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EXECUTIVE SUMMARY

Clinton Power Station
NRC Inspection Report 50-461/98005(DRS)

This inspection included a review of the licensee's implementation of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." The report covers a one-week, on-site inspection by regional, resident, and Office of Nuclear Reactor Regulation inspectors, and a contractor from Idaho National Engineering and Environmental Laboratory.

In general, the Clinton Power Station program did not met the requirements of the maintenance rule (MR); the extent of the deficiencies identified represented a programmatic breakdown. These deficiencies were self-identified during a Quality Assurance audit (Q38-97-14, "Quality Assurance Audit Report on Maintenance Rule," October 1997) and during the subsequent improvement program. Areas of concern identified in the audit included scoping, performance criteria, goals, and monitoring. These deficiencies were considered violations of the MR. In addition, weaknesses were noted with risk assessments when taking equipment out-of-service. However, based on implementing Section VII.B.6, "Violations Involving Special Circumstances," of NUREG-1600, "General Statement of Policy and Procedures for NRC Enforcement Actions" (Enforcement Policy), a Notice of Violation is not being issued. Four non-cited violations and three inspection follow-up items were identified.

Maintenance

- The initial scoping determinations did not include all structures, systems, and components (SSCs) and functions required to be in the MR scope. This was considered a violation of the MR. System and function rescoping determinations were appropriate. (Section M1.1)

- The approach to establishing risk ranking for SSCs appeared acceptable, although the risk ranking process was evolving and the downgrading of systems was not always sufficiently justified. Several limitations with the use of the probabilistic risk assessment (PRA), with respect to the MR, were identified. (Section M1.2.b.2)

- The proactive performance of two periodic assessments prior to the July 10, 1996, implementation date resulted in good evaluations of the effect of the MR on the maintenance program. Optimizing preventive maintenance frequency was a good process to reduce unavailability and achieve an appropriate balance. The process for balancing unavailability and reliability was acceptable, although not well-defined. (Section M1.3 and M1.4)

- With the exception of the recently revised procedure for risk assessment during Mode 4 evolutions, procedural guidance was inadequate. The processes for assessing plant risk resulting from equipment being out-of-service for on-line maintenance and for shutdown risk management were weak. The PRA group not being an integral part of the work control process was a program weakness. (Section M1.5)

- The previously established performance criteria were ineffective for gauging effectiveness of preventive maintenance. This was considered a violation of the MR. A significant fraction of recently approved reliability performance criteria were also inappropriate, while a majority of the performance criteria was yet to be approved. Recently approved unavailability performance criteria were more restrictive than as modeled in the PRA to ensure that meeting the criteria reflected effective maintenance. (Section M1.6)

- In the past, goals and corrective action plans were not developed in all cases when systems were classified as (a)(1). This was considered a violation of the MR. Appropriate goals and corrective action plans had not yet been developed for many systems recently classified as (a)(1), although those that had been developed were generally acceptable. Reclassifications of systems from (a)(1) to (a)(2) were acceptable and performed with adequate basis. (Section M1.6.b.1.3)

- The monitoring of reliability and availability against performance criteria and goals was inadequate. Functional failures were not identified by the program process and unavailability was not always monitored, especially during shutdown. These deficiencies were considered a violation of the MR. (Section M1.6.b.1.4)

- The structural monitoring program was consistent with current industry guidance and practice. Baseline inspections were essentially complete; deficiencies and the associated resolutions were properly documented. (Section M1.6.b.5)

<u>Quality Assurance</u>

- Recent assessments of the MR program, which concluded that the program was inadequate and that implementation was ineffective, were strengths. The use of outside personnel provided independent insights into the MR program and added to the overall quality of the assessments. (Section M7.1)

<u>Engineering</u>

- System engineers were experienced and knowledgeable about their systems and had some understanding of the MR and their responsibilities. However, due to the evolving program, system engineers did not appear to take sufficient ownership of the program to ensure effective implementation. (Section E4.1)

Report Details

Summary of Plant Status

Clinton Power Station was in an extended shutdown during the inspection.

Introduction

This inspection included a review of the licensee's implementation of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," (the maintenance rule). The report covers a one-week, on-site inspection by three regional inspectors, a resident inspector, and a consultant from the Idaho National Engineering and Environmental Laboratory. Assistance and support were provided by the Quality Assurance, Vendor Inspection, and Maintenance Branch, Office of Nuclear Reactor Regulation (NRR).

I. Operations

O4 Operator Knowledge and Performance

O4.1 Operator Knowledge of Maintenance Rule

a. Inspection Scope (62706)

The inspectors interviewed three licensed operators including one nuclear shift supervisor, one senior reactor operator, and one reactor operator to determine if they understood the general requirements of the maintenance rule (MR) and their particular duties and responsibilities for its implementation.

b. Observations and Findings

The operations personnel interviewed had a general knowledge of the MR and their role in its implementation. These personnel were knowledgeable of the responsibilities concerning the tracking of unavailability data, which was a concern from the October 1997 Quality Assurance (QA) audit. The definition of availability had recently been clarified by the MR expert panel to eliminate multiple differing definitions and establish a single approved definition. Recent training for operators provided an overview of the MR program; however, the intended program changes will affect operator responsibilities which would necessitate additional training.

Only the shift supervisor had a working knowledge of risk assessment for taking equipment out-of-service (OOS). The other two operators were not familiar with the risk matrix or its use, stating instead that risk would have been evaluated before an activity was scheduled. However, all three operators had a good understanding of the steps to be taken for emergent work. The operators also stated that implementation of the MR did not significantly impact other operator responsibilities.

c. Conclusions

Operations personnel interviewed had the requisite knowledge to fulfill their responsibilities concerning the MR.

II. Maintenance

M1 Conduct of Maintenance (62706, 62002)

M1.1 SSCs Included Within the Scope of the Rule

a. Inspection Scope

The inspectors reviewed the scoping documentation to determine if the appropriate structures, systems, and components (SSCs) were included within the MR program in accordance with 10 CFR 50.65(b). References used during the inspection included Nuclear Management Resource Council (NUMARC) 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," NRC Inspection Procedure (IP) 62706, "Maintenance Rule," and Regulatory Guide (RG) 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Revision 2.

b. Observations and Findings

The initial system based scoping effort was described in the Project Document "Implementation of the Maintenance Rule at Clinton Power Station." The October 1997 QA audit, the independent assessment, and the subsequent rescoping effort identified several systems that were not included in the initial MR scope. These systems included the following:

- Station heating system - required to maintain temperature greater than 40°F to prevent freezing of high pressure core spray, reactor coolant isolation cooling, and shutdown service water piping;

- Chill water system - required to provide cooling water for containment, switchgear heat removal, penetration coolers, and auxiliary building steam tunnel;

- Containment/drywell structure - required to house, support, and protect safety-related equipment.

