the goals were still not trendable.

Audit No. 96-AII-03 found that risk significant SSC performance criteria were not established per 10 CFR 50.65 and NUMARC 93-01. The assessment noted that the facility had not established performance criteria for SSCs commensurate with safety by failing to demonstrate that performance criteria used for reliability preserved the assumptions used in the PRA. The team made a similar findings and through discussions with the maintenance rule coordinator and management it appeared that the assessment finding was not understood and properly acted upon by the facility. A more aggressive and questioning posture of the expert panel may have identified this problem.

Audit No. 96-AII-03, noted that NUMARC 93-01 describes one role of the expert panel as "developing the final list of risk significant systems using the inputs of the PRA analysis and their own familiarity with the plant". The expert panel compensates for the limitations of PRA implementation approaches and the limitations in the meaning of importance measures. The team found that the expert panel did not properly risk rank the fission product barriers (fuel clad, reactor coolant pressure boundary, and primary containment) which were not adequately addressed in the PRA from a risk significance standpoint. These fission product barriers should have been classified as risk significant.

c. <u>Conclusions</u>

The team concluded that the assessments identified a number of good findings. Some of these findings were adequately addressed. However, several of the findings were not adequately addressed. Issues that were common to all assessments appeared not to be adequately addressed, including training, the expert panel's role, and procedures. Other issues identified by the assessments and found to be an issue by the team include: adequacy of performance criteria for structures and criteria for moving from (a)(2) to (a)(1); reliability performance criteria for risk significant SSCs; risk ranking by the expert panel; and inadequate trendable goals for the (a)(1) system function EDE-02B.

The team concluded that assessment findings could have been better addressed by the facility.

V. Management Meetings

X1 Exit Meeting Summary

The team discussed the progress of the inspection with facility representatives on a daily basis and presented the inspection results to members of management at the conclusion of the inspection on January 31, 1997. Seabrook management acknowledged the findings presented.

The team asked whether any materials examined during the inspection should be considered proprietary. Seabrook personnel indicated that the program assessments provided to the team were proprietary information.

PARTIAL LIST OF PERSONS CONTACTED

North Atlantic Energy Service Corporation

D. Abely, Outage Coordinator
B. Bruchel, Engineering Performance Manager
A. Callendrello, Licensing Manager
B. Drawbridge, Executive Director
J. Grillo, Operations Manager
T. Harpster, Director, Nuclear Licensing
R. Hickok, Nuclear Training Manager
G. Kline, Technical Support Manager
W. Profio, Station Director
J. Peterson, Maintenance Manager
P. Richardson, Director of Oversight
G. Sessler, Maintenance Rule Coordinator
B. Seymour, Security and Safety Manager
D. Sherwin, Planning, Scheduling and Outage Manager
R. Spooner, Maintenance Rule Coordinator, Millstone Unit 1
J. Subotka, NRC Coordinator
R. White, Mechanical Engineering Manager

NRC

R. Blough, Deputy Director, DRS
J. Brand, Reactor Engineer, DRP
J. MacDonald, Sr. Resident Inspector, DRP
J. Rogge, Branch Chief, DRP

LIST OF INSPECTION PROCEDURES USED

IP 62706 Maintenance Rule

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

50-443/97-80-01 (VIO) Three functions were omitted from the maintenance rule program scoping.

50-443/97-80-02 (URI) Review additional information on seven functions to determine adequacy of scoping decisions.

50-443/97-80-03 (IFI) Review balancing of reliability and unavailability after the periodic assessment is performed.

50-443/97-80-04 (IFI) The performance of the emergency electrical distribution system will be reviewed to evaluate (a)(1)/(a)(2) classification.

50-443/97-80-05 (VIO) Reliability performance criteria were established without considering safety.

50-443/97-80-06 (IFI) Review process and criteria for placing structures into the (a)(1) category.

LIST OF ACRONYMS USED

ACR	Abnormal condition report
BOP	Balance of plant
CAB	Control building ventilation
CDF	Core damage frequency
CFR	Code of Federal Regulations
CRD	Control rod drive
EDE	Emergency electrical distribution
EDG	Emergency diesel generators
EOP	Emergency operating procedures
FF	Functional failure
IFI	Inspection followup Item
IPE	Individual Plant Evaluation
kV	Kilovolts
LCO	Limiting Condition for Operation
MCC	Motor control center
MOV	Motor operated valve
MPFF	Maintenance preventable functional failure
MRFF	Maintenance rule functional failure
MS	Main Steam
NAESC	North Atlantic Energy Services Corporation
NOV	Notice of Violation
NRR	Nuclear Reactor Regulation
OLM	Online maintenance
PCCW	Primary component cooling water system
PMG	Performance monitoring guideline
PRA	Probabilistic Risk Assessment
QA	Quality Assurance
RAW	Risk Achievement Worth
RCS	Reactor coolant system
RM	Radiation monitoring system
RPS	Reactor Protection System
RRW	Risk Reduction Worth
SI	Safety injection
SRV	Safety Relief Valve
SSC	Structures, Systems or Components
SSPS	Station planning and scheduling manual
TSGI	Technical support group instructions
UFSAR	Updated final safety analysis report
URI	Unresolved Item