REGULATORY GUIDE 1.160

(Draft was DG-1051)

MONITORING THE EFFECTIVENESS OF MAINTENANCE AT NUCLEAR POWER PLANTS

A. INTRODUCTION

The NRC published the maintenance rule on July 10, 1991, as Section 50.65, “Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” of 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities.” The NRC's determination that a maintenance rule was needed arose from the conclusion that proper maintenance is essential to plant safety. As discussed in the regulatory analysis for this rule,[1] there is a clear link between effective maintenance and safety as it relates to such factors as the number of transients and challenges to safety systems and the associated need for operability, availability, and reliability of safety equipment. In addition, good maintenance is also important in providing assurance that failures of other than safety-related structures, systems, and components (SSCs) that could initiate or adversely affect a transient or accident are minimized. Minimizing challenges to safety systems is consistent with the NRC's defense-in-depth philosophy. Maintenance is also important to ensure that design assumptions and margins in the original design basis are maintained and are not unacceptably degraded. Therefore, nuclear power plant maintenance is clearly important in protecting public health and safety.

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[1]NRC Memorandum to All Commissioners from J. Taylor on "Maintenance Rulemaking," June 27, 1991. Copies are available for inspection or copying for a fee from the NRC Public Document Room at 2120 L Street, NW., Washington, DC; the PDR's mailing address is Mail Stop LL-6, Washington, DC 20555; phone (202)634-3273; fax (202)634-3343.

Paragraph (a)(1) of 10 CFR 50.65 requires that power reactor licensees 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. Such goals are to be established commensurate with safety and, where practical, take into account industry-wide operating experience. When the performance or condition of an SSC does not meet established goals, appropriate corrective action must be taken. For a nuclear power plant for which the licensee has submitted the certifications specified in 10 CFR 50.82(a)(1) (i.e., plants undergoing decommissioning), Paragraph (a)(1) of 10 CFR 50.65 applies only to the extent that the licensee must monitor the performance or condition of all SSCs associated with storing, controlling, and maintaining spent fuel in a safe condition, in a manner sufficient to provide reasonable assurance that such SSCs are capable of fulfilling their intended functions.[2]

[2]The specific requirements for decommissioning plants became effective August 28, 1996. See 61 FR 39278, July 19, 1996, "Decommissioning of Nuclear Power Reactors."

Paragraph (a)(2) of 10 CFR 50.65 states that monitoring as specified in Paragraph (a)(1) is not required where it has been demonstrated that the performance or condition of an SSC is being effectively controlled through the performance of appropriate preventive maintenance, such that the SSC remains capable of performing its intended function.

Paragraph (a)(3) of 10 CFR 50.65 requires that performance and condition monitoring activities and associated goals and preventive maintenance activities be evaluated at least every refueling cycle provided the interval between evaluations does not exceed 24 months. The evaluations must be conducted taking into account, where practical, industry-wide operating experience. Adjustments must be made where necessary to ensure that the objective of preventing failures of SSCs through maintenance is appropriately balanced against the objective of minimizing unavailability of SSCs because of monitoring or preventive maintenance. In performing monitoring and preventive maintenance activities, an assessment of the total plant equipment that is out of service should be taken into account to determine the overall effect on performance of safety functions.

Paragraph (b) of 10 CFR 50.65 states that the scope of the monitoring program specified in Paragraph (a)(1) is to include safety-related and nonsafety-related SSCs as follows.

(1) Safety-related structures, systems, or components 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 guidelines in 10 CFR 50.34(a)(1) or 100.11 of this chapter, as applicable.[3]

[3]This Paragraph (b)(1) of the maintenance rule was changed in the final rulemaking for "Reactor Site Criteria Including Seismic and Earthquake Engineering Criteria for Nuclear Power Plants," December 11, 1996. See 61 FR 65157.

(2) Nonsafety-related structures, systems, or components:

(i) That are relied upon to mitigate accidents or transients or are used in plant emergency operating procedures (EOPs); or

(ii) Whose failure could prevent safety-related structures, systems, and components from fulfilling their safety-related function; or

(iii) Whose failure could cause a reactor scram or actuation of a safety-related system.

Paragraph (c) of 10 CFR 50.65 states that the rule provisions are to be implemented by licensees no later than July 10, 1996.

This Regulatory Guide 1.160 is being revised to endorse Revision 2 of NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"[4] (April 1996), which has been updated by the Nuclear Energy Institute. The regulatory guidance is intended to provide flexibility for a licensee to structure its maintenance program in accordance with the safety significance of those SSCs within the scope of the rule.