10 CFR 50.65(b) established the scope of the monitoring program for selection of safety-related and nonsafety-related SSCs to be included within the MR program. The monitoring program shall include safety-related SSCs that are relied upon to remain functional during and following design basis events to ensure the integrity of the reactor coolant pressure boundary, the capability to shut down the reactor and maintain it in a safe shutdown condition, and the capability to prevent or mitigate the consequences of

accidents that could result in potential offsite exposure comparable to the 10 CFR 100 guidelines. The monitoring program shall also include nonsafety-related SSCs that are relied upon to mitigate accidents or transients, or are used in the plant emergency operating procedures, or whose failure could prevent safety-related SSCs from fulfilling their safety-related function, or whose failure could cause a reactor scram or actuation of a safety-related system. Contrary to these requirements, the systems identified above performed functions that required their inclusion in the MR scope. This was considered a violation of 10 CFR 50.65(b). However, based on implementing the guidance of Section VII.B.6, "Violations Involving Special Circumstances," of the "General Statement of Policy and Procedures for NRC Enforcement Actions" (Enforcement Policy), NUREG-1600, a Notice of Violation is not being issued (Non-cited Violation (NCV) 50-461/98005-01(DRS)).

The rescoping method was described in Nuclear Station Engineering Department (NSED) Procedure M.07, "NSED Maintenance Rule Activities." The rescoping effort was performed by system function; scoping criteria followed the guidance of NUMARC 93-01. Overall, the inspectors concluded that the rescoping effort was good. Scoping determinations were appropriate, and systems and functions excluded from the MR were adequately justified. The licensee considered a total of 194 systems during the rescoping phase; of these 128 systems were determined to be within the MR scope. The inspectors identified two minor issues where the functions were not clearly defined to ensure the components associated the functions were adequately addressed.

- Component cooling water valves' function to transfer fuel pool cooling from component cooling to shutdown service water.
- The portion of the hydrogen cooling system associated with the main generator, whose rupture could cause a generator trip on loss of hydrogen.

The licensee agreed these system functions should be revised or new functions developed to clarify the intent. The licensee was not aware of any recent equipment failures that had impacted these functions.

c. Conclusions

The initial scoping effort did not include all systems required to be in the MR scope. Rescoping determinations were appropriate for plant systems and functions.

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

a. Inspection Scope

Paragraph (a)(1) of the MR requires that goals be commensurate with safety. Additionally, implementation of the MR using the guidance contained in NUMARC 93-01, required that safety be taken into account when setting performance criteria and monitoring under paragraph (a)(2) of the MR. This safety consideration was to be used to determine if the SSC should be monitored at the system, train, or plant level. The inspectors reviewed the methods and calculations that the licensee established for making these risk determinations. NUMARC 93-01 recommended the use of an expert panel to establish safety significance of SSCs by combining probabilistic risk assessment (PRA) insights with operations and maintenance experience, to compensate for the limitations of PRA modeling and importance measures. The inspectors reviewed the composition of the expert panel and the experience and qualifications of its members. The inspectors reviewed the licensee's expert panel process and the information available which documented the expert panel decisions. The inspectors interviewed several members of the expert panel to determine their knowledge of the MR and to understand the functioning of the panel.

b.1 Observations and Findings on the Expert Panel

In response to the October 1997 QA audit, the expert panel was reconstituted in January 1998. The original expert panel was used for scoping and risk significance determinations. Routine activities, such as approval of performance criteria, were carried out by the Material Condition Management Team (MCMT). However, the MCMT was not effective for MR issues because the MCMT was focused on other, non-maintenance rule issues, and lacked PRA expertise.

The inspectors interviewed members of the reconstituted expert panel and reviewed the Maintenance Rule Expert Panel Charter. The reconstituted expert panel was heavily involved in the revision of the MR program. The revision effort included identification of specific functions for systems, rescoping, risk ranking, development of MR program procedures, and review of (a)(1) goals and corrective action plans. The reconstituted panel was comprised of experienced individuals from operations, engineering, including a PRA engineer, and maintenance. Strong operations involvement was evident from observations of expert panel discussions. All panel members had received some PRA training and were knowledgeable of PRA limitations. For example, the expert panel decided to classify containment functions, both primary and secondary, as high safety significance even though many of the functions were not explicitly modeled in the PRA.

c.1 Conclusions on Expert Panel

The reconstituted expert panel was a well-balanced group of qualified, experienced personnel. The panel used PRA in conjunction with their experience base to assess the safety significance of SSCs.

b.2 Observations and Findings on Risk Determinations

The licensee used 1995 updated PRA importance measures to initially determine safety significance of the functions identified during the rescoping effort, using the guidance of NUMARC 93-01. The expert panel made the final determination in each case. Twelve systems were selected for review during the inspection. With one exception described below, the results of using this approach were determined to be acceptable.

The inspectors were concerned that on April 6, 1998, the expert panel downgraded feedwater function FW-01 from high to low safety significance. The feedwater system, consisted of two turbine-driven reactor feed pumps (TDRFPs) and one standby, motor-driven pump. The turbine-driven pumps were not credited as a viable source of high-pressure injection in the PRA, only the standby motor-driven pump. The PRA evaluation identified loss of feedwater as an initiating event, and loss of feedwater contributed approximately 7% of the total core damage frequency in the PRA. This initiating event corresponded to loss of the TDRFPs, which the licensee designated as function FW-01.

The expert panel's decision was based on, "the PRA does not rely on the TDRFPs as a success method for most accident scenarios." The PRA expert panel member stated that NUMARC 93-01 allowed initiating events to be excluded when determining safety significance. This was judged to be an overly narrow interpretation of the guidance in NUMARC 93-01. The licensee's determination appeared to be inappropriate because loss of the TDRFPs initiated a significant percentage (7%) of core damage sequences, and these losses could be prevented by effective maintenance. The PRA only modeled the TDRFPs through this trip initiator, and so the only measure of the safety significance of the pumps was through this particular initiating event.

The PRA relied heavily on generic data, most of which was from the 1980s. Only very limited checks were made for some initiating events, to ensure that this data was representative of actual equipment performance. This decreased the confidence in the PRA results, including ranking of SSCs with respect to safety significance. In addition, although the NRC concluded in a safety evaluation report that the Individual Plant Examination submittal met the overall intent of Generic Letter 88-20, "Individual Plant Examination for Severe Accident Vulnerabilities," significant weaknesses were identified, which could limit the usefulness of the PRA for other applications, such as MR.

The licensee was in the process of updating the PRA, the second update since the original Individual Plant Examination submittal to the NRC. As part of this update, a contractor was revising guidelines for establishing SSC safety significance with respect to the MR. Due to the planned revision for risk significance determinations and the specific FW-01 issue, this is considered an inspection follow-up item (IFI) (50-461/98005-02(DRS)) pending review of the revised process and implementation.

c.2 <u>Conclusions on Risk Determinations</u>

The approach to establishing the risk ranking for SSCs appeared acceptable, although the risk ranking process was evolving and the downgrading of some systems were not always sufficiently justified. Further review will be required. Several limitations with the use of the PRA with respect to the MR were identified, although the intended PRA update may resolve some of these issues.

