July 2, 1998

FOR: The Commissioners

FROM: L. Joseph Callan /s/
Executive Director for Operations

SUBJECT: PROPOSED REVISION TO 10 CFR 50.65(a)(3) TO REQUIRE LICENSEES TO PERFORM SAFETY ASSESSMENTS

PURPOSE:

To obtain the Commission's approval to publish a proposed rule in the *Federal Register* that would amend 10 CFR 50.65 to require that licensees assess the impact on safety before removing equipment from service for maintenance.

BACKGROUND:

The maintenance rule, 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," was issued on July 10, 1991, and became effective on July 10, 1996. The staff has periodically submitted papers and presented briefings to the Commission on the status of the maintenance rule. On March 4, 1997, the staff submitted SECY-97-055, "Maintenance Rule Status, Results, and Lessons Learned," and briefed the Commission on March 10, 1997, on that subject. The briefing included a discussion of the following provision of 50.65(a)(3): "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." The Commission and the staff discussed the fact that this provision of the rule is not a requirement because "should" does not impose an obligation to act. The Commission issued a staff requirements memorandum (SRM) on April 11, 1997, directing the staff to consider whether the language regarding the performance of 50.65(a)(3) safety assessments needs to be clarified. In SECY-97-173, "Potential Revision to 10 CFR 50.65(a)(3) of the Maintenance Rule to Require Licensees to Perform Safety Assessments," dated August 1, 1997, the staff recommended revising 50.65(a)(3) and provided three alternatives for clarifying that paragraph. Those alternatives were to (1) make no change, (2) require the paragraph (a)(3) safety assessments, and (3) make comprehensive revisions to paragraph (a)(3) of the rule.

In response to SECY-97-173, the Commission issued an SRM on December 17, 1997, approving, with comments, the staff's recommendation to develop a proposed rule that would amend the maintenance rule to require that licensees take safety assessments into account before performing maintenance activities. More specifically, the Commission directed the staff to (1) add an introductory sentence to 10 CFR 50.65 to clarify that the rule applies under all conditions of operation, including normal shutdown; (2) make editorial corrections to the third sentence of paragraph (a)(3); and (3) delete the last sentence of paragraph (a)(3), and create a new paragraph, (a)(4). The new paragraph (a)(4) would change "should" to "shall" regarding the performance of safety assessments; expand the scope of the requirement for performing those assessments to include all planned maintenance activities; specify that the safety assessments are to examine the extant plant condition and the condition expected during the maintenance activity; and specify that the safety assessments are to be used to ensure that the plant is not placed in risk-significant configurations or configurations that would degrade the performance of safety functions to an unacceptable level. Additionally, the Commission directed that extended or protracted regulatory analysis of Alternative 1 is unnecessary and that the regulatory analysis discussion of Alternative 3 be limited.

This paper provides the Commission with the rulemaking package for the proposed rule that would amend 10 CFR 50.65 as directed.

DISCUSSION:

The proposed rule that would revise the maintenance rule to require that licensees perform safety assessments and take them into account before performing maintenance activities was developed as directed by SRM 97-173. The results of the effort are detailed in the proposed *Federal Register* Notice (Attachment 1). The regulatory analysis for this proposed rule (Attachment 2) supports the choice of Alternative 2.

Following the Commission direction in the SRM on SECY-97-173, this proposed rule would:

1. Add an introductory sentence to 10 CFR 50.65 clarifying that the rule applies under all conditions of operation, including normal shutdown. The rule has applied under all conditions, but it did not explicitly so state. As a preamble, before paragraph (a)(1), the following statement would be added: "The requirements of this section are applicable during all conditions of plant operation, including normal shutdown operations."

2. Be silent regarding the change to the third sentence in paragraph (a)(3) because the desired editorial corrections were incorporated in the 1998 edition of the Code of Federal Regulations. The first "preventative" was corrected to "preventing," and the second "preventative" was changed to "preventive" for consistency.

3. Delete the last sentence of paragraph (a)(3) of the rule. This action removes and separates the safety assessment requirement from the more programmatic periodic evaluation requirements of the rule left in paragraph (a)(3).

4. Add a new paragraph (a)(4) that requires the performance of safety assessments. The Industry guidance document, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," NUMARC 93-01, includes the safety assessments in their recommended program. The NRC endorsed that guidance by Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." The industry's practice has been to incorporate the provision for performing safety assessments into their maintenance rule implementation programs, and NRC's intent has been that the safety assessments be performed. However, at present, the NRC cannot ensure that licensees follow their own

programs with regard to the safety assessments.

The new paragraph (a)(4) would read as follows: "Before performing maintenance activities on structures, systems, or components within the scope of this section (including, but not limited to, surveillance testing, post-maintenance testing, corrective maintenance, performance/condition monitoring, and preventive maintenance), an assessment of the current plant configuration as well as expected changes to plant configuration that will result from the proposed maintenance activities shall be conducted to determine the overall effect on performance of safety functions. The results of this assessment shall be used to ensure that the plant is not placed in risk-significant configurations or configurations that would degrade the performance of safety functions to an unacceptable level."