[4]This document is available for inspection or copying for a fee in the NRC Public Document Room, 2120 L Street NW. , Washington, DC; the PDR's mailing address is Mail Stop LL-6, Washington, DC 20555; phone (202)634-3273; fax (202)634-3343.

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B. DISCUSSION

OBJECTIVE

The objective of 10 CFR 50.65 (referred to hereafter as the maintenance rule or the rule) is to require monitoring of the overall continuing effectiveness of licensee maintenance programs to ensure that (1) safety-related and certain nonsafety-related SSCs are capable of performing their intended functions and (2) for nonsafety-related equipment, failures will not occur that prevent the fulfillment of safety-related functions, and failures resulting in scrams and unnecessary actuations of safety-related systems are minimized.

DEVELOPMENT OF INDUSTRY GUIDELINE, NUMARC 93-01

The nuclear industry developed a document, NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants" (May 1993),[4] that provides guidance to licensees regarding implementation of the maintenance rule. This document was prepared by NUMARC. A verification and validation (V&V) effort was conducted by NUMARC, with NRC staff observation, to test the guidance document on several representative systems. A number of changes were made to the NUMARC guidance document based on the results of the V&V effort. The NRC staff reviewed this document and found that it provided acceptable guidance to licensees. In June 1993, the NRC staff issued Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," which endorsed the May 1993 version of NUMARC 93-01. In January 1995, the NRC staff issued Revision 1 to Regulatory Guide 1.160 to reflect the amendment to 10 CFR 50.65(a)(3) that changed the requirement for performing the periodic evaluation from annually to once per refueling cycle, not to exceed 24 months between evaluations.

From September 1994 to March 1995, the NRC staff performed a series of nine pilot site visits to verify the usability and adequacy of the draft NRC maintenance rule inspection procedure and to determine the strengths and weaknesses of the implementation of the rule at each site that used the guidance provided in NUMARC 93-01. The findings are described in NUREG-1526, "Lessons Learned from Early Implementation of the Maintenance Rule at Nine Nuclear Power Plants"[5] (June 1995). The NRC staff concluded that the requirements of the rule could be met more consistently across the industry if some clarifying guidance was added to NUMARC 93-01 to address the findings noted in NUREG-1526. The NRC staff met with industry representatives in a series of public meetings to discuss proposed revisions to NUMARC 93-01 that would address the findings noted during the site visits. Revision 2 to NUMARC 93-01 (April 1996) resulted from these meetings.

[5]Copies are available at current rates from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20402-9328 (telephone (202)512-2249); or from the National Technical Information Service by writing NTIS at 5285 Port Royal Road, Springfield, VA 22161. Copies are available for inspection or copying for a fee from the NRC Public Document Room at 2120 L Street NW., Washington, DC; the PDR's mailing address is Mail Stop LL-6, Washington, DC 20555; telephone (202)634-3273; fax (202)634-3343.

PLANT, SYSTEM, TRAIN, AND COMPONENT MONITORING LEVELS

The extent of monitoring may vary from system to system depending on the system's importance to safety. Some monitoring at the component level may be necessary; however, it is envisioned that most of the monitoring could be done at the plant, system, or train level. SSCs with high safety significance and standby SSCs with low safety significance should be monitored at the system or train level. Except as noted in the Regulatory Position of this guide, normally operating SSCs with low safety significance may be monitored through plant-level performance criteria, including unplanned scrams, safety system actuations, or unplanned capability loss factors. For SSCs monitored in accordance with 10 CFR 50.65(a)(1), additional parameter trending may be necessary to ensure that the problem that caused the SSC to be placed in the Paragraph (a)(1) category is being corrected.

USE OF EXISTING LICENSEE PROGRAMS

The NRC staff encourages licensees to use, to the maximum extent practicable, activities currently being conducted, such as technical specification surveillance testing, to satisfy monitoring requirements. Such activities could be integrated with, and provide the basis for, the requisite level of monitoring. Consistent with the underlying purposes of the rule, maximum flexibility should be offered to licensees in establishing and modifying their monitoring activities.

USE OF RELIABILITY-BASED PROGRAMS

Licensees are encouraged to consider the use of reliability-based methods for developing the preventive maintenance programs covered under 10 CFR 50.65(a)(2); however, the use of such methods is not required.