M1.3 (a)(3) Periodic Evaluations

a. Inspection Scope

Paragraph (a)(3) of the MR requires that performance and condition monitoring activities, associated goals, and preventive maintenance (PM) activities be evaluated, taking into account where practical, industry-wide operating experience (IOE). This evaluation was required to be performed at least one time during each refueling cycle, not to exceed 24 months between evaluations. The inspectors reviewed the procedural guidelines for these evaluations, the Cycle 5 periodic assessment, and the January 1998 Monthly Maintenance Rule Performance Report.

b. Observations and Findings

The guidance for conducting periodic assessments were contained in M.07, Attachment 4, "Periodic Assessment of Maintenance Effectiveness Guidance." The guidance was recently revised to include additional areas to assess, such as scoping changes, structure monitoring, removal of systems from service, audit results, MR awareness, and review of actions from previous periodic assessments. However, no guidance was included to assess IOE as discussed in Section M1.7. With the exception of assessing IOE, the guidance for preparing periodic assessments met the requirements of 10 CFR 50.65(a)(3) and the intent of NUMARC 93-01, Sections 12 and 13.5. Two assessments were performed prior to the July 10, 1996, MR implementation date. In general, the information contained in the Cycle 5 assessment was acceptable, although the new guidance required additional program assessments which should improve the process. The Cycle 5 assessment addressed significant changes to the maintenance program for each system. An example of this, providing a means to monitor maintenance activities within the MR program, is discussed in Section M1.4. The review of the Cycle 6 periodic assessment, which will use the revised guidance, is considered an IFI (50-461/98005-03 (DRS)). Although not required by the MR, the licensee also issued monthly reports which contained unavailability data and functional failures for each system to provide management with a continual overview of SSC performance with respect to its criteria.

c. Conclusions

The revised guidance for performing periodic assessments, with one exception, met the requirements of the MR and the intent of the NUMARC implementing guidance. Performing two assessments prior to the July 10, 1996 MR implementation date was proactive. These assessment provided good evaluations of the effect of the MR on the maintenance program.

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

a. Inspection Scope

Paragraph (a)(3) of the MR requires that adjustments be made where necessary to ensure that the objective of preventing failures through the performance of PM was appropriately balanced against the objective of minimizing unavailability due to monitoring or PM.

b. Observations and Findings

Procedure M.07 provided some guidance for balancing unavailability and reliability for high safety significance SSCs. The procedure required evaluating the balance between unavailability and reliability and recommending changes to maintenance activities to optimize performance. The procedure stated that performance criteria should be set such that staying within their limits was considered achieving a balance between reliability and availability. This was an acceptable method. As identified in the March 1998, independent assessment, the guidance for how the balancing process was to be implemented was not well-defined. The licensee was in the process of proposing changes to the MR procedure that would expand the guidance and criteria for balancing unavailability and reliability.

The Cycle 5 periodic assessment concluded for systems that met their performance criteria, that unavailability and reliability were balanced. As part of the assessment, the licensee reviewed changes in maintenance, operation, and design to determine any effect on the MR program for that system. For example, the unavailability of the reactor core isolation cooling system was within 10 hours of exceeding the unavailability performance criterion, while experiencing zero functional failures during the same cycle. The licensee recommended revising the frequency of a lubrication PM from a 6-month to a 9-month schedule. While this approach was a good initiative to optimize OOS time due to PMs to ensure a proper balance, no benefit had been gained because 2 years later the proposed PM frequency still had not been implemented.

c. Conclusions

The process for balancing unavailability and reliability was considered acceptable, although not well-defined. The optimization of PM frequency was a good process to reduce unavailability and achieve an appropriate balance, but recommendations were not always implemented.

M1.5 (a)(3) On-line Maintenance Risk Assessments

a. Inspection Scope

Paragraph (a)(3) of the MR specified that when removing plant equipment from service the overall effect on performance of safety functions be taken into account. The guidance contained in NUMARC 93-01 required that an assessment method be developed to ensure that overall plant safety function capabilities were maintained when removing SSCs from service for PM or monitoring. The inspectors reviewed the procedures and discussed the process with the PRA engineers and the work control group.

b. Observations and Findings

The October 1997 QA audit found that ongoing assessments were not performed for the total plant equipment that was OOS to determine the overall effect on performance of safety functions when performing monitoring and PM activities. This conclusion was based on the lack of adequate procedural guidance to assess risk. Subsequently, the licensee began developing a configuration risk management program. It appeared, however, that the licensee did not seriously consider the importance of risk assessment until the February 1998 loss of shutdown cooling event. Because of this event and because the plant was in an 18-month extended shutdown period, the initial licensee focus was on Mode 4 evolutions. Procedure CPS No. 1151.09, "Methodology for Outage Safety Reviews and Maintenance of Acceptable Shutdown Risk," was revised extensively in February 1998, and incorporated the NUMARC 91-06, "Guidelines for Industry Actions to Assess Shutdown management," approach to maintaining adequate defense-in-depth for key safety functions. This procedure was used by work control personnel and operators for both planned and emergent maintenance. This procedure represented a significant improvement in work control.

The PRA group evaluated planned maintenance schedules on a weekly basis, using a risk meter that requantified core damage minimal cutsets from a modified full-power PRA model. This, however, represented only an approximate solution to the problem. Work control personnel clearly expressed a lack of trust in the PRA results, and a concern about the overall ability of the PRA to provide useful information. An additional weakness what that the PRA group did not appear to be an integral part of the work control process.

The licensee planned to upgrade the PRA tools available for configuration risk management, and to revise procedures to address other modes of operation before leaving Mode 4. This is an IFI (50-461/98005-04(DRS)) pending an NRC post-implementation review of the licensee's overall process for configuration risk management.

c. Conclusions

With the exception of the recently revised procedure for risk assessment during Mode 4 evolutions, procedural guidance was inadequate. The processes for assessing plant risk resulting from equipment being OOS for on-line maintenance and for shutdown risk management were weak. The PRA group not being an integral part of the work control process was a program weakness.

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

a. Inspection Scope

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

(a)(1) systems	(a)(2) systems
High Pressure Core Spray	Station Air
Instrument and Control Power	Control Rod Drives
Containment Isolation/Integrity (pseudo)	Standby Liquid Control
Lighting	Component Cooling Water
Feedwater	Actuation Trip Signal Monitoring (pseudo)
Control Room Heating, Ventilation, and Air Conditioning (HVAC)	
Instrument Air	

The inspectors reviewed each of these systems to verify that goals or performance criteria were established in accordance with safety significance, that IOE 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 preventable functional failure (MPFF).