5. Specify that the scope of the requirement for performing those assessments is to cover all planned maintenance activities. The NRC's intent is that the performance of safety assessments not be limited to monitoring and preventive maintenance activities. It would be imprudent of the NRC to require the development of a licensee practice for reviewing the safety aspects of most maintenance activities while omitting safety assessments before planned corrective maintenance activities. In fact, many licensees have already voluntarily included in their programs the performance of safety assessments before all planned maintenance activities.

6. Specify that the safety assessments are to examine the existing plant condition and the condition expected during the maintenance activity. The proposed language would be more specific regarding the reviews of (a) actual plant conditions before the planned maintenance activity is begun and (b) plant conditions expected while the activity is in progress. The rule would require the licensee to recognize its plant's capability to perform safety functions both before and after the planned change in plant condition for the performance of the maintenance activity.

7. Specify that the results of the safety assessments are to be used to help the licensee ensure that the plant is not placed in risk-significant configurations, i.e., a configuration for which the incremental contribution to the annual risk is not insignificant or configurations that would degrade safety functions to an unacceptable level. The proposed language would be more specific regarding the purpose of the safety assessments.

In SECY 97-055, the staff informed the Commission on the results of the first 18 maintenance rule baseline inspections. To update the Commission, the following information has been collected from 50 maintenance rule baseline inspections (MRBIs) for which inspection reports had been issued as of April 20, 1998. The staff continued to find that all licensees had developed programs to implement the safety assessment provision of paragraph (a)(3) of the rule. However, at 5 sites, instances were found in which the licensee had failed to perform paragraph (a)(3) safety assessments called for by their maintenance rule implementation programs. Although the safety significance of the unassessed plant configurations at the 5

sites was not quantitatively determined during the inspections in all cases, it appears that some of the unassessed configurations had resulted in plants that were in a state of substantially greater risk than was realized by the licensees. At 19 other sites, weaknesses were found in their safety assessment programs, but no instances of failures to perform safety assessments were found. No weaknesses were found in the safety assessment programs in place at the other 26 sites. Thus, of the 50 MRBIs, about 50 percent found weaknesses or problems with implementation of the paragraph (a)(3) safety assessments, including instances where licensees did not perform the assessments required by the their programs.

The staff has also recognized that the nuclear power industry has changed since the 1991 issuance of the maintenance rule. One significant change is that licensees have increased the frequency and amount of maintenance while at power. This may be due in part to the fact that rate deregulation of the electric utility industry will cause all nuclear power plants to operate more efficiently. One mechanism for increasing efficiency is to shorten refueling outages and reduce or eliminate mid-cycle maintenance outages by performing more maintenance while at power. As discussed in an October 6, 1994 letter from the Director of the Office of Nuclear Reactor Regulation to the Executive Vice President of the Nuclear Energy Institute, NRC senior management became concerned with both the increased frequency and amount of on-line maintenance and the apparent lack of licensees' understanding of its impact on plant safety.

Given that licensees have increased both the amount and frequency of on-line maintenance and that an MRBI review of the safety assessment process examines only a small sample of maintenance activities, the staff considers 5 licensee programs that missed assessments and their apparent risk significance, and 19 programs with weaknesses out of 50 inspected programs, to be a safety concern. If these proposed revisions to the maintenance rule are issued, the staff proposes to revisit a sample of approximately 20 licensees with identified safety assessment weaknesses to perform paragraph (a)(4) implementation inspections.

In its SRM on SECY-97-173, the Commission also indicated that development of the regulatory guidance should not delay issuance of the proposed maintenance rule change. The staff plans to prepare a regulatory guide in conjunction with the development of the final rule and have it ready for issuance 120 days after the publication date of the rule. The Nuclear Energy Institute (NEI), representing the nuclear power industry in a letter dated October 10, 1997, to the NRC Executive Director for Operations, specifically recommended that the word "should" in the last sentence in paragraph (a)(3) be changed to "shall" and be "made immediately effective" and is developing changes to NUMARC 93-01 to implement the revised rule.

In response to further direction from the Commission in its SRM on SECY-97-173, the staff has worked, and will continue to work, to ensure consistency among the efforts to change the maintenance rule, 10 CFR 50.59, and other applicable areas as they arise.

COORDINATION

The Office of the General Counsel has reviewed this proposed rule and has no legal objection to its content. The Office of the Chief Financial Officer has reviewed this proposed rule for resource implications and has no objection to its content. The Office of the Chief Information Officer has reviewed this proposed rule for information technology impacts and has no objections.

RESOURCES:

Resources to develop and implement this rulemaking, including follow-up inspection activities, are budgeted at a total of 3.25 FTE and $400,000 in contract support.