SAFETY SIGNIFICANCE CATEGORIES

The maintenance rule requires that goals be established commensurate with safety. In order to implement this requirement, NUMARC 93-01 established two safety significance categories, "risk-significant" and "non-risk-significant." The process for placing SSCs in either of these two categories is described in section 9.0 of NUMARC 93-01. The statements of consideration for the rule use the terms "more risk-significant" and "less risk-significant." NRC inspection procedure (IP) 62706[4] uses the terms "high safety significance" and "low safety significance." After discussions with industry representatives, the NRC staff has determined that the preferred terminology is "high safety significance" and "low safety significance." Some licensees may elect to define other safety significance categories or may elect to define more than two categories, which would be acceptable if these alternative categories are defined in the licensee's procedures and used in a consistent manner.

SAFETY SIGNIFICANCE RANKING METHODOLOGY

The NRC staff endorses the use of the SSC safety significance ranking methodology described in Revision 2 (April 1996) of NUMARC 93-01 as an acceptable method for meeting the requirements of the maintenance rule.[6] However, because of some unique aspects of the maintenance rule, including the fact that standby SSCs of low safety significance are treated the same as SSCs of high safety significance, this endorsement for purposes of the maintenance rule should not be construed as an endorsement for other applications. These issues were discussed in SECY 95-265, "Response to August 9, 1995, Staff Requirements Memorandum Request to Analyze the Generic Applicability of the Risk Determination Process Used in Implementing the Maintenance Rule."[4]

[6]The staff is developing guidance that addresses the acceptable criteria for the use of PRAs in risk-informed regulatory matters. The NRC staff anticipates that a future revision to this Regulatory Guide 1.160 would reference the guidance, when available, to make the NRC staff's guidance on the use of PRA in the maintenance rule consistent with the NRC staff's guidance in other areas of risk-informed regulation. The industry will be encouraged to use this guidance at that time.

APPLICABILITY OF APPENDIX B TO 10 CFR PART 50

With regard to the scope of the maintenance rule, as stated in Paragraph (b) of the rule, it is understood that balance of plant (BOP) SSCs may have been designed and built with normal industrial quality and may not meet the standards in Appendix B to 10 CFR Part 50. It is not the intent of the NRC staff to require licensees to generate paperwork to document the basis for the design, fabrication, and construction of BOP equipment (i.e., BOP equipment need not meet the requirements of Appendix B to 10 CFR Part 50).

Each licensee's maintenance efforts should minimize failures in both safety-related and BOP SSCs that affect safe operation of the plant. The effectiveness of maintenance programs should be maintained for the operational life of the facility.

SWITCHYARD MAINTENANCE ACTIVITIES

As noted in the Regulatory Position of this guide, there may be a need to address maintenance activities that occur in the switchyards that could directly affect plant operations. Plant management should be aware of and have the ability to control these activities.

EMERGENCY DIESEL GENERATORS

Industry- and NRC-sponsored probabilistic risk analyses (PRAs) have shown the safety significance of emergency ac power sources. The station blackout rule (10 CFR 50.63) required plant-specific coping analyses to ensure that a plant could withstand a total loss of ac power for a specified duration and to determine appropriate actions to mitigate the effects of a total loss of ac power. During the station blackout reviews, most licensees: (1) made a commitment to implement an emergency diesel generator (EDG) reliability program in accordance with NRC regulatory guidance but reserved the option to later adopt the outcome of Generic Issue B-56 resolution, and (2) stated that they had or will implement an equivalent program. Subsequently, utilities docketed commitments to maintain their selected target reliability values (i.e., maintain the emergency diesel generator target reliability of 0.95 or 0.975). Those values could be used as a goal or as a performance criterion for emergency diesel generator reliability under the maintenance rule.

Emergency diesel generator unavailability values were also assumed in plant-specific individual plant examination (IPE) analyses. These values should be compared to the plant-specific emergency diesel generator unavailability data regularly monitored and reported as industry-wide plant performance information. These values could also be used as the basis for a goal or performance criterion under the maintenance rule. In addition, in accordance with Paragraph (a)(3) of the rule, licensees must periodically balance unavailability and reliability of the emergency diesel generators.

C. REGULATORY POSITION

1. NUMARC 93-01

Revision 2 of NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,"[4] provides methods that are acceptable to the NRC staff for complying with the provisions of 10 CFR 50.65 with the following provisions and clarifications.

