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Facility Name:	Oyster Creek Nuclear Generating Station
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Inspectors:	J. Caruso, Operations Engineer, Team Leader C. Sisco, Operations Engineer J. T. Shedlosky, Sr. Reactor Analyst S. Pindale, Resident Inspector T. Bergman, Operations Engineer, HQMB, NRR
Approved by:	Glenn W. Meyer, Chief Operator Licensing and Human Performance Branch Division of Reactor Safety

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EXECUTIVE SUMMARY

This inspection involved a review of Oyster Creek's implementation of 10 CFR50.65, the maintenance rule. The report covers a 1-week onsite inspection by regional and NRR inspectors during the week of April 7, 1997.

MAINTENANCE

- GPUN had done a very good job on scoping based on the sample of SSCs reviewed, and the team did not identify any additional SSCs to add to the program scope.

- The GPUN PRA group was considered to be a program strength. This group had provided rigorous analysis to support the maintenance rule implementation. The PRA level of detail, data, truncation limits and quality were acceptable to perform risk ranking for the maintenance review.

- The team concluded that the expert panel was very knowledgeable and highly effective. The expert panel members had a thorough working knowledge of the PRA risk-ranking process and were effective in dealing with its results. Nonetheless, the team was concerned that the program was heavily dependent on their guidance and reviews, and in contrast the maintenance rule knowledge level of system engineers who were tasked with implementing the rule on a day-to-day basis was found to be very weak.

- The team identified a violation of the maintenance rule relating to failure to fully implement the maintenance rule program by the required date of July 1996, in that on April 4, 1997, eight systems that had been inappropriately categorized as (a)(2) systems were categorized as (a)(1) systems, based on historical data (prior to July 1996).

- The performance criteria of zero MPFFs for systems appeared to be very conservative and may not be sustainable long term. The criteria for moving structures from (a)(2) to (a)(1) was not clearly defined.

- In general, material condition and housekeeping for the systems inspected were very good, except that for the shutdown cooling system, housekeeping was found to be poor.

- The on-line maintenance (OLM) program was strong. GPUN had established a program with an appropriate level of controls for OLM work activities. The risk achievement worth was quantified for individual work weeks. Emergent work was evaluated with the same process. The PRA group was actively involved in the OLM program.

- The team identified a violation of the maintenance rule relating to failure to evaluate the maintenance program effectiveness and to evaluate adjustments to the monitoring and preventive maintenance program based on balancing of reliability and availability.

- System engineers reviewed industry-wide operating experience for their systems as assigned and recommended actions as appropriate, but did not consider industry-wide operating experience while performing functional failure reviews. Although not required by procedure or rule, this practice was inconsistent with management's expectations. The team did not identify examples in which industry experience would have made particular functional failures into MPFFs.

- The system engineers had generally very good knowledge of their systems, but their knowledge of the maintenance rule was very weak. Extensive condition monitoring and trending were being performed by system engineers, but this monitoring was not linked to the maintenance rule, in that specific monitored criteria were not used as a performance criteria. SROs (senior reactor operators) demonstrated a basic understanding of maintenance rule requirements and implementation.

- GPUN's program, which relied on the control room SROs to initiate and the expert panel to decide whether failures were FFs or MPFFs, resulted in system engineers not understanding the bases for these determinations. Given the system engineers were responsible for identifying the root cause(s), corrective action(s), establishing goals, and monitoring SSC performance, this approach did not seem sustainable for the long term and was considered a weakness in GPUN's implementation of the maintenance rule.

- The assessment provided by an independent contractor identified some good findings. Unfortunately, this assessment was completed approximately 7 months after the required implementation date for the rule.