RECOMMENDATIONS:

That the Commission:

1. Approve the notice of proposed rulemaking (Attachment 1) for publication in the *Federal Register*.
2. Certify that this rule, if issued, would not have a significant economic impact on a substantial number of small entities to satisfy the requirements of the Regulatory Flexibility Act, 5 U.S.C. 605(b).
3. Note that:
    1. This rulemaking would be published in the *Federal Register* for a 75-day public comment period;
    2. The appropriate congressional committees will be informed (see Attachment 3);
    3. A public announcement (Attachment 4) will be issued when the proposed rule is filed with the Office of the *Federal Register*;
    4. The proposed rule contains no new or amended information collection requirements;
    5. Copies of the *Federal Register* notice of proposed rulemaking will be distributed to all affected Commission licensees. The notice will be sent to other interested parties upon request; and
    6. Copies of this paper have been sent to the Advisory Committee on Reactor Safeguards and the Committee to Review Generic Requirements. The committees will be briefed before the final rule is issued.

original /s/ by
L. Joseph Callan
Executive Director for Operations

Attachments:
1. *Federal Register* Notice
2. Regulatory Analysis
3. Congressional Letters
4. Public Announcement

Contact: Richard P. Correia
301-415-1009

ATTACHMENT 1

[7590-01-P]

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50
RIN 3150-AF95

Monitoring the Effectiveness of Maintenance at Nuclear Power Plants

AGENCY: Nuclear Regulatory Commission.

ACTION: Proposed rule.

SUMMARY: The Nuclear Regulatory Commission (NRC) is proposing to amend its power reactor safety regulations to require that licensees assess the cumulative effect of out-of-service equipment on the plant's capability to perform safety functions before beginning any maintenance activity on structures, systems, or components within the scope of the maintenance rule. The amendments would also clarify that the proposed rule applies under all conditions of operation including normal shutdown, that the safety assessments include both the plant conditions before and those expected during planned maintenance activities, and that the safety assessments are to be used to ensure that the plant is not placed in a condition of significant risk or a condition that would degrade the performance of safety functions to an unacceptable level.

DATES: Submit comments by [Insert the date 75 days after publication in the *Federal Register*]. Comments received after this date will be considered if it is practical to do so, but the Commission is able to ensure consideration only for comments received on or before this date.

ADDRESSES: Mail comments to: The Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Attention: Rulemakings and Adjudications Staff.

Deliver comments to: 11555 Rockville Pike, Rockville, Maryland, between 7:30 a.m. and 4:15 p.m. on Federal workdays.

You may also provide comments via the NRC's interactive rulemaking web site through the NRC home page (http://www.nrc.gov). From the NRC home page, select "Rulemaking" from the tool bar. The interactive rulemaking website may then be accessed by selecting "Rulemaking Forum." This site possesses the ability of uploading comments as files (any format) if your web browser supports that function. For information about the interactive rulemaking site, contact Ms. Carol Gallagher, 301-415-5905, e-mail CAG@nrc.gov.

Certain documents related to this rulemaking, including comments received, may be examined at the NRC Public Document Room, 2120 L Street NW. (Lower Level), Washington, DC. These same documents also may be viewed and downloaded electronically via the interactive rulemaking website established by NRC for this rulemaking.

FOR FURTHER INFORMATION CONTACT: Richard P. Correia, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555, 301-415-1009, e-mail rpc@nrc.gov.

SUPPLEMENTARY INFORMATION:

Background

The NRC's Maintenance Team Inspections of all nuclear power plant licensees in the late 1980s found the lack of consideration of plant risk in prioritizing, planning, and scheduling maintenance activities to be a common weakness. To address that weakness, paragraph (a)(3)

of 10 CFR 50.65, the maintenance rule, currently includes the provision that "(I)n 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." The maintenance rule was issued on July 10, 1991.

During plant visits in mid-1994, several NRC senior managers expressed concerns that licensees were increasing both the amount and frequency of maintenance performed during power operation without adequately evaluating safety when planning and scheduling maintenance activities. The NRC Executive Director for Operations (EDO) addressed these concerns regarding the safety implications with performing maintenance while at power to the president of the Institute of Nuclear Power Operations (INPO) in a letter dated October 6, 1994. In this letter, the EDO noted that it appeared that some licensees were either not following INPO guidelines for the conduct of maintenance and management of outages or had adopted only portions of the guidance. The EDO also recommended that INPO support NEI and appropriate utility managers during meetings with NRC senior managers to discuss the concerns they raised during the site visits.

The growing amount of on-line maintenance (i.e., maintenance performed during power operations) being performed by licensees and the inadequate pre-maintenance safety evaluations have raised the Commission's concern.

Discussion

The nuclear power industry has changed since the 1991 issuance of the maintenance rule. Rate deregulation of the electric utility industry will likely cause all nuclear power plants to seek ways to operate more efficiently. One mechanism for increasing efficiency is shortening refueling and maintenance outages. Licensees have come to realize that performing more maintenance at power can lead to shorter refueling outages and reduction or elimination of mid-cycle maintenance outages.

Licensees have relied upon their individual plant technical specifications to help assure safe operation of the plant when equipment is out of service. However, the removal of multiple pieces of equipment, especially safety-related equipment, from service can undermine the fundamental premise of technical specifications, which is to provide adequate protection against random failures.