1.1 Scope of the Rule

1.1.1 "Could Cause" Criterion

During the nine pilot site visits, the NRC staff recognized that some licensees interpreted the words in section 8.2.1.5 of NUMARC 93-01 to mean that only those SSCs that had actually caused a plant scram or safety system actuation needed to be included within the scope of the rule. The NRC staff's position is that the SSCs to be included under the criterion "could cause a reactor scram or actuation of a safety system" should not be limited to SSCs that "did cause" or ``could likely cause.'' This position was discussed in NUREG-1526, "Lessons Learned from Early Implementation of the Maintenance Rule at Nine Nuclear Power Plants" (June 1995).[5] Licensees should consider the following SSCs to be within the scope of the rule.

1. SSCs whose failure has caused a reactor scram or actuation of a safety-related system at their site.

2. SSCs whose failure has caused a reactor scram or actuation of a safety-related system at a site with a similar configuration.

3. SSCs identified in the licensee's analysis (e.g., FSAR, IPE) whose failure would cause a reactor scram or actuation of a safety-related system.

The only exception to items 2 and 3 above would be a licensee who has demonstrated by an analysis (e.g., FSAR, IPE) and by operational experience that the design or configuration of an SSC is fault-tolerant through redundancy or installed standby spares such that a reactor scram or actuation of a safety-related system is implausible. In these cases, the licensee may exclude the SSC from the scope of the rule.

1.1.2 SSCs Relied Upon To Mitigate Accidents or Transients or Used in Emergency Operating Procedures

Nonsafety-related SSCs that are relied upon to mitigate accidents or transients or that are used in emergency operating procedures (EOPs) are included in the scope of the rule by 10 CFR 50.65(b)(2)(i). NUMARC 93-01 states that only those SSCs that provide a significant fraction of the mitigating function need to be included in the scope of the rule. The NRC staff considers this to mean that SSCs that are directly used to address the accident or transient or explicitly used in the EOPs are within the scope of the rule, as are SSCs whose use is implied and that provide a significant fraction of the mitigating function. Examples of SSCs that should be considered include communications and emergency lighting systems, which are necessary to successfully mitigate accidents and transients and to use the EOPs, although they may not directly address the accident or transient, or not be explicitly mentioned in the EOPs.

1.1.3 Function Versus System

The rule provides criteria to determine which SSCs must be included within the scope of the rule. Alternatively, licensees may use a functional basis to determine which SSCs must be monitored within the scope of the rule. That is, the licensee may determine all the functions performed by the SSCs and include within the scope of the maintenance rule only those functions, and the associated SSCs that fulfill those functions, that meet the scoping criteria of the rule.

1.1.4 Systems with Multiple Design Functions

For systems that have multiple design functions, the NRC staff's position is that some design functions may be within the scope of the maintenance rule while others may be outside the scope of the rule. Failures of components that affect a design function that is within the scope of the maintenance rule would require corrective action and monitoring under the rule. For example, the components (piping, pumps, and valves) in the high-pressure coolant injection system (HPCI) that are needed to perform the design function (injection of high-pressure water into the reactor) would be included within the scope of the rule because this is a safety-related function of the system. However, the components that are only used for testing (e.g., test loop, sample valves, bypass valves) might be excluded from the scope of the rule unless they meet another scoping criterion (e.g., if they could cause failure of a safety-related SSC), because these components are not required for the coolant injection function of the HPCI.

1.2 Definition of Maintenance

For the purposes of the maintenance rule, maintenance activities are as described in the "Final Commission Policy Statement on Maintenance of Nuclear Power Plants."[7] This definition is very broad and includes all activities associated with the planning, scheduling, accomplishment, post-maintenance testing, and return-to-service activities for surveillances and preventive and corrective maintenance. These activities are considered maintenance regardless of which organization performs the activity (e.g., maintenance, operations, contractors). This definition is referenced in NUMARC 93-01. Some licensees have questioned the guidance because in section 9.4.5 of NUMARC 93-01 an example of a failure that is not a maintenance-preventable functional failure (MPFF) is "failures due to operational errors...." The operational errors referred to in that example are those that are not associated with a maintenance activity.

[7]53 FR 9430, March 23, 1988.

An example of an operator action that would not be an MPFF would be improper closure of a valve while filling a tank that results in a pump trip followed by a reactor trip. An example of an operator action that would be an MPFF could be when an operator failed to reopen a suction valve for a pump following post-maintenance testing and the closed suction valve caused pump failure during a subsequent demand.