Report Details

M1 Conduct of Maintenance (62706)

M1.1 SSCs Included Within the Scope of the Rule (62706)

a. Inspection Scope

The team reviewed the 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). The team used NRC Inspection Procedure (IP) 62706, NUMARC 93-01, Regulatory Guide 1.160, the Oyster Creek Final Safety Analysis Report, the Emergency Operating Procedures, and other information provided by GPUN as references. The team selected an independent sample of 42 SSCs that the team believed could have been included within the scope of the rule, but were not. The team used this sample to verify GPUN's scoping decisions.

b. Observations and Findings

GPUN's scoping matrix dated March 26, 1997, contained in TDR 1196, Revision 1, identified a total of 316 SSCs, of which 144 SSCs had been determined to be within the scope of the maintenance rule. The team reviewed the 172 SSCs that GPUN did not include within the scope of the rule, and selected a sample of 42 SSCs to verify the appropriateness of excluding these SSCs from the requirements of the rule. The team determined that all 42 SSCs had been appropriately scoped as outside the rule.

c. Conclusions

The team concluded that GPUN had done a very good job on scoping, and on the basis of the sample of SSCs reviewed, SSCs were properly included within the scope of the maintenance rule.

M1.2 Safety (Risk) Determination, Risk Ranking, and Expert Panel(62706)

a. Inspection Scope

Paragraph (a)(1) of the rule requires that goals be established, commensurate with the safety significance of the SSC. 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 should be used to determine if the SSC would be monitored at the system, train or plant level. The team reviewed the methods and calculations that GPUN had established for making these safety determinations and the specific safety determinations made for some SSCs. The team also reviewed the expert panel process and the documentation of the decisions made by the expert panel.

b. Observations and Findings on Safety (Risk) Determinations, Risk Ranking, and Expert Panel

Safety Determinations and Rankings

A plant specific probabilistic risk assessment (PRA) was used to rank SSCs with regard to safety significance. GPUN 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 Oyster Creek Plant Probabilistic Risk Assessment model that supported the development of the Individual Plant Examination (IPE) for internal events and from the Individual Plant Examination for External Events (IPEEE).

The Oyster Creek base case model was a large event tree, small fault tree model. The base case model was finalized in 1991 for the IPE and included both RPS and ADS system models and also plant modifications which were expected to be installed, which included two station blackout combustion gas turbine generators, the hardened vent and manual containment spray actuation. Basic event failure data and initiating event data were developed from generic industry databases which were statistically supported by Bayesian analysis, with plant event data gathered over the ten year period 1978 through 1988. Uncertainty distributions were developed for all basic event and initiating event data and have been propagated throughout the analysis. The team noted that GPUN intended to update the basic event failure data and initiating event data.

The model included system maintenance alignments, which were established to represent the system condition during periodic train and component corrective and preventive maintenance actions. The model included support systems, common cause failures and spacial interactions. The IPE modeled recirculation pump seal loss of coolant accidents (LOCAs). This was of interest since the plant uses isolation or emergency condensers, which do not inject to the reactor vessel as does the reactor core isolation cooling system at other boiling water reactors. The IPE modeled support system dependencies in two large support system fault trees, and common cause failures were modeled within systems.

The GPUN PRA Group established a truncation limit for the Oyster Creek base case model of 1.0E-13 through a series of sensitivity studies. They decided on this level after analysis of the effect of lowering the sequence truncation limit on individual component and system risk achievement worth in a range from 1.0E-10 to 1.0E-14. There was no truncation at the system fault tree level. The overall CDF reported from the Oyster Creek base case analysis reported in the IPE was 3.9E-06 per reactor year, this included the contribution due to internal flooding. The low CDF was due to the low contribution of transient events, 8E-07 per reactor year; the average transient CDF for BWRs is an order of magnitude higher. Station blackout contributed 59%, transients 21%, LOCAs 6%, anticipated transient without scram (ATWS) 6%, internal flooding 5% and intersystem LOCA 3%.

GPUN developed a special case of the Oyster Creek model in which all human action failure contributions were set to guaranteed success. This allowed calculation and sorting risk worth on hardware failure and unavailability. In the Oyster Creek base case model the recovery of containment heat removal actions were dominated by human performance. The total mean calculated core damage frequency of this model was 2.9E-06 per reactor year.