During plant visits in mid-1994, several NRC senior managers had concerns with the fact that licensees were increasing both the amount and frequency of maintenance performed during power operations. Some licensees were limiting the planned maintenance to a single train of a system while others would allow multiple equipment in other systems within a single train to be out of service as long as it did not violate the plant's Technical Specifications. However, allowable outage times specified in Technical Specifications are based upon a random single failure in a system and a judgement of a reasonable time to effect repairs before plant shutdown is required. Technical Specifications were not intended to address allowable outage times for multiple equipment being out of service at the same time. Further, it can not be implied that it is acceptable to voluntarily remove equipment from service to perform on-line maintenance on the assumption that such actions are bounded by a worst case single failure which is a plant specific design requirement that is contained in a number of the general design criteria (GDC) in 10 CFR 50, Appendix A. The NRC senior managers also had concerns with the fact that on-shift personnel, planning and scheduling personnel and licensee management lacked an understanding of the relative safety importance of safety systems or combinations of equipment that would have risk significance if taken out of service. It appeared that risk insights from plant specific Individual Plant Examination (IPE) results, whose purpose was to improve licensee understanding of the plant's safety and to address potential vulnerabilities, were not fully utilized in the plant's operational and maintenance decision process. These concerns were addressed in a letter dated October 6, 1994, from the Director of the Office of Nuclear Reactor Regulation to the Executive Vice-President of the Nuclear Energy Institute. The growing amount of maintenance performed during power operations and the underutilization of risk insights in plant operations and maintenance

activities have raised the Commission's concern.

In determining the need for the maintenance rule a decade ago, one factor the Commission considered was its belief that there existed "a need to broaden its capability to take timely enforcement action where maintenance activities fail to provide reasonable assurance that safety-significant SSCs [structures, systems, and components] are capable of performing their intended function." Now, the Commission desires to act to help ensure that there is reasonable assurance such that maintenance activities will not place a plant in 1) a configuration that would degrade unacceptably a SSC's capability to perform its intended safety functions or 2) a risk-significant configuration, i.e., a configuration for which the incremental contribution to the annual risk associated with accidents that result in damage to the reactor fuel or the release of fission products to the environment is not insignificant.

The first 50 NRC maintenance rule baseline inspections (MRBIs) for which inspection reports had been issued as of April 20, 1998, found that all licensees had developed programs to implement the safety assessment provision of paragraph (a)(3). However, at 5 sites, instances were found in which the licensee did not assess the impact on safety of total plant equipment out of service before it entered one or more specific plant configurations for maintenance purposes. At 19 other sites, weaknesses -- the term reserved for situations in which the overall assessment of a licensee program has found the program, or significant aspects of that program, to be particularly ineffective or for individual findings that have either high safety significance or programmatic implications -- were found, among which were paragraph (a)(3) safety assessment tools that did not include all high-safety-significant SSCs.

Although the safety significance of the unassessed plant configurations at the 5 sites was not quantitatively determined during the inspection in all cases, it appears that some of the unassessed configurations had resulted in plants that were in a state of substantially greater risk than was realized by the licensees. Given the concerns raised by NRC senior managers during site visits in 1994, the increased amount of on-line maintenance, the number of missed assessments and their apparent risk significance, in addition to the weaknesses found with the paragraph (a)(3) safety assessment programs, the Commission considers this to be a safety concern. The Commission, therefore, believes it is necessary to explicitly require licensees to perform safety assessments prior to removing equipment from service for maintenance during all conditions of plant operations including normal shutdown.

With regard to the operating conditions under which the proposed rule would apply, extensive interaction among the NRC, the industry, and the public has taken place over the need for regulations governing activities during shutdown conditions (i.e., shutdown as may be defined in each plant's individual technical specifications, but generally considered as a time when all control rods are inserted and the average reactor coolant temperature is below 200F). The question of whether 10 CFR 50.65 applies during shutdown conditions became an issue. The Commission desires to clarify that the rule does apply during shutdown conditions. Regarding which activities would be preceded by a safety assessment, the Commission has recognized that, although definitions regarding maintenance activities are fairly consistent from organization to organization, there is some variation in the definition of corrective maintenance. For example, some definitions bring a time dependency while some others consider the urgency of the repair. To eliminate inconsistency, and to cause more prudent use of the safety assessments, the Commission desires the regulation to cover all planned maintenance activities, rather than only the recommended monitoring and preventive maintenance in the current rule. Each planned non-emergency maintenance activity would now include a safety assessment prior to its being authorized to begin. In fact, many licensees have followed the guidance contained in Regulatory Guide 1.160 and NUMARC 93-01 and have already voluntarily included all planned maintenance activities in the scope of their safety assessment programs.

With regard to the safety assessments themselves, licensee implementation has been inconsistent. The Commission desires to specify that an appropriate safety assessment would include a review the current condition of the plant and the plant condition expected during the planned maintenance activity. Assessing the current plant configuration as well as expected changes to plant configuration that will result from the proposed maintenance activities, as would be called for under paragraph (a)(4) of the proposed rule, is intended to ensure that the plant is not placed in risk-significant configurations, i.e., a configuration for which the incremental contribution to the annual risk is not insignificant, or a configuration that would degrade safety functions to an unacceptable level. These assessments do not necessarily require that a quantitative assessment of probabilistic risk be performed. The level of sophistication with which such assessments are performed is expected to vary, based on the circumstances involved. It should be understood, however, that the contribution to risk of a specific plant configuration depends on both the degree of degradation of the safety functions and the duration for which the plant is in that configuration. Further, assessing the degree of safety function degradation requires that there be an understanding of the impact of removal of the equipment on the capability of the plant to prevent or mitigate accidents and transients. The assessments may range from deterministic judgements to the use of an on-line, living probabilistic risk assessment (PRA).