1.3 Timeliness

NUMARC 93-01 states that activities such as cause determinations and moving SSCs from the (a)(2) to the (a)(1) category must be performed in a "timely" manner. Some licensees have requested that the NRC staff provide a specific period that would be considered "timely." To

be consistent with the intent of the maintenance rule to provide flexibility to licensees, the NRC staff does not consider it appropriate to provide a specific timeliness criterion. Licensees are to undertake and accomplish activities associated with the maintenance rule in a manner commensurate with the safety significance of the SSC and the complexity of the issue being addressed.

1.4 MPFFs as an Indicator of Reliability

NUMARC 93-01 states that performance criteria for SSCs of high safety significance should be established to assure that reliability and availability assumptions used in the plant-specific safety analysis are maintained or adjusted. NUMARC 93-01 further allows the use of MPFFs as an indicator of reliability. The maintenance rule requires that the performance of SSCs be monitored commensurate with safety; however, the maintenance rule does not require that the assumptions in the safety analysis be validated. Licensees who choose to use their safety analyses as described in NUMARC 93-01 must be able to demonstrate how the number of MPFFs allowed per evaluation period is consistent with the assumptions in the risk analysis. For standby SSCs, this would require, at a minimum, a reasonable estimate of the number of demands during that time period.

If a licensee desires to establish a reliability performance criterion that is not consistent with the assumptions used in the risk analysis, adequate technical justification for the performance criterion must be provided. For some SSCs, an MPFF performance criterion may be too small to be effectively monitored and trended as required by the rule. In these cases, the licensee should establish performance or condition monitoring criteria that can be monitored and trended so that the licensee can demonstrate that maintenance is effective.

1.5 Monitoring Structures

The maintenance rule does not treat structures differently from systems and components. Experience with the rule and NUMARC 93-01 during the pilot site visits and the initial period following the effective date of the rule indicated that specific guidance for monitoring the effectiveness of maintenance for structures was needed, as structures present a different situation than do systems and components. The primary difficulty in implementing the rule for structures using NUMARC 93-01 was in establishing appropriate criteria for performance and monitoring structures under Paragraph (a)(1) instead of Paragraph (a)(2).

The effectiveness of maintenance can be monitored by using performance criteria or goals, or by condition monitoring. While it is acceptable to use performance criteria or goals, most licensees have found it more practical to use condition monitoring for structures. With certain exceptions (e.g., primary containment), structures do not have unavailability, and rarely have demands placed on their safety significant functions (e.g., maintain integrity under all relevant design basis events), which makes reliability monitoring impractical.

An acceptable structural monitoring program for the purposes of the maintenance rule should have the following attributes.

- Consistent with the NUMARC 93-01 approach for systems and components, most structures would be monitored in accordance with Paragraph (a)(2), provided there is not significant degradation of the structure.

- The condition of all structures within the scope of the rule would be assessed periodically. The appropriate frequency of the assessments would be commensurate with the safety significance of the structure and its condition.

- Licensees would evaluate the results of the assessments to determine the extent and rate of any degradation of the structures. Deficiencies would be corrected in a timely manner commensurate with their safety significance, their complexity, and other regulatory requirements.

- A structure would be monitored in accordance with Paragraph (a)(1) if either (1) degradation is to the extent that the structure may not meet its design basis or (2) the structure has degraded to the extent that, if the degradation were allowed to continue uncorrected until the next normally scheduled assessment, the structure may not meet its design basis. The structure would continue to be monitored in accordance with Paragraph (a)(1) until the degradation and its cause have been corrected.

- For structures monitored in accordance with Paragraph (a)(1), there would be additional degradation-specific condition monitoring and increased frequency of assessments until the licensee's corrective actions are complete and the licensee is assured that the structure can fulfill its intended functions and will not degrade to the point that it cannot fulfill its design basis.

Consistent with the intent of the rule, licensees should use their existing structural monitoring programs (e.g., those required by other regulations or codes) to the maximum extent practical.

1.6 Definition of Standby

In NUMARC 93-01, standby SSCs of low safety significance must have SSC-specific performance criteria or goals, similar to SSCs of high safety significance. NUMARC 93-01 provides a definition of standby. Some licensees have improperly interpreted this definition as meaning that SSCs that are energized are normally operating. As stated in NUMARC 93-01, if the SSC only performs its intended function when initiated by either an automatic or manual demand signal, the SSC is in standby.

Normally operating SSCs are those whose failure would be readily apparent (e.g., a pump failure results in loss of flow that causes a trip). Standby SSCs are those whose failure would not become apparent until the next demand, actuation, or surveillance. Only those SSCs of low safety significance, whose failure would be readily apparent (because they are normally operating), should be monitored by plant-level criteria.

SSCs may have both normally operating and standby functions. In order to adequately monitor the effectiveness of maintenance for the SSCs associated with standby functions, licensees should develop SSC-specific performance criteria or goals, or condition monitoring.

1.7 Normally Operating SSCs of Low Safety Significance

1.7.1 Cause Determinations

For all SSCs that are being monitored using plant-level performance criteria (i.e., normally operating SSCs of low safety

significance), the NRC staff's position is that a cause determination is required whenever any of these performance criteria are exceeded (failed) in order to determine which SSC caused the criterion to be exceeded or whether the failure was a repetitive MPFF. As part of the cause determination, it would also be necessary to determine whether the SSC was within the scope of the maintenance rule and, if so, whether corrective action and monitoring (tracking, trending, goal setting) under 10 CFR 50.65(a)(1) should be performed.

1.7.2 Unplanned Manual Scrams

In order to monitor the effectiveness of maintenance for those SSCs monitored by plant-level criteria, NUMARC 93-01 recommends that only those scrams that are automatically initiated be counted. The NRC staff's position is that all unanticipated scrams be considered, including those scrams that are manually initiated in anticipation of an automatic scram. The purpose of this is not to discourage manual trips but rather to ensure that operators do not mask a maintenance performance issue. If ineffective maintenance is forcing plant shutdowns, whether the trip is initiated automatically or manually should not affect how licensees address the maintenance performance issue under the maintenance rule.

1.7.3 Establishing SSC-Specific Performance Criteria

The maintenance rule requires that licensees monitor the effectiveness of maintenance for all SSCs within the scope of the rule. NUMARC 93-01 allows licensees to monitor SSCs of low safety significance with plant-level criteria. NUMARC 93-01 notes that some normally operating SSCs of low safety significance cannot be practically monitored by plant-level criteria. Licensees must ensure that the plant-level criteria established do effectively monitor the maintenance performance of the normally operating SSCs of low safety significance, or they should establish SSC-specific performance criteria or goals or use condition monitoring.

For example, a licensee determined that the rod position indication system and the spent fuel pool pit cooling system were within the scope of the maintenance rule because they were safety-related at the licensee's site. None of the three plant-level performance criteria described in NUMARC 93-01 (unplanned automatic scrams, unplanned capability loss factor, or unplanned safety system actuations) would monitor the effectiveness of maintenance on these systems. Therefore, additional plant-level performance criteria or system-specific performance criteria must be established.

1.8 Clarification of MPFFs Related to Design Deficiencies

The third paragraph of Section 9.4.5 of NUMARC 93-01 provides guidance on the licensee's options following a failure and on whether, as a result of the licensee's corrective actions, subsequent failures would be considered MPFFs. In particular, this paragraph addresses failures caused by design deficiencies. Ideally, licensees would make design modifications to eliminate the poorly designed equipment. However, if the licensee determines that such an approach is not cost effective (e.g., the cost of modification is prohibitive), the licensee has two options:

(1) Replace or repair the failed equipment and make adjustments to the preventive maintenance program as necessary to prevent recurrence of the

failure. Subsequent failures of the same type that are caused by inadequate corrective or preventive maintenance would be MPFFs, and could be repetitive MPFFs.

(2) Perform an evaluation that demonstrates that the equipment can be run to failure (as described in Section 9.3.3 of NUMARC 93-01). If the equipment can be run to failure, the licensee can replace or repair the failed equipment, but adjustments to the preventive maintenance program are not necessary and subsequent failures would not be MPFFs.

1.9 SSCs Considered Under 10 CFR 50.65(a)(1)

Paragraph (a)(1) of the maintenance rule requires that goal setting and monitoring be established for all SSCs within the scope of the rule except for those SSCs whose performance or condition is adequately controlled through the performance of appropriate preventive maintenance as described in Paragraph (a)(2) of the rule. In NUMARC 93-01, all SSCs are initially placed under Paragraph (a)(2) and are only moved under Paragraph (a)(1) if experience indicates that the performance or condition is not adequately controlled through preventive maintenance as evidenced by the failure to meet a performance criterion or by experiencing a repetitive MPFF. Therefore, the Paragraph (a)(1) category could be used as a tool to focus attention on those SSCs that need to be monitored more closely. It is possible that no (or very few) SSCs would be handled under the requirements of Paragraph (a)(1). However, the rule does not require this approach. Licensees could also take the approach that all (or most) SSCs would be handled under Paragraph (a)(1) of the rule and none (or very few) would be considered under Paragraph (a)(2) of the rule. Licensees may take either approach.

During the pilot site visits, licensees questioned whether a large number of SSCs monitored under Paragraph (a)(1) would be used by the NRC as an indicator of poor maintenance performance. The NRC staff assured the licensees that NRC management would not use the number of SSCs monitored under Paragraph (a)(1) as an indicator of maintenance performance nor would it be used in determining the systematic assessment of licensee performance (SALP) grade in the maintenance area. The number of SSCs monitored under Paragraph (a)(1) can vary greatly because of factors that have nothing to do with the quality of the licensee's maintenance activities. For example, two identical plants with equally effective maintenance programs could have different numbers of SSCs monitored under Paragraph (a)(1) because of differences in the way system boundaries were defined (a system with three trains may be defined as one system at one plant while the same system may be defined as three separate systems at an identical plant) or because of differences in the way performance criteria were defined at the two plants (a licensee who takes a very conservative approach to monitoring against the performance criteria would have more SSCs in the (a)(1) category). The NRC staff also cautioned licensee managers that they should not view the number of SSCs in the (a)(1) category as an indicator of performance since that attitude might inhibit the licensees' staff from monitoring an SSC under Paragraph (a)(1) when a performance criterion has been exceeded or a repetitive MPFF has occurred. If there is some doubt about whether a particular SSC should be monitored under Paragraph (a)(1) or Paragraph (a)(2), the conservative approach would be to monitor the SSC under Paragraph (a)(1).

1.10 Use of Other Methods

Licensees may use methods other than those provided in Revision 2 of NUMARC 93-01 to meet the requirements of the maintenance rule, but the NRC will determine the acceptability of other methods on a case-by-case basis.

2. OTHER DOCUMENTS REFERENCED IN NUMARC 93-01

NUMARC 93-01 references other documents, but NRC's endorsement of NUMARC 93-01 should not be considered an endorsement of the referenced documents.

3. INCLUSION OF ELECTRICAL DISTRIBUTION EOUIPMENT

The monitoring efforts under the maintenance rule, as defined in 10 CFR 50.65(b), encompass those SSCs that directly and significantly affect plant operations, regardless of what organization actually performs the maintenance activities. Maintenance activities that occur in the switchyard can directly affect plant operations; as a result, electrical distribution equipment out to the first inter-tie with the offsite distribution system (i.e., equipment in the switchyard) should be considered for inclusion as defined in 10 CFR 50.65(b).

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants and licensees regarding the NRC staff's plans for using this regulatory guide.

Except in those cases in which an applicant or licensee proposes an acceptable alternative method for complying with specified portions of the NRC's regulations, the methods described in this guide will be used in the evaluation of the effectiveness of maintenance activities of licensees who are required to comply with 10 CFR 50.65. The guide will also be used to evaluate the effectiveness of emergency diesel generator maintenance activities associated with compliance with 10 CFR 50.63.

REGULATORY AND BACKFIT ANALYSES

Separate regulatory and backfit analyses were not prepared for this Revision 2 of Regulatory Guide 1.160. The regulatory analysis and the backfit analysis that were prepared when this guide was first issued as a draft, DG-1020, in November 1992, are still applicable. The backfit analysis prepared for DG-1020 concluded that no backfit was associated with the regulatory guide because it was only providing guidance to implement the existing requirements of the maintenance rule. The Commission determined, on the basis of the backfit analysis performed for the maintenance rule, "... that backfitting of the requirements in the maintenance rule will provide a substantial increase in the level of protection of public health and safety beyond that currently provided by the Commission's regulations, and that the costs of implementing the rule are justified in view of this increased protection."* The regulatory analysis and backfit analysis for DG-1020 are available, in the file for Regulatory Guide 1.160, for inspection or copying for a fee in the Commission's Public Document Room, 2120 L Street NW., Washington, DC; the PDR's mailing address is Mail Stop LL-6, Washington, DC 20555: phone (202)634-3273; fax (202)634-3343.

*56 FR 31320