As a sensitivity study, GPUN PRA group calculated risk worth using the Oyster Creek PRA base case model. The resulting risk worths were compared to those used for the maintenance rule. Both models were quantified with truncation levels of 1.0E-13. The sensitivity study concluded that maintenance rule model was more inclusive than the base case model. Instrument air system split fractions were not contained in any of the importance measures in the PRA base case model. If that model had been used to determine risk significance, instrument air would not have been included. All other risk significant systems would remain the same regardless of the model used.

Expert Panel

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. GPUN 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 in the function for fire protection, the diesel driven fire pumps were classified as risk significant based on their function of providing makeup water to the reactor, the isolation condenser shell and to the station fire water headers. However, the external events analysis determined that a fire in the "A" 480 volt switchgear room or in the cable spreading area had a contribution to core damage frequency. GPUN hasn't specifically considered the risk importance of the fire detection and suppression systems in those two areas. Additionally, the team found that of the three fission product barriers, fuel clad integrity and the reactor coolant system, were not classified as risk significant as expected. After discussions with the expert panel, their members agreed to consider the importance of fire in these two areas as well as reconsidering the risk significance of the fission product barriers.

c. Conclusions on Safety (Risk) Determinations, Safety (Risk) Ranking, and Expert Panel

The GPUN PRA group was considered to be a program strength. The PRA group had provided rigorous analysis to support the maintenance rule implementation. The team concluded that the PRA level of detail, data, truncation limits and quality were acceptable to perform risk ranking for the maintenance review, and that the PRA group had provided strong support for the maintenance rule.

The team concluded that the expert panel was very knowledgeable and highly effective. The expert panel members had a working knowledge of the PRA risk ranking process and were effective in dealing with its results. The program placed great reliance on the expert panel. Nonetheless, the team was concerned that the program was heavily dependent on their guidance and reviews, and in contrast the maintenance rule knowledge level of system engineers who were tasked with implementing the rule on a day to day basis was found to be very weak.

M1.3 Goal Setting and Monitoring (a)(1) 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 had been demonstrated to be effective for SSCs under (a)(2) of the maintenance rule. The team also discussed the program with appropriate plant personnel. The team performed detailed programmatic reviews of maintenance rule implementation for the following SSCs:

(a)(1) Systems

- Core spray
- Condensate
- Feedwater
- Isolation Condenser
- Fire Protection (pump house/diesel-driven pumps)
- Reactor Building Closed Cooling Water
- Reactor Protection
- Shutdown Cooling
- 125 VDC
- 4160 VAC

(a)(2) Systems

- Structures

The team reviewed each of these systems to verify that goals or performance criteria were established in accordance with safety, that industry-wide operation experience was taken into consideration, that appropriate monitoring and trending were being performed, and that corrective actions were taken when a SSC failed to meet its goal or performance criteria or experienced a maintenance preventable functional failure (MPFF). The team also reviewed goals and performance criteria for SSCs not listed above.

b. Observations and Findings

Goal Setting and Performance Criteria (General)

GPUN had generally established system and train level performance criteria in terms of unavailability and a single maintenance preventable functional failure (MPFF) for a two year rolling period. The team determined that extensive condition monitoring and trending was being performed by system engineering but this monitoring was not linked to the maintenance rule, in that specific monitored criteria were not used as performance criteria. The team judged the goals of the (a)(1) systems reviewed to be appropriate with the exception that ten systems had been placed in (a)(1) status in April 1997 based on historical reviews did not have goals established.

GPUN moved 10 systems into an a(1) classification because of MPFFs identified in April 1997 vice July 10, 1996. Eight systems (containment isolation, auxiliary boiler, main transformer, emergency diesel generators, isolation condenser, essential service water, reactor building ventilation and control room heating and air-conditioning) were reclassified based on an historical review of deviation reports written between 1993 and 1996 that identified MPFFs not previously identified. Two other systems (reactor protection, and heat trace) were reclassified to a(1) status based on revised system functions as defined in GPUN Procedure OC-7, Revision 1, "Work Performance Standard". The team determined that the late (a)(1) categorization of these ten SSCs based on historical data represented a violation of 10 CFR 50.65(c), which required implementation of maintenance rule programs by July 10, 1996, including a review of three years of historical performance data. **(VIO 50-219/97-80-01)**