Additional guidance will be developed and promulgated in Regulatory Guide 1.160, Revision 3 (proposed), to assist licensees in implementing this provision of the proposed rule. The guidance will contain information regarding risk-significant configurations and unacceptable levels of safety function degradation.

Proposed Rule

This proposed rule would make five changes to 10 CFR 50.65:

1. Add an introductory paragraph to 10 CFR 50.65 clarifying that the proposed rule applies under all conditions of operation, including normal shutdown.

Prior to paragraph (a)(1), add the following wording: "The requirements of this section are applicable during all conditions of plant operation, including normal shutdown operations." The intent of this paragraph is to ensure that safety assessments are performed before maintenance activities when the plants are shut down as well as when the plants are at power. The shutdown condition may be defined in a plant's technical specifications, but the intent of this paragraph is that shutdown is generally considered as a time when all control rods are inserted and the average reactor coolant temperature is below 200 F.

2. Delete the last sentence of paragraph (a)(3) and create a new paragraph, (a)(4), that requires the performance of safety assessments.

The proposed rule would remove the last sentence of paragraph (a)(3) and would add a new paragraph, (a)(4), as follows in its entirety: "Before performing maintenance activities on structures, systems, or components within the scope of this section (including, but not limited to, surveillance testing, post-maintenance testing, corrective maintenance, performance/condition monitoring, and preventive maintenance), an assessment of the current plant configuration as well as expected changes to plant configuration that will result from the proposed maintenance activities shall be conducted to determine the overall effect on performance of safety functions. The results of this assessment shall be used to ensure that the plant is not placed in risk-significant configurations or configurations that would degrade the performance of safety functions to an unacceptable level." Deleting the current last sentence in paragraph (a)(3) will remove the recommendation for performing safety assessments from the paragraph that contains the periodic, programmatic, long-term review considerations of the rule. Creating a new paragraph, (a)(4), specifically for the safety assessment requirements would cause the assessment concept to stand as a separate entity within the maintenance rule.

3. Define in paragraph (a)(4) the scope of the requirement for performing those assessments to be all conditions of operation including normal shutdown.

The proposed rule would add the following in paragraph (a)(4) to define the scope of pre-maintenance safety assessments: "Before performing maintenance activities on structures, systems, or components within the scope of this section (including, but not limited to, surveillance testing, post-maintenance testing, corrective maintenance, performance/ condition monitoring, and preventive maintenance), an assessment . . . shall be conducted . . . ." The NRC's intent is that licensees perform safety assessments before all planned maintenance activities that require removing from service equipment that is within the scope of the maintenance rule, as defined in 10 CFR 50.65(b) and (a)(1).

4. Specify in paragraph (a)(4) that the safety assessments are to examine the extant plant condition and the condition expected during the planned maintenance activity.

The proposed rule would include the following wording in paragraph (a)(4): ". . . an assessment of the current plant configuration as well as expected changes to the plant configuration that will result from the proposed maintenance activities . . . ." The NRC's intent is that a reasonable safety assessment be performed. The assessment may range from simple and straightforward to complex. However, notwithstanding the degree of sophistication required for the assessment, the NRC intends that the assessment will examine the plant condition existing prior to the commencement of the maintenance activity and examine the changes expected by the proposed maintenance activity.

5. Specify in paragraph (a)(4) that the objective of performing the safety assessments is to ensure that the plant is not placed in risk-significant configurations or configurations that would degrade the performance of safety functions to an unacceptable level. The proposed rule would add in paragraph (a)(4) the wording to specify the NRC's expectations regarding the use of each safety assessment, as follows: "The results of this assessment shall be used to ensure that the plant is not placed in risk-significant configurations or configurations that would degrade the performance of safety functions to an unacceptable level." The NRC's intent is to require that each licensee perform a safety assessment before undertaking each planned maintenance activity and be aware of the risk issues associated with that maintenance activity. The guidance to be developed for licensees and promulgated in Regulatory Guide 1.160, Revision 3 (proposed), is expected to assist the industry in implementing this provision of the proposed rule, providing guidance regarding risk-significant configurations and unacceptable levels of safety function degradation.

Finding of No Significant Environmental Impact: Environmental Assessment

The Commission has determined under the National Environmental Policy Act of 1969, as amended, and the Commission's regulations in Subpart A of 10 CFR Part 51 that this rule, if adopted, would not be a major Federal action significantly affecting the quality of the human environment and, therefore, an environmental impact statement is not required. The draft environmental assessment that forms the basis for this determination reads as follows:

Identification of the Proposed Action

The Commission is proposing to amend its regulations to require commercial nuclear power plant licensees to perform assessments of the plant's status before performing maintenance activities on structures, systems, and components (SSCs) within the scope of 10 CFR 50.65, the maintenance rule. The rule would be modified by adding an introductory sentence to clarify that the proposed rule would apply under all conditions of operation, including normal shutdown; deleting the last sentence of paragraph (a)(3); and creating a new paragraph, (a)(4). The new paragraph (a)(4) would change "should" to "shall" regarding the performance of safety assessments; define the scope of the requirement for performing those assessments to include all planned maintenance activities; specify that the safety assessments are to examine the extant plant condition and the condition expected during the maintenance activity; and specify that the safety assessments are to be used to ensure that, by the conduct of maintenance, the plant is not placed in risk-significant conditions or safety system performance is not degraded to an unacceptable level.