The process to evaluate onsite passive structures for inclusion under the MR was reviewed. Structures evaluated by the inspectors included buildings, enclosures, storage tanks, earthen structures, and passive components and materials housed therein. In addition, the inspectors assessed by what means performance of structures determined to be within scope were monitored for degradation.

b. Observations and Findings

At the time of this inspection, most performance criteria were being revised. The old criteria were based on systems rather than the functions identified during the recent rescoping process. Consequently, the old criteria generally did not correlate with recently identified functions. Of the 61 proposed new criteria for 135 MR systems, only 11 had been approved by the reconstituted expert panel by April 6, 1998. The 11 approved criteria included 10 systems and one pseudo-system (containment isolation). The previously approved plant level criteria remained in effect.

In general, the previously approved performance criteria did not provide an effective means to gauge the effectiveness of preventive maintenance. Most of the old reliability performance criteria had been established as allowing less than three MPFFs over a period of one cycle. Although many of the criteria were revised in 1996 to set an acceptable failure rate that better corresponded with PRA assumptions, many criteria still lacked a technical basis. For example, the old performance criteria for the fuel building ventilation system allowed two functional failures per cycle. However, the active components which had a MR function consisted primarily of four isolation dampers which were tested quarterly. Consequently, the criteria allowed a non-conservative 8.3% failure rate for the dampers. No technical basis for the criteria was provided. In another example, the fuel handing system had an identified function to remain intact during a seismic event. The old criteria allowed two functional failures per cycle; no technical basis was provided for allowing two structural failures per cycle. Other types of criteria problems existed as well. For example, the old performance criteria for the hydrogen igniter system lacked a reliability performance criteria and no justification for the omission was provided even though the system was classified as high safety significance. The old performance criteria for the nuclear boiler system did not address the function of reactor pressure and level indication information for control room operators. The old performance criteria for the standby liquid control system was primarily established at the system rather than train level. Additionally, the old performance criteria for the reactor protection system were not explicitly stated, but relied upon separate analyses. Consequently, it was not clear what the criteria was nor what was being tracked.

10 CFR 50.65(a)(2) states that the monitoring as specified in 10 CFR 50.65(a)(1) is not required where it has been demonstrated that the performance or condition of a SSC is being effectively controlled through the performance of appropriate preventive maintenance, such that, the SSC remains capable of performing its intended function. Contrary to 10 CFR 50.65(a)(2), the licensee had not demonstrated that the performance or condition of SSCs identified above were being effectively controlled through the performance of appropriate preventive maintenance as evidenced by the failure to establish performance criteria with adequate technical basis such that the SSCs should have been monitored in accordance with section (a)(1) and was a violation of 10 CFR 50.65(a)(2). However, based on implementing the guidance of Section VII.B.6, "Violations Involving Special Circumstances," of the "General Statement of Policy and Procedures for NRC Enforcement Actions" (Enforcement Policy), NUREG-1600, a Notice of Violation is not being issued (NCV 50-461/98005-05(DRS)).

b.1 Observations and Findings for Reliability and Unavailability Performance Criteria

The inspectors reviewed the performance criteria to determine if the licensee had adequately set performance criteria consistent with the assumptions used to establish the safety significance. Section 9.3.2 of NUMARC 93-01 recommended that high safety significance SSC performance criteria be set to assure that the availability and reliability assumptions used in the risk determining analysis (i.e., PRA) were maintained.

The inspectors identified problems with many of the recently approved reliability performance criteria. The licensee's approach to establishing reliability goals and performance criteria was to multiply the failure probability from the PRA by the number of demands expected across all similar components associated with a particular function. This gave the expected number of failures over the next cycle. This number was rounded (usually down) to the nearest integer to obtain the reliability goal or performance criterion. This was a departure from the approach outlined in EPRI Technical Bulletin 96-11-01, "Monitoring Reliability for the Maintenance Rule," but was judged to be acceptable, as long as there was a clear basis for the value of the failure probability used in the calculation. This, however, was not always the case. The expert panel misinterpreted the EPRI Technical Bulletin in that the five percent significance level used in the bulletin was taken in error to be a failure probability, and as such was used for SSCs not modeled explicitly in the PRA. This misinterpretation was pointed out to and acknowledged by the licensee during the inspection.

The licensee often used an arbitrary 2.5% or 5.0% component failure rate in determining the number of functional failures to be allowed by reliability performance criteria. However, the failure rates used often exceeded the PRA assumed failure rates for similar components. Additionally, the inspectors noted that the criteria were often based on component failure rates that could result in an unacceptably high failure rate at the train or system level because of the system configuration.

The licensee specified condition monitoring as a supplement to several reliability criteria. The inspectors considered the use of condition monitoring to supplement reliability monitoring, in concept, to be beneficial. However, in most cases, the licensee had not specified what condition monitoring limits would be cause for (a)(1) classification. For example, although condition monitoring activities such as vibration and oil analysis, and monitoring of bearing temperatures were specified for the motor-driven feed pumps, no criteria were specified for when (a)(1) classification should be considered. In another example, condition monitoring was specified for the standby liquid control system, but no condition monitoring activities were delineated nor were criteria were specified. The licensee was aware of the weaknesses with respect to the condition monitoring criteria and was working with engineering personnel to specify appropriate condition monitoring activities with appropriate criteria.

In contrast to the concern with the reliability criteria, the approved availability criteria were good. In several cases, the expert panel chose to use more restrictive unavailability time than that modeled in the PRA to ensure that meeting the criteria reflected effective maintenance. Justifications for high safety significance functions which lacked availability performance criteria were appropriate.

Due to the identified concerns and unapproved performance criteria, a review of approved performance criteria will be performed as follow-up to the NCVs. Specific concerns with the revised performance criteria included the following:

b.1.1 Containment and Reactor Coolant System Isolation Criteria

The licensee had established pseudo-system 97 for containment isolation/integrity and reactor coolant pressure boundary monitoring. Six specific reliability criteria were established for the various portions of the pseudo-system. The performance criterion for containment isolation valves was less than 25 functional failures per fuel cycle. The basis for the criterion was that there were 164 containment isolation valves for

72 containment penetrations. The valves were expected to experience six demands per cycle from surveillance testing, which would result in a total of 984 demands across all of the valves. Using an arbitrary 2.5% component failure rate, the licensee determined that allowing 24 functional failures was acceptable. The inspectors noted that the reliability permitted by the performance criterion would allow at least a 4.2% per demand probability that both an inboard and an outboard isolation valve failure would occur in the same penetration. The PRA generic data assumed a motor-operated valve (MOV) failure rate of 0.3% and the observed component failure rate at the station was only 0.19%. When the issue was brought to the licensee's attention, the licensee agreed that this performance criterion was non-conservative. Similar problems existed with other specific criteria for this pseudo-system.