The team determined the performance criteria of zero MPFFs for risk significant systems appeared to be very conservative and may not be sustainable long term due to the large number of systems that may become (a)(1). NUMARC 93-01, Paragraph 9.3.2, "Performance Criteria for Evaluating SSCs," states that "Performance criteria for risk significant SSCs should be established to assure reliability and availability assumptions used in the plant-specific PRA, IPE, IPEEE, or other risk determining analysis are maintained or adjusted when determined necessary by the utility." The expert panel had generally established system and train level performance criteria in terms of unavailability and MPFF for a two year rolling period.

The GPUN PRA group quantified the effect of the performance criteria for both unavailability and reliability through sensitivity studies. When all systems were placed at their maximum allowed unavailability limit core damage frequency increased to 4.3E-06 per reactor year. This represents an increase of approximately 14% above the PRA base case due to the increase in maintenance outage time. The sensitivity study for the reliability performance criteria was performed by changing the PRA base case failure rates for standby risk significant systems to one failure for the estimated number of demands during the rolling two year period. In this case the core damage frequency was observed to increase to 6.9E-06 per reactor year. This represents an acceptable increase of approximately 82% above the PRA base case due to the combined effect of those failures.

Detailed Review of (a)(1) and (a)(2) SSCs

The team reviewed the implementation of the maintenance rule to individual (a)(1) and (a)(2) SSCs. Findings from this review are discussed below.

The structures were monitored under the preventive maintenance program and were categorized as an (a)(2) system. The team determined that the structures within the scope of the maintenance rule were consistent with the structures listed within Section 3.2 of the FSAR. GPUN had completed approximately 50% of the baseline inspections of structures. The team determined the structures monitoring criteria was acceptable, however; the criteria to be exceeded prior to placing a structure in the (a)(1) category was a structure failure. This criteria was set at a threshold value that was too high. This issue of placing structures in (a)(1) is a generic issue in the industry and represented an Inspector Follow Item. **(IFI 50-219/97-80-02)**

The reactor protection system (RPS) was monitored in accordance with paragraph (a)(1) of the rule as a result of five MPFFs. GPUN had a conservative definition of functional failure for the reactor protection system, counting failures as FFs if the failure prevented a half scram from occurring when necessary or if a failure caused a half scram inappropriately. The system engineer had not prepared an (a)(1) evaluation form because the MPFFs had only recently been identified by the expert panel. One of the MPFFs had occurred in 1993, three in 1994, and one in 1996. Since the (a)(1) evaluation form had not been completed, the root cause(s), corrective action(s) and goal(s) had not been established.

The fire protection system was monitored on the train level, and both trains were in (a)(1). Both trains had been out of service for extended time periods due to various corrective maintenance and overhaul activities. The two diesel-driven pumps were 1960's vintage. The fire protection system engineer stated that the diesel-driven pump's failures had resulted in multiple corrective maintenance activities. One of the bigger problems was unavailability of parts, and therefore, several of the major components (e.g. fuel injector pump, governor assembly) had been rebuilt. The system engineer stated that approval had been received to purchase a new diesel engine for the No. 2 fire pump. The team found that although both trains had been made (a)(1) due to unavailability, functional failures had also occurred.

The team independently reviewed a list of deviation reports related to the fire protection system, and identified that some of the functional failures appeared to have been maintenance preventable functional failures (MPFF). Specifically, on three occasions, the No. 2 diesel-driven pump failed its operability surveillance test due to low discharge pressure (February 7, 1996; March 27, 1996; and August 29, 1996). The two functional failures after the February 7, 1996, appeared to have been related to ineffective corrective actions for one or more problems associated with the fuel injectors and the governor that likewise affected the first functional failure. GPUN had originally determined that these two failures were not maintenance preventable, and had attributed the failures to component age, although a vendor performed maintenance on the components. Upon further discussion, GPUN agreed that the March and August, 1996 functional failures should have been classified as MPFFs. In addition, the licensee acknowledged a weakness in their process by which vendor maintenance was not specifically considered for these failures. Notwithstanding the weaknesses related to the above MPFFs, both fire protection systems had been (a)(1) since the implementation of the maintenance rule, and as such, had received priority attention in resolving the performance problems. In addition, the GPUN's corrective action program appeared to have been effective in addressing short term performance problems, as indicated by the absence of further functional failures after September 1996. GPUN's proposed long term actions, to replace one of the diesel-driven pumps, was likewise an appropriate action due to the poor performance history and reliability.

The team reviewed procedure 2000-ADM-1200.02, "Operating Experience Review Program," to determine the extent by which system engineers utilized industry-wide experience. The procedure specified the method by which nuclear industry and in-house operating experience was screened, evaluated, distributed and trended. There was no formal guidance for the system engineers' use of industry-wide experience in conducting individual system or component evaluations. A representative from the expert panel (system engineering manager) informed the team that the system engineers were expected to factor industry-wide experience into specific functional failure evaluations. The representative stated that if the system engineer identified the existence of industry-wide information that may have prevented a functional failure, then the failure would be deemed maintenance preventable. The team did not find examples of evaluations that supported this expectation. Nonetheless, the system engineers were not aware of the expectation to consider and/or research industry-wide experience for functional failures, nor were they aware of some of the available tools to conduct searches for individual component failures within the nuclear industry (e.g. Nuclear Plant Reliability Data System). The team did find, however, that system engineers occasionally questioned component engineers regarding failure history/experience with specific components. In this regard, the system engineer may indirectly (through component engineers) utilize industry-wide experience. In general, the system engineers viewed the Operating Experience Review Program as a process to screen and assign for review industry information such as NRC Information Notices, vendor notices, and INPO issue/event reports. This is consistent with procedure 2000-ADM-1200-02.

In the course of verifying the implementation of the maintenance rule, the team performed walkdowns to examine the material condition of the systems (i.e., fire protection pump house/diesel-driven pumps, reactor building closed cooling water, shutdown cooling, feedwater, and condensate systems) and determined that the areas were generally very good regarding material condition and housekeeping. No deficient conditions were noted with the notable exception of the shutdown cooling system. The team determined that the overall material condition and housekeeping of the shutdown cooling system area was poor for the three pump and heat exchanger trains and associated valving. These areas were located in a locked area (two elevations), which was radioactively contaminated and was a high radiation area. GPUN acknowledged the poor condition of the room.

c. Conclusions for Goal Setting and Performance Criteria

A violation of the maintenance rule relating to failure to monitor the performance or condition of SSCs against licensee established goals was identified by the team. The performance criteria/goal of zero MPFFs for systems appeared to be very conservative and may not be sustainable long term. The basis for moving structures from (a)(2) to (a)(1) was not clearly defined. GPUN had selected performance criteria for unavailability and reliability and had qualified that selection through risk analysis. In general, material condition and housekeeping for the systems inspected were very good, except as noted with the shutdown cooling system.

System engineers reviewed industry-wide operating experience for their systems as assigned and recommended actions as appropriate but did not consider industry-wide operating experience while performing functional failure reviews. Although not required by procedure or rule, this practice was inconsistent with management's expectations. The team did not identify examples in which industry experience would have made particular functional failures into MPFFs.

Unavailability performance criteria was developed and related to the PRA. However, system engineers were not readily knowledgeable of the particular unavailability criteria and goals. In addition, reliability was not measured or trended, nor was it balanced against unavailability, thereby potentially preventing the identification of degraded performance from an SCC reliability perspective.

M1.4 Plant Safety Assessments before taking Equipment Out of Service (IP 62706)

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 for on-line maintenance, discussed the process with responsible planning, scheduling and PRA individuals, and attended several planning meetings.

b. Observations and Findings

On-line maintenance (OLM) was governed by 2000-ADM-3022.01, "OLM Risk Management." The process was designed to manage risk associated with scheduling and performing OLM activities.

OLM work activities were scheduled and approved for the current operating cycle (Cycle 16) by establishing an OLM system window schedule. There were periodic schedule review meetings for the associated work week schedules at predetermined milestones prior to the actual work week. The first meeting occurred twelve weeks prior to the work week. The next meeting occurred six weeks prior to the work week, and then the meetings occurred weekly until work week implementation. The OLM procedure specified the participants and the scheduling, planning, and coordination aspects that were to be considered during the meetings. The team attended twelve-week and five-week schedule meetings. While the twelve-week meeting discussed the items only in very general and brief terms, the five-week meeting discussions were very focused on coordination, preparation and implementation of the various work-week activities. All participants were well-prepared for the meeting.

GPUN categorized systems by their risk impact on core damage frequency and large early release fraction as well as their status within the PRA model. The GPUN PRA group had established the risk associated with each OLM week either qualitatively, using models of single system maintenance actions, or quantitatively, using the PRA model. The model used to evaluate OLM was a no maintenance model. Removal of the test and maintenance unavailability reduced the core damage frequency to 3.34E-06 per reactor year. Risk achievement worth was determined for each work week based on the assumption that all equipment was removed from service simultaneously.

Emergent work was reviewed by the PRA group on a case by case basis. The inspection team observed this practice during the week of the on site inspection, work week 62C3, during which the "A" station blackout combustion gas turbine generator was removed from service for an extended preventive maintenance overhaul. Procedure 2000-ADM-3022.01 provided basic guidance for risk assignments in the event of emergent work for specific systems, a qualitative determination. Station workers frequently consulted with the PRA group in order to determine a risk level for emergent work (by use of PRA/system window model update).

GPUN managed shutdown risk through management policy 2000-POL-3023.01, "Shutdown Management Policy," and procedure 2000-ADM-3023.01, "Shutdown Risk Management." Risk was managed through the use of a key safety functions process that was defined in NUMARC 91-06, "Guidelines for Industry Action to Assess Shutdown Management." GPUN had also developed an outage risk assessment manager (ORAM) model to assess the risk of system unavailability. Models were developed of the decay heat removal systems' failure mechanisms. These models included support systems. ORAM was developmental and was used by GPUN during a portion of the last refueling outage. GPUN also used two computer codes to predict coolant temperature for proposed plant conditions. The first code calculates bulk average coolant temperature for a static condition. The second was a finite element analysis to determine heat up rate and final temperatures.

The team reviewed the OLM work-week activities for the week that the team was onsite. The combined risk assignment was consistent with the licensee's procedures. Out of service times for the affected systems were appropriately monitored and tracked.

c. Conclusions

The team concluded that the Oyster Creek OLM program was strong. The team concluded that GPUN had established an effective program with an appropriate level of controls for OLM work activities, including the risk achievement worth was quantified for individual work weeks, emergent work was evaluated with the same process, the PRA group was actively involved in the OLM program.

M1.5 (a)(3) Periodic Evaluations and Balancing Reliability and Availability (IP 62706)

a. Inspection Scope

Paragraph (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 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.

b. Observations and Findings

The team reviewed GPUN's periodic evaluation (96-012, Maintenance Self-Assessment) issued on March 28, 1997 and concluded that it did not meet the requirements of the rule in that it did not provide an evaluation of the maintenance program effectiveness. The report did not evaluate the performance of assigned goals under (a)(1); failed to demonstrate the effectiveness of preventative maintenance under (a)(2); failed to identify how industry operating experience was taken into account where practical; did not evaluate the effectiveness of corrective actions taken; and did not consider balancing availability and reliability or describe any adjustments made to the planned maintenance program as a result of SSC performance.

For example, GPUN's periodic evaluation stated that balancing of reliability and operability was considered by the Expert Panel during the development of performance criteria and out of service levels, and that balancing availability and reliability was a continuous process conducted through GPUN's on-line maintenance program, the deviation report program and daily plan of the day meetings. However, the discussion of balancing in the periodic evaluation for each of these activities was focused solely on availability and did not describe where GPUN had balanced changes in availability against reliability, nor describe how the preventive maintenance program had been adjusted as a result. GPUN also did not have any apparent methodology that described how to perform the balancing or make adjustments as required by Paragraph (a)(3) of the rule.

Failure to issue a periodic evaluation that provided an evaluation of the maintenance program effectiveness and to make adjustments to the monitoring and preventive maintenance program based on balancing of reliability and availability is a violation of 10 CFR 50.65(a)(3). **(VIO 50-219/97-80-03)**

c. Conclusions

The team identified a violation of the maintenance rule relating to failure to evaluate the maintenance program effectiveness and to evaluate adjustments to the monitoring and preventive maintenance program based on balancing of reliability and availability. The team judged the recently completed evaluation to be generally ineffective and insubstantial.

M2 Engineering Support of Facilities and Equipment

M2.1 Review of Final Safety Analysis Report (FSAR) Commitments

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

M3 Staff Knowledge and Performance

a. Inspection Scope

The team interviewed engineers, managers, and senior reactor operators (SRO) to assess their understanding of the maintenance rule and associated responsibilities.

b. Observations and Findings

The system engineers interviewed had generally very good knowledge of their systems but their knowledge of the maintenance rule was very weak. They were generally knowledgeable of the major requirements and purposes of the rule but their knowledge and understanding of performance criteria and goal setting for their systems was generally weak. In addition, the system engineers were unable to explain why a particular failure in the systems was classified as a functional failure (FF) or maintenance-preventible functional failure (MPFF). However, by GPUN's procedures, the FF/MPFF decision was the responsibility of the control room SROs and the expert panel. The team also noted that not all of the system engineers were able to effectively use the computer data base to access maintenance rule information on their systems.

The actual maintenance rule performance monitoring in many instances was collected and plotted by the Maintenance Rule Coordinator, with copies of the resulting graphs sent to the system engineers. The system engineers did extensive condition monitoring of their systems (e.g., pump and motor vibration, pump hydraulic performance, pump flow rates, pump suction/discharge pressures, pump seal leak rates, motor currents and temperatures, lube oil system performance, selected valve leak rates, and other system leak rates). However, there was no apparent link between this monitoring and the maintenance rule program, and the monitoring plans had not been updated since January 1995, and therefore did not include maintenance rule monitoring in the plan. The monitoring that the system engineers collected was valuable information with respect to SSC performance, but was not measured against performance criteria for the purposes of determining (a)(1) or (a)(2) classification. The system engineers did not fully understand the maintenance rule perspective of performance monitoring. Nor did they understand "goal setting" principles delineated in the maintenance rule. They generally believed their goals, once their system was placed in (a)(1) to be related to getting their system back to (a)(2) without having quantitative criteria.

SROs demonstrated a basic knowledge level of maintenance rule requirements and implementation. They were less aware of PRA and risk bases for both the maintenance rule and on-line maintenance. They knew where the majority of the relevant maintenance rule information could be found (e.g. computer system, procedures, Oyster Creek standards), and they also utilized shift technical advisors when questions arose during a workshift. They were all knowledgeable of Oyster Creek Standard 7 (OC-7) for use in determining whether a functional failure occurred. When questioned for specific postulated SSC failures, they effectively implemented OC-7. One SRO identified a potential deficiency with OC-7 for system 852 (instrument air). The functional failure definition says two flow paths are *inservice*. There are two instrument air system redundant flowpaths, each consisting of a series of three pre-filters. The SRO stated that normally one is *isolated* and occasionally *valved out of service* rather than both being inservice. The Maintenance Rule Coordinator was notified of this deficiency for correction.

c. Conclusions

The system engineers had generally very good knowledge of their systems, but their knowledge of the maintenance rule was very weak. Extensive condition monitoring and trending were being performed by system engineers, but this monitoring was not linked to the maintenance rule in that specific monitored parameters had no performance criteria as related to the maintenance rule program. SROs demonstrated a basic knowledge level of maintenance rule requirements and implementation.

GPUN's program, which relied on the control room SROs to initiate determinations and the expert panel to decide whether failures were FFs or MPFFs, resulted in system engineers not understanding the bases for these determinations. Given the system engineers were responsible for identifying the root cause(s), corrective action(s), establishing goals, and monitoring SSC performance, this approach seemed short-sighted and was considered a weakness in GPUN's implementation of the maintenance rule.

M7 Quality Assurance (QA) in Maintenance Activities

M7.1 Self-Assessments of the Maintenance Rule Program

a. Inspection Scope

The team reviewed three assessments which were conducted to determine if the maintenance rule was properly implemented.

b. Observations and Findings

The maintenance rule information transfer effort (MRITE) assessment, conducted January 1996 provided some useful early assessment of the maintenance rule implementation at Oyster Creek. The self-assessment performed by the Oyster Creek maintenance self-assessment group provided status but did not provide useful assessment of the effectiveness of GPUNs maintenance rule implementation. The assessment provided by an independent contractor issued on March 27, 1997 identified some good findings. Unfortunately, this assessment was completed approximately 7 months after the required implementation date for the rule. This assessment pointed out a number of substantive weaknesses in MR implementation in the areas of periodic assessment, reliability, availability monitoring, structure monitoring, and training which were still outstanding. The team's independent assessment agreed with many of the findings in this report. The nature and significance of these weaknesses should have been readily apparent and corrected by the required implementation date of the rule.

c. Conclusions

The assessment provided by an independent contractor identified some good findings. Unfortunately, this assessment was completed approximately 7 months after the required implementation date for the rule.

V. Management Meetings

XI. Exit Meeting Summary

The team discussed the progress of the inspection with GPUN representatives on a daily basis and presented the inspection results to members of management at the conclusion of the inspection on April 11, 1997.

The team asked whether any materials examined during the inspection should be considered proprietary. GPUN indicated that no information provided to the team was considered proprietary.

PARTIAL LIST OF PERSONS CONTACTED

General Public Utilities Nuclear

W. Berhle, Manager, ER Programs
K. Canavan, Safety & Risk Analysis
D. Croneberger, Director, Equipment Reliability
J. DeBlasio, Manager, System Engineering
D. Egan, Maintenance Rule Coordinator
M. Godknecht, Engineering
R. Keaten, VP Engineering
S. Levin, Director, Operations & Maintenance
D. Masiero, Engineering Support
D. McMillan, Manager, System Engineering

K. Mulligan, Plant Operations Director
J. Perry, Manager, Logistical Support
A. Rone, VP Nuclear Safety & Technical Services
P. Scallon, Safety Review
D. Slear, Director, Configuration Control
H. Wilson, Maintenance Assessment

LIST OF ACRONYMS USED

ADS	Automatic Depressurization System
BWR	Boiling Water Reactor
CDF	Core Damage Frequency
CFR	Code of Federal Regulations
FSAR	Final Safety Analysis Report
FF	Functional Failure
GPUN	General Public Utilities Nuclear - Oyster Creek Nuclear Generating Station
HPCI	High Pressure Coolant Injection
IEEE	Institute of Electrical and Electronics Engineers
IOE	Industry Operating Experience
IPE	Individual Plant Examination
IPEE	Individual Plant Examination for External Events
LOCA	Loss of Coolant Accident
MCC	Motor Control Center
MPFF	Maintenance Preventable Functional Failure
NRC	Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
NUMARC	Nuclear Management and Resources Council
PRA	Probabilistic Risk Assessment
PSA	Probabilistic Safety Assessment
PSFF	Preventable System Function Failure
QA	Quality Assurance
RPS	Reactor Protection System
RAW	Risk Achievement Worth
RRW	Risk Reduction Worth
SRO	Senior Reactor Operator
SSC	Systems, Structures, and Components
TS	Technical Specification
VAC	Volts Alternating Current
VDC	Volts Direct Current