The Need for the Proposed Action

Paragraph (a)(3) of the maintenance rule, in part, currently recommends that, "(I)n 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." The Commission believes the performance of this type of assessment is prudent. The maintenance rule baseline inspections, being performed at each commercial nuclear power plant site, have found that all inspected licensees have implemented programs to perform the assessments, but about half of the sites inspected had programs with discernable weaknesses in this area, including instances in which, in accordance with the licensee's own programs, safety assessments should have been made but were not. Because of the hortatory nature of the safety assessment provision in 50.65(a)(3), the Commission cannot ensure that licensees perform the assessments. Moreover, licensees are free to remove the performance of the assessments from their programs as they so desire. This proposed change to the Commission's regulations will permit the Commission to ensure that licensees perform the assessments, as appropriate.

The other changes are clarifications regarding applicability of the rule. During preliminary discussions prior to potential development of a rule on shutdown plant operations, a major question arose regarding whether 10 CFR 50.65 requirements apply during the time a plant is shut down. The Commission concluded that inclusion of a statement to the affirmative would eliminate the doubt.

Removing the provision regarding safety assessments from paragraph (a)(3) and creating for it a new, separate paragraph, (a)(4), would disassociate that new requirement from the more time-dependent requirement for evaluating of the program and the program's effectiveness at maintaining an appropriate balance between reliability and availability for each SSC. In the new paragraph, the requirement for safety assessment performance is stipulated to ensure licensees will perform those assessments. Because there were questions regarding when the assessments were to be performed, what plant conditions are to be evaluated and how they were to be used, the proposed new paragraph (a)(4) describes that the assessments are to be performed before all planned maintenance activities, are to examine pre-maintenance plant conditions and expected changes due to the proposed maintenance activity, and are to be used to ensure that the plant is not placed in risk-significant configurations or configurations that would degrade the performance of safety functions to an unacceptable level.

Environmental Impacts of the Proposed Action

The proposed rule would require that commercial nuclear power plant licensees perform certain assessments of plant equipment status prior to performing all planned maintenance activities. The purpose of the proposed rule is to increase the effectiveness of the maintenance rule by requiring licensees to perform an assessment of plant conditions prior to planned maintenance and changes expected to result from the planned maintenance activity, to ensure that licensees understand the assessments are to be performed when the plant is shut down as well as at power, and to improve licensees' understanding of what conditions to assess and to what use to put the completed assessment. Accordingly, implementation of this proposed rule would not have any significant adverse impact on the quality of the human environment. The Commission believes that proper implementation of the proposed rule will reduce the likelihood of an accidental release of radioactive material caused by imprudently prioritized, planned, or scheduled maintenance.

The determination of this environmental assessment is that there will be no significant offsite impact to the public from this action. The NRC has also committed to complying with Executive Order (EO) 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," dated February 11, 1994, in all its actions. The NRC has determined that there are no disproportionate, high, or adverse impacts on minority or low-income populations. In the letter and spirit of EO 12898, the NRC is requesting public comment on any environmental justice considerations or questions that the public thinks may be related to this proposed rule but somehow were not addressed. Comments on any aspect of the Environmental Assessment, including environmental justice, may be submitted to the NRC as indicated under the ADDRESSES heading.

States Consulted and Sources Used

The NRC has sent a copy of this proposed rule to every State Liaison Officer and requested his or her comments on the Environmental Assessment.

Paperwork Reduction Act Statement

This proposed rule does not contain a new or an amended information collection requirement subject to the requirements of the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). Existing requirements were approved by the Office of Management and Budget, approval number 3150-0011.

Public Protection Notification

If an information collection requirement does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

Regulatory Analysis

The Commission has prepared a draft regulatory analysis on this proposed regulation. The analysis examined the costs and benefits of the alternatives considered by the Commission for revising 10 CFR 50.65, the maintenance rule. Those alternatives were to (1) make no change to the rule, (2) require the safety assessments currently recommended in paragraph (a)(3) of the rule, and (3) make comprehensive revisions to paragraph (a)(3) of the rule. The analysis selected Alternative 2 as the preferred course of action. Details of the alternative selection are contained in the draft analysis, which is available for inspection in the NRC Public Document Room, 2120 L Street NW (Lower Level), Washington, D.C. Single copies of the analysis may be obtained from Richard P. Correia, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555, 301-415-1009, e-mail rpc@nrc.gov.

The Commission requests public comments on the draft regulatory analysis. Comments on the draft analysis may be submitted to the NRC as indicated under the ADDRESSES heading.

Regulatory Flexibility Certification

In accordance with the Regulatory Flexibility Act of 1980 (5 U.S.C. 605(b)), the Commission certifies that this proposed rule will not, if adopted, have a significant economic impact on a substantial number of small entities. This proposed rule affects only the operation of nuclear power plants. The companies that own these plants do not fall within the scope of the definition of small entities set forth in the Regulatory Flexibility Act or the size standards adopted by the NRC (10 CFR 2.810).