b.1.2 Instrument Air Criteria

The reliability performance criterion for three functions of the instrument air system was less than four functional failures per cycle. The inspectors considered the criterion acceptable for the two low safety significance functions. However, the criterion was also applied to the high safety significance function of providing air to support the automatic depressurization function. The active components covered by this function consisted primarily of four MOVs, which experienced eight demands per cycle, or a total of 32 demands across the four valves. Consequently, the approved criterion could allow a 9.4% failure rate for the high safety significance function, which was an order of magnitude higher than the failure rate of 0.3% assumed in the PRA for MOVs. When the issue was brought to the licensee's attention, the licensee agreed that this performance criterion was non-conservative.

b.1.3 Emergency Lighting Criteria

The reliability performance criterion for emergency lighting was less than 13 functional failures per cycle, which applied to 27 emergency lighting units (ELUs). In developing the criteria, the licensee assumed that each ELU would experience 18 demands per cycle. However, of the 18 demands, only one demand, an 8-hour discharge test, truly tested the function of the ELUs. The rest of the demands counted were from monthly momentary tests which did not fully test the function of the ELUs. Consequently, the performance criterion could allow a 44% failure rate of the 8-hour discharge test. When the issue was brought to the licensee's attention, the licensee agreed that this performance criterion was non-conservative.

b.2 Observations and Findings for Plant Level Performance Criteria for Low Safety Significance Normally Operating SSCs

The established plant level criteria were: no reactor scrams (automatic or manual), less than 5 safety system actuations, and less than 4% unplanned loss capacity. As part of the QA audit, the licensee had identified that no (a)(1) monitoring was being performed, nor had a corrective action plan been developed to address plant level issues even though all three plant level criteria had been exceeded. In response to the audit finding, a condition report (CR) was initiated (CR 1-98-02-442) that placed plant level performance criteria in (a)(1). Although the licensee was able to identify which equipment and what events caused the plant level criteria to be exceeded, the corrective action plan had not yet been developed.

b.3 Observations and Findings for Goals Established for (a)(1) SSCs

Although 23 systems had been classified as (a)(1), only 9 systems had established goals and planned corrective actions. Many of the 23 systems had been reclassified just prior to or during the inspection in response to additional functional failures identified through engineering reviews. The additional reviews were prompted by the QA audit findings and rescoping effort. In addition, the audit identified that goals and corrective action plans either had not been established or were not adequate for the (a)(1) lighting and leak detection systems. 10 CFR 50.65(a)(1) requires, in part, that the holders of an operating license shall monitor the performance or condition of SSCs within the scope of the rule as defined by 10 CFR 50.65(b) against licensee-established goals, in a manner sufficient to provide reasonable assurance that such SSCs are capable of fulfilling their intended functions. Such goals shall be established commensurate with safety. When the performance or condition of an SSC does not meet established goals, appropriate corrective action shall be taken. Contrary to 10 CFR 50.65(a)(1), the licensee had not established adequate goals when the lighting and leak detection systems were placed in (a)(1). However, based on implementing the guidance of Section VII.B.6, "Violations Involving Special Circumstances," of the "General Statement of Policy and Procedures for NRC Enforcement Actions" (Enforcement Policy), NUREG-1600, a Notice of Violation is not being issued (NCV 50-461/98005-06(DRS)).

As a result of the audit, the (a)(1) goals and corrective action plans in place during this inspection had been recently developed or revised. With the exception of the goals established for pseudo-system 97, the approved goals and corrective action plans were acceptable. The goals for the pseudo-system 97 had reliability performance measures which did not have an adequate technical basis as discussed in Section M1.6.b.1.

Several systems were reclassified as (a)(2) based on improved performance. The bases for (a)(2) classifications, which included allowing no failures during the established monitoring periods, were appropriate.

b.4 Monitoring Against Performance Criteria and Goals

As part of the QA audit, the licensee identified a number of significant problems associated with monitoring against performance criteria and goals. Specifically:

- Identification of MPFFs was not consistent. The QA audit identified two instances where repetitive MPFFs were not identified, and one instance where a functional failure was not evaluated for whether it was maintenance preventable. The audit also identified that documentation to support functional failure determinations was poor. Since the audit, significant engineering effort was devoted to the identification of functional failures which were previously missed.

Despite this effort, the inspectors identified two cases where functional failures had not been identified (Sections M2.1.b.2 and M2.1.b.9).

- Unavailability times were not always identified and tracked. The audit identified several instances where unavailabilities were not captured. During this inspection, the inspectors were unable to evaluate this aspect of the program because unavailability monitoring was not being performed.

- The licensee was not monitoring unavailability for systems which both required unavailability monitoring and were required to be available while shutdown. The licensee was aware that corrective actions for this concern were outstanding.

10 CFR 50.65(a)(1) requires that each licensee monitor the performance or condition of SSCs, against licensee-established goals, in a manner sufficient to provide reasonable assurance that such SSCs, are capable of fulfilling their intended functions. Contrary to the above, the licensee failed to adequately monitor the established goals, which was a violation of 10 50.65(a)(1). However, based on implementing the guidance of Section VII.B.6, "Violations Involving Special Circumstances," of the "General Statement of Policy and Procedures for NRC Enforcement Actions" (Enforcement Policy), NUREG-1600, a Notice of Violation is not being issued (NCV 50-461/98005-07(DRS)).

b.5 Observations and Findings on Structures and Structure Monitoring

The structural monitoring program was delineated in NSED Instruction CS-09, "Monitoring of Significant Structures." This document provided a listing of structures, inspection acceptance criteria, and qualifications for personnel performing the inspections. A checklist containing inspection guidelines and a list of inspection attributes were included as part of CS-09. The program was consistent with current industry practice and met the guidelines in RG 1.160, Revision 2.

The MR structural baseline inspections were considered complete and the results acceptable, except for the recently added containment and drywell structures, which had been previously excluded from CS-09. The additional inspections were to be completed before startup from the current outage. The baseline inspection effectively took credit for recent structural inspections performed by other programs. Discrepancies were identified, documented, evaluated, and appropriate corrective actions initiated as required. However, several maintenance work requests (MWRs) to corrective structural discrepancies were canceled. A CR was initiated to document the canceled MWRs and to track the completion of reinitiated MWRs. There were no structures inspected that were considered degraded. The inspectors' walkdown of selected structures did not find any structural deficiencies that had not been previously identified during the baseline inspection.

c. Conclusions

Previously established performance criteria were ineffective for gauging effectiveness of preventive maintenance. Many of the recently approved reliability performance criteria were also inappropriate and the majority of the performance criteria was yet to be approved. Unavailability performance criteria was more restrictive than that modeled in the PRA to ensure that meeting the criteria reflected effective maintenance. Monitoring of reliability and availability against performance criteria and goals was not adequate; functional failures were not identified by the program process and unavailability was not always monitored, especially during shutdown.

In the past, goals and corrective action plans were not developed in all cases when systems were classified as (a)(1). Appropriate goals and corrective action plans had not yet been developed for many systems recently classified as (a)(1), although those that had been developed were generally acceptable. Reclassifications of systems from (a)(1) to (a)(2) were acceptable and performed with adequate basis.

The structure monitoring program was consistent with current industry guidance and practice. Baseline inspections were essentially complete; deficiencies and the associated resolutions were properly documented.

M1.7 Use of Industry-wide Operating Experience

a. Inspection Scope

Paragraph (a)(1) of the MR states that goals shall be established commensurate with safety and, where practical, taking into account IOE. Paragraph (a)(3) of the MR states that performance and condition monitoring activities and associated goals and PM activities shall be evaluated at least every refueling cycle. The evaluation shall be conducted taking into account IOE. The inspectors reviewed the program to integrate IOE into the MR monitoring program. The MR coordinator, system engineers (SEs), and the industry operating experience information coordinator were interviewed to learn the extent to which they understood the application of IOE information to MR processes.

b. Observations and Findings on Use of Industry-wide Operating Experience

The station's IOE procedure CPS No. 1016.07, "Industry Operating Experience Report Assessment Program," was a guideline for gathering, evaluating, and acting on IOE; however, it did not specify how the IOE was to be used. The fundamental approach was that if a review by group leaders and the IOE coordinator identified a potential issue, then an "Operating Experience Impact Assessment Form," was prepared. Application of IOE to the MR program was not specified in station's IOE procedure.

Procedure M.07 did not discuss the use of IOE for scoping or in the periodic assessment. The inspectors reviewed the Cycle 5 periodic assessment and determined that IOE had not been consistently used during the assessment. The MR coordinator recognized the omission of IOE requirements from M.07 and said a proposed procedure revision fully incorporated IOE requirements. The revision had not been issued at the conclusion of the inspection .

Although the MR program was not formally linked to the station's IOE program, IOE was being used in the MR program. The SEs were aware of the IOE program and how to obtain IOE information. Computer access to IOE from a wide range of sources was available to SEs. However, the use of IOE in the MR activities was not always evident. The March 1998 independent assessment noted that IOE had not been used in setting goals for all (a)(1) systems. The inspectors, however, noted extensive packages of IOE had been provided to SEs for recently revised (a)(1) system plans such that this area of concern appeared resolved. Information from IOE was incorporated into (a)(1) goals and corrective action plans; however, no documentation supporting consideration of IOE in performance criteria was available. The SEs stated this was considered during expert panel meetings.

c. Conclusions for Use of Industry-wide Operating Experience

The station IOE program was not clearly linked to the MR program. The recently revised (a)(1) goals and corrective action plans appropriately considered IOE.

M2 Maintenance and Material Condition of Facilities and Equipment (62706, 71707)

M2.1 General System Review

a. Inspection Scope

The inspectors conducted a detailed examination of several systems from a MR perspective to assess the effectiveness of the program when it was applied to individual systems.

b.1 Observations and Findings for the High Pressure Core Spray System

The high pressure core spray system consisted of seven high safety significance and five low safety significance functions. Most of the functions were monitored by appropriate reliability and/or unavailability criteria. However, the criteria for the instrumentation/trip signals functions had not been approved as they would be monitored by pseudo-system 96 discussed in Section M2.1.b.12. The system had been monitored under (a)(1) for check valve failures. The inspectors reviewed the corrective actions and goals for the (a)(1) monitoring and the expert panel actions to return the system to (a)(2) and found the licensee's actions to be appropriate.

b.2 Observations and Findings for the Instrument and Control Power System

The instrument and control power system consisted of three high safety significance functions and four low safety significance functions. The high safety significance functions were adequately monitored by reliability performance criteria and goals. The system was monitored under (a)(1) as of April 1994, due to fuse failures of the DC power supply. The root cause of the failures was determined to be a problem with the drive board circuit design and degradation of socket-style connections on the drive boards. Although the fuse failures problems were corrected in early 1996, the system recently experienced unexpected reverse transfers, unexpected circuit breakers trips, and circuit card failures. As a result, the system remained in (a)(1). Although some corrective actions were developed, goals were not established for the recent problems.

The licensee did not always consider whether circuit card failures caused by the testing method of the inverters would be considered functional failures. Consequently, the inspectors noted one instance where MPFFs were not properly identified. A June 1997, inverter card failure resulted in loss of equipment functionality, but was not properly evaluated as a functional failure. Because the failure occurred as the result of a maintenance activity (surveillance) an MPFF should have been identified. The licensee preliminarily concluded that the event constituted a MPFF.

b.3 Containment and Reactor Coolant System Isolation Pseudo-System

The licensee had established a pseudo-system 97 for containment and reactor coolant system isolation functions. The functions were classified as high safety significance and were supported by safety-related equipment. As discussed in Section M1.6.b.1.1, the established containment isolation valve reliability criterion was inadequate. Appropriate technical justification was provided for not having availability criteria. Functional failure determinations for this pseudo-system were appropriate.

b.4 Observations and Findings for the Lighting System

The nonsafety-related lighting system consisted of one low safety significance function, which was monitored by a reliability criterion. The performance criterion was changed recently from less than 3 MPFFs to less than 13 functional failures. As discussed in Section M1.6.b.1.3, this criterion was inadequate. The system was properly classified as (a)(1) under the MR program due to exceeding the MPFF performance criterion. The system experienced a 100 percent failure of the emergency lighting batteries. This was caused by a lack of a PM program to change the batteries on a scheduled frequency. In addition, many of the batteries were drained during a September 1997, electrical bus outage that caused the emergency lights to illuminate.

The corrective action was to revise the procedure and applicable checklists to include requirements to turn emergency lighting units off during bus outages. In addition, a PM schedule was developed that would replace the batteries on a periodic basis. The goals and corrective actions for returning the system to (a)(2) were considered acceptable.

b.5 Observations and Findings for the Feedwater (FW) System

The FW system consisted of four high safety significance functions and eight low safety significance functions. The functions were monitored by appropriate reliability and/or unavailability performance criteria. As discussed in Section M1.2.b.2, the inspectors questioned the low safety significance determination for the turbine drive FW pumps. The FW system was recently placed in (a)(1) due to a failure of the FW regulating valve to operate because of an out-of-tolerance hydraulic actuator pressure switch. The system's reliability performance criterion was changed to zero functional failures, which had been exceeded based on the recent historical review. No corrective actions and goals were established for this system because of the recent placement in (a)(1).

b.6 Observations and Findings for the Control Room HVAC System

The control room HVAC system had 12 low safety significance functions. The functions were monitored by appropriate reliability and/or unavailability performance criteria. The system was placed in (a)(1) for repetitive MPFFs of a hydramotor. No corrective actions and goals were established because of the recent system placement in (a)(1).

b.7 Observations and Findings for the Instrument Air System

The instrument air system consisted of five high safety significance and five low safety significance functions. The scoping and boundaries for the system were acceptable; however, the performance criteria for function IA-00 were inadequate as discussed in Section M1.6.b.1.2. The system was recently placed in (a)(1) for repetitive MPFFs on the automatic depressurization system pressure regulating valves. No corrective actions and goals were established because of the recent system placement in (a)(1).

b.8 Observations and Findings for the Service Air System

The service air system consisted of three high safety significance and four low safety significance functions. The functions were monitored by appropriate reliability and/or unavailability performance criteria. The system was (a)(2) and a walkdown revealed good material condition. Functional failure determinations for this system were appropriate.

b.9 Control Rod Drive System

The control rod drive system included both high and low safety-significance functions. The system was monitored by reliability performance criteria. Appropriate justification existed for not having availability performance criteria. This system was being considered (a)(1) classification because of three recently identified functional failures.

b.10 Standby Liquid Control System

The standby liquid control system was a safety-related high safety significance system. The (a)(2) system was appropriately monitored at the train level with both reliability and availability performance criteria. No functional failures were allowed under the reliability criteria and the criteria for train unavailability was consistent with values assumed in the PRA. Functional failure determinations for this system were appropriate.

b.11 Component Cooling Water (CC) System

The CC system was a low safety significance system consisting primarily of nonsafety-related components. The system was monitored by plant level performance criteria because the system was normally operating. Based on discussions with engineering personnel, the CC system provided cooling to fuel pool cooling and cleanup system heat exchangers and pumps. Upon a loss of the nonsafety-related CC cooling, the cooling source could be manually transferred to shutdown service water. To accomplish such a transfer, MOVs in the CC system were required to close to isolate the CC system from the safety-related shutdown service water system. However, this standby function of the CC system had not been explicitly defined among the CC system functions. The licensee acknowledged the issue and planned to develop an additional function with a reliability criteria for monitoring purposes. No functional failures had been misidentified as a result of this omission.

b.12 Observations and Findings for Actuation Trip Signal Monitoring System (96)

The 96 pseudo-system was developed to monitor the performance of actuation trip signals in numerous systems. At the time of inspection, the licensee had not established performance criteria for this system and was in the process of identifying individual functions and critical components to include within the parent function. As such, this system could not be properly assessed at this time.

c. Conclusions for General System Review

In general, SSCs were being properly classified under (a)(1) or (a)(2) of the MR. As a result of the new performance criteria and historical reviews, SSCs classifications were being revised. The inspectors identified several MPFF examples in the SSCs reviewed that were not previously identified. The corrective actions, both in progress and planned, for SSCs in (a)(1) appeared adequate. SSC functions for the systems reviewed were properly scoped under the MR.

M2.2 Material Condition

a. Inspection Scope

In the course of verifying the implementation of the MR using NRC IP 62706, the inspectors performed walkdowns using NRC IP 71707, "Plant Operations," to examine the material condition of the systems listed in Section M1.6.

b. Observations and Findings

With minor exceptions, the systems were free of corrosion, oil leaks, water leaks, trash, and based upon external condition, appeared to be well maintained.

c. Conclusions

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

M7 Quality Assurance in Maintenance Activities (40500)

M7.1 Licensee Self-Assessments of the Maintenance Rule Program

a. Inspection Scope

The inspectors reviewed the October 1997 QA audit and the March 1998 independent assessment performed by a contractor on the MR program implementation.

b. Observations and Findings

These assessments concluded that the MR program was inadequate and that implementation was ineffective. Concerns raised in these assessments and confirmed in this inspection report included: scoping deficiencies, inadequate performance criteria and goals, inadequate risk assessment when removing equipment from service, not monitoring unavailability during shutdown, not effectively monitoring SSC unavailability, inadequate functional failure determinations, the lack of guidance for balancing reliability and unavailability , and not meeting the guidance of RG 1.160, Revision 2. Based on the results of the audit, the licensee developed a Program Improvement Plan, which later evolved into the Plan for Excellence, to address the audit concerns. This appeared to address all the concerns identified during the audit in order to establish a program that met MR requirements. Whether the plan will be effective in implementing an adequate program will be reviewed during a follow-up MR inspection. As a result of the self-assessments, much effort was put forth in reestablishing the expert panel, the rescoping effort, historical reviews, and developing new performance criteria. The use of outside personnel on the QA audit and independent assessment who were knowledgeable of the MR provided insights into the program and added to the effectiveness of the reviews.

c. Conclusions

The assessments identified numerous weaknesses of the MR program and formed the basis for an extensive corrective action program. The use of outside personnel provided independent insights into the MR program and added to the overall quality of the assessments.

III. Engineering

E4 Engineering Staff Knowledge and Performance (62706)

E4.1 System Engineers' Knowledge of the Maintenance Rule

a. Inspection Scope (62706)

The inspectors interviewed SEs to assess their understanding of PRA, the MR, and associated responsibilities.

b. Observations and Findings

The SEs were experienced and knowledgeable about their systems. The SEs MR involvement in the past was inconsistent in that systems were not always properly monitored for unavailability and MPFF determinations were weak. Based on recent training, the SEs had a better understanding of the MR and PRA implications. The SEs used the revised functions to perform historical reviews to identify additional MPFFs not previously identified. However, weaknesses still existed in engineering knowledge with respect to the MR and classifying functional failures. The inspectors noted that the MR program was still evolving and that SEs, in addition to relying upon procedure M.07, had to also be aware of electronic mail and memorandums concerning MR determinations. One SE mistakenly believed that functional failures resulting from operations surveillance activities were not considered maintenance preventable. Because of past history and the evolving program, some SEs did not have much involvement in the development of SSC functions and performance criteria. Consequently, it appeared that SEs were not taking the ownership of the MR program for their assigned systems as envisioned by licensee management.

The SEs responsibilities included tracking the performance of their assigned systems, MPFF determinations, and the preparation of goals and corrective action. M.07 also stated that pipe hangers were included in the function directly supported, however, not all SEs were aware of this responsibility.

c. Conclusions

The SEs were experienced and knowledgeable about their systems and had some understanding of the MR and their responsibilities. However, due to the evolving program, SEs did not appear to take sufficient ownership of the program to ensure effect implementation.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors discussed the progress of the inspection with licensee representatives on a daily basis and presented the inspection results to members of licensee management at the conclusion of the inspection on April 14, 1998. The licensee acknowledged the findings presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary; none was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

G. Baker, Manager, Quality Assurance
J. Barron, Director, Plant Engineering
V. Cwietniewicz, Manager, Maintenance
A. Hable, PRA Engineer
M. Hiter, Quality Assurance
G. Hunger, Manager, CPS
W. Maguire, Director Operations
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M. Norris, Supervisor, Engineering Assurance
T. Parrent, Quality Assurance
W. Romberg, Manager, Nuclear Station Engineering Department
M. Stookey, Licensing
D. Szymkiewicz, Maintenance Rule Coordinator
G. Vandre, Nuclear Station Engineering Department
P. Walberg, PRA Supervisor

LIST OF INSPECTION PROCEDURES USED

IP 62706:	Maintenance Rule
IP 40500:	Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems
IP 71707:	Plant Operations
IP 62002:	Inspection of Structures, Passive Components, and Civil Engineering Features at Nuclear Power Plants

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

50-461/98005-01(DRS)	NCV	Scoping Errors
50-461/98005-02(DRS)	IFI	Risk determination Process
50-461/98005-03(DRS)	IFI	Cycle 6 Periodic Assessment Review
50-461/98005-04(DRS)	IFI	On-line Risk Assessment
50-461/98005-05(DRS)	NCV	Inadequate Performance Criteria
50-461/98005-06(DRS)	NCV	Inadequate Goals
50-461/98005-07(DRS)	NCV	Failure to Monitor Goals

LIST OF ACRONYMS USED

CC	Component Cooling Water
CFR	Code of Federal Regulations
CPS	Clinton Power Station
CR	Condition Report
DC	Direct Current
DRS	Division of Reactor Safety
EA	Enforcement Action
ELU	Emergency Lighting Unit
EPRI	Electric Power Research Institute
FW	Feedwater
HVAC	Heating, Ventilation, and Air Conditioning
IFI	Inspection Follow-up Item
INEEL	Idaho National Engineering and Environmental Laboratory
IOE	Industry-wide Operating Experience
IP	Inspection Procedure
MCMT	Material Condition Management Team
MOV	Motor-operated Valves
MPFF	Maintenance Preventable Functional Failure
MR	Maintenance Rule
MWR	Maintenance Work Request
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
NSED	Nuclear Station Engineering Department
NUMARC	Nuclear Management Resource Council
OOS	Out-of-Service
PM	Preventive Maintenance
PRA	Probabilistic Risk Assessment
QA	Quality Assurance
RG	Regulatory Guide
SE	System Engineer
SSC	Structure, System, or Component
TDRFP	Turbine-driven Reactor Feed Pumps

LIST OF DOCUMENTS REVIEWED

NSED Procedure M.07, "NSED Maintenance Rule Activities," Revision 4, 3/2/98
NSED Instruction CS-09, "Monitoring of Significant Structures," Revision 3, 3/26/98
NSED Instruction CS-02, "Lake Monitoring," Revision 4, 7/13/95
NSED Instruction CS-03, "Dam and Appurtenant Works Monitoring," Revision 6, 7/25/95
NSED Instruction CS-04, "Ultimate Heat Sink Monitoring," Revision 8, 10/11/95
NSED Standard GD (RS) - 18.00, "PRA Review Standard," Revision 1, 2/11/98
NSED Instruction EP - 18, "PRA Applications," Revision 2, 10/3/97
NSED Instruction EP - 10, "Probabilistic Risk Assessment System Files," Revision 7, 11/5/97
CPS No. 1029.05, "Implementation of the Maintenance Rule at CPS," Revision 2, 3/1/98
CPS No. 1029.04, "Conduct of the Material Condition Management Team (MCMT)," Revision 2, 3/1/98
CPS No. 1016.07, "Industry Operating Experience Report Assessment Program," Revision 0, 12/13/97
CPS No. 1014.10, "Removal of Monitored Equipment from Service," Revision 1, 7/9/96
CPS No. 1141.01, "Work Control Program," Revision 1, 6/25/97
CPS No. 1151.04, "Planned Outage Scheduling," Revision 3, 7/25/97
CPS No. 1151.09, "Methodology for Outage Safety Reviews and Maintenance of Acceptable Shutdown Risk," Revision 1, 2/27/98
CPS No. 1016.01, "CPS Condition Reports," Revision 29, 4/11/97
GD(RS)-19.00, "Maintenance Rule Review Standard," Revision 0, 1/4/96
Maintenance Rule Expert Panel Maintenance Rule Charter, Revision 3, 2/9/98
1993 Assessment of Maintenance Effectiveness at Clinton Power Station, 12/14/94
Assessment of Maintenance Effectiveness at Clinton Power Station for Cycle 5
Independent Assessment of Maintenance Implementation at Clinton Power Station, 3/12/98
Q38-97-14, Quality Assurance Audit Report on Maintenance Rule, 10/97
Q38-96-17, Nuclear Assessment Audit Report on Maintenance Rule, 9/96
Emergency Operating Procedure Flow Charts, Revision 23
Clinton Power Station Individual Plant Examination, 9/92
P21-96(03-18)-6, "Maintenance Rule Performance Criteria," 3/18/96
Probability Risk Assessment Update Report, 12/94
Outline of Instruction - PRA and the Maintenance Rule, 8/95
Training for the Expert Review Panel on the PRA Model, Results and Limitations (Outline)
Project Document, "Implementation of the Maintenance Rule at Clinton Power Station," 5/8/96

EA 98-248

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SUBJECT: NRC INSPECTION REPORT NO. 50-461/98005(DRS) AND EXERCISE OF ENFORCEMENT DISCRETION

Dear Mr. MacFarland:

On April 14, 1998, the NRC completed an inspection of your implementation of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," (the maintenance rule) at the Clinton Power Station. The enclosed report presents the results of that inspection.

The Clinton Power Station program for implementing the requirements of the maintenance rule was based on the guidance provided in NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," dated April 1996, which was endorsed in Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," dated March 1997.

Based on the inspection, we concluded that the maintenance rule program at Clinton Power Station did not meet regulatory requirements because of ineffective management oversight during the development and implementation of this program. Due to the extent of the deficiencies, we considered this a programmatic breakdown in implementation of the maintenance rule. There were four areas where deficiencies were noted: (1) required structures, systems, or components were not included within scope; (2) the criteria established to demonstrate the effectiveness of preventative maintenance for certain structures, systems or components were inadequate; (3) goals and corrective actions plans were not established; and (4) performance criteria and goals were not effectively monitored. These deficiencies were self-identified during an October 1997 Quality Assurance audit and subsequent improvement program, and in most of the areas, adequate corrective actions were planned to address the deficiencies. However, a significant portion of the recently approved reliability criteria were still inappropriate, and a majority of the performance criteria was yet to be approved. In addition, although also identified as a concern int he October 1997 audit, the process for assessing risk for taking equipment out-of-service was not addressed seriously until after Clinton's loss of shutdown cooling event in February 1998. Except for the recently revised procedure for risk assessment during Mode 4 evolutions, procedural guidance for this aspect was inadequate.