Backfit Analysis

As required by 10 CFR 50.109, the Commission has completed a backfit analysis for this proposed rule. The Commission has determined, on the basis of this analysis, that backfitting to comply with the requirements of this proposed rule provides a substantial increase in protection to the public health and safety or the common defense and security at a cost that is justified by the increased protection.

When the maintenance rule was first promulgated in 1991, the NRC staff did not foresee the significant changes licensees would be making in maintenance practices. To enhance operational efficiency brought about by the rate deregulation of the electric utility industry, licensees are shortening their refueling outages by performing more maintenance while the plant is at power. At-power maintenance practices have evolved to the point that not only are major systems and components taken off line, but also multiple systems and components are taken off line simultaneously. Taking systems and components off line for maintenance could result in an increased likelihood of an accident or transient, compared to risk that occurs from expected random equipment failures.

The objective of this proposed rule is to make mandatory that licensees assess the cumulative impact of out-of-service equipment on the capability of the plant to perform safety functions and that licensees consider the results of the assessment before undertaking maintenance activities at operating nuclear power plants in order to ensure that the plants are not placed in risk-significant configurations or configurations that would degrade the performance of safety functions to an unacceptable level. Thus, the proposed rule would state that licensees must perform safety assessments before removing SSCs from service for planned maintenance.

In addition, this proposed rule would (1) add an introductory sentence to 10 CFR 50.65 clarifying that the rule applies under all conditions of operation, including normal shutdown; (2) delete the last sentence of paragraph (a)(3) of the rule and create a new paragraph, (a)(4), that requires the performance of safety assessments; (3) specify that the scope of the requirement for performing those assessments covers all planned maintenance activities; (4) specify that the safety assessments are to examine the extant plant condition and the condition expected during the maintenance activity; and (5) specify that the results of the safety assessments are to be used to help the licensee ensure that the plant is not placed in risk-significant configurations or configurations that would degrade safety functions to an unacceptable level.

The pre-maintenance assessments, along with the clarifications regarding their scope and their use, which the Commission proposes to require are intended to cause licensees to manage this risk and ensure their plants are not placed in risk-significant conditions or conditions in which the performance of safety functions is not degraded to unacceptable levels.

The details of this backfit analysis have been incorporated in the regulatory analysis.

For the reasons elaborated in the regulatory analysis, which also contains cost information, the Commission concludes that the proposed modification to the maintenance rule will result in a level of safety beyond that currently provided by the Commission's regulations, a substantial increase in the overall protection of public health and safety, and that the net costs of the rule are justified in view of this increased level of safety.

List of Subjects in 10 CFR Part 50

Antitrust, Classified information, Criminal penalties, Fire protection, Intergovernmental relations, Nuclear power plant and reactors, Radiation protection, Reactor siting criteria, Reporting and recordkeeping requirements.

For the reasons set out in the preamble and under the authority of the Atomic Energy Act of 1954, as amended; the Energy Reorganization Act of 1974, as amended; and 5 U.S.C. 553, the NRC is proposing to adopt the following amendments to 10 CFR Part 50:

PART 50 -- DOMESTIC LICENSING OF PRODUCTION AND UTILIZATION FACILITIES

1. The authority citation for Part 50 continues to read as follows:

AUTHORITY: Secs. 102, 103, 104, 105, 161, 182, 183, 186, 189, 68 Stat. 936, 937, 938, 948, 953, 954, 955, 956, as amended, sec. 234, 83 Stat. 444, as amended (42 U.S.C. 2132, 2133, 2134, 2135, 2201, 2232, 2233, 2236, 2239, 2282); secs. 201, as amended, 202, 206, 88 Stat. 1242, as amended, 1244, 1246, (42 U.S.C. 5841, 5842, 5846).

Section 50.7 also issued under Pub. L. 95-601, sec. 10, 92 Stat. 2951 (42 U.S.C. 5851). Section 50.10 also issued under secs. 101, 185, 68 Stat. 936, 955, as amended (42 U.S.C. 2131, 2235); sec. 102, Pub. L. 91-190, 83 Stat. 853 (42 U.S.C. 4332). Sections 50.13, 50.54(dd), and 50.103 also issued under sec. 108, 68 Stat. 939, as amended (42 U.S.C. 2138). Sections 50.23, 50.35, 50.55, and 50.56 also issued under sec. 185, 68 Stat. 955 (42 U.S.C. 2235). Sections 50.33a, 50.55a, and Appendix Q also issued under sec. 102, Pub. L. 91-190, 83 Stat. 853 (42 U.S.C. 4332). Sections 50.34 and 50.54 also issued under sec. 204, 88 Stat. 1245 (42 U.S.C. 5844). Sections 50.58, 50.91, and 50.92 also issued under Pub. L. 97-415, 96 Stat. 2073 (42 U.S.C. 2239). Section 50.78 also issued under sec. 122, 68 Stat. 939 (42 U.S.C. 2152). Sections 50.80-50.81 also issued under sec. 184, 68 Stat. 954, as amended (42 U.S.C. 2234). Appendix F also issued under sec. 187, 66 Stat. 955 (42 U.S.C. 2237).

2. In 50.65, an introductory paragraph is added, paragraph (a)(3) is revised, and a new paragraph (a)(4) is added, to read as follows:

50.65 Requirements for monitoring the effectiveness of maintenance at nuclear power plants.

The requirements of this section are applicable during all conditions of plant operation, including normal shutdown operations.

(a) * * *

(3) Performance and condition monitoring activities and associated goals and preventive maintenance activities shall be evaluated at least every refueling

cycle provided the interval between evaluations does not exceed 24 months. The evaluations shall be conducted taking into account, where practical, industry-wide operating experience. Adjustments shall be made where necessary to ensure that the objective of preventing failures of structures, systems, and components through maintenance is appropriately balanced against the objective of minimizing unavailability of structures, systems, and components due to monitoring or preventive maintenance.

(4) Before performing maintenance activities on structures, systems, or components within the scope of this section (including, but not limited to, surveillance testing, post-maintenance testing, corrective maintenance, performance/condition monitoring, and preventive maintenance), an assessment of the current plant configuration as well as expected changes to plant configuration that will result from the proposed maintenance activities shall be conducted to determine the overall effect on performance of safety functions. The results of this assessment shall be used to ensure that the plant is not placed in risk-significant configurations or configurations that would degrade the performance of safety functions to an unacceptable level.

		*	*	*	*	*	*	

Dated at Rockville, Maryland, this day of , 1998.

For the Nuclear Regulatory Commission,

_____
John C. Hoyle,
Secretary of the Commission.

ATTACHMENT 2

Regulatory Analysis
Amendments to 10 CFR 50.65
Monitoring the Effectiveness of Maintenance
at Nuclear Power Plants

Introduction

This regulatory analysis conforms to the guidance as specified in NUREG\BR-0058, "Regulatory Analysis Guidelines of the U. S. Nuclear Regulatory Commission," and, thus, it meets the requirements of the backfit rule and provisions of the charter of the Committee to Review Generic Requirements. This backfit analysis demonstrates that the proposed requirements provide a substantial increase in protection to the public health and safety or the common defense and security at a cost that is justified by the substantial increase. Passages that address the items that must be considered in the backfit analysis have been cross referenced to the appropriate 10 CFR 50.109 citation.

1.0 Statement of the Problem

On July 10, 1991, the U.S. Nuclear Regulatory Commission (NRC) published 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." The Commission took this action because proper maintenance is essential to plant safety and 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. 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 an accident are minimized. Minimizing challenges to safety systems is consistent with the Commission's defense-in-depth philosophy. Maintenance is also important in ensuring that design assumptions and margins in the original design basis are maintained and are not degraded. Therefore, nuclear power plant maintenance is clearly important in protecting public health and safety.

In the late 1980s, the NRC's Maintenance Team Inspections found that, although licensees had adequate maintenance programs in place and had shown an improving trend in implementing those programs, a common weakness in those programs was a lack of consideration of plant risk in the prioritization, planning, and scheduling of maintenance activities. This weakness was one of the major reasons for the wording in 10 CFR 50.65(a)(3), which states that "(I)n 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." Because this section uses the word "should" instead of "shall," the legal effect is to serve as a recommendation rather than as a requirement.

During plant visits in mid-1994, several NRC senior managers had concerns with the fact that licensees were increasing both the amount and frequency of maintenance performed during power operations. Some licensees were limiting the planned maintenance to a single train of a system while others would allow multiple equipment in other systems within a single train to be out of service as long as it did not violate the plant's Technical Specifications. However, allowable outage times specified in Technical Specifications are based upon a random single failure in a system and a judgement of a reasonable time to effect repairs before plant shutdown is required. Technical Specifications were not intended to address allowable outage times for multiple equipment being out of service at the same time. Further, it cannot be implied that it is acceptable to voluntarily remove equipment from service to perform on-line maintenance on the assumption that such actions are bounded by a worst case single failure which is a plant specific design requirement that is contained in a number of the general design criteria (GDC) in 10 CFR 50, Appendix A. The NRC senior managers also had concerns with the fact that on-shift personnel, planning and scheduling personnel and licensee management lacked an understanding of the relative safety importance of safety systems or combinations of equipment that would have risk significance if taken out of service. It appeared that risk insights from plant specific Individual Plant Examination (IPE) results, whose purpose was to improve licensee understanding of the plant's safety and to address potential vulnerabilities, were not fully utilized in the plant's operational and maintenance decision process. These concerns were addressed in a letter dated October 6, 1994, from the Director of the Office of Nuclear Reactor Regulation to the Executive Vice President of the Nuclear Energy Institute. The growing amount of maintenance performed during power operations and the underutilization of risk insights in plant operations and maintenance activities is a safety concern.

In SECY-97-055, "Maintenance Rule Status, Results, and Lessons Learned," dated March 4, 1997, the NRC staff described the challenge of inspecting and the NRC staff's inability to enforce the pre-maintenance safety assessment provision of 50.65(a)(3). The staff notes that, in general, licensees have followed the guidance contained in Regulatory Guide 1.160 and NUMARC 93-01 and thus have voluntarily complied with this provision of 50.65(a)(3) because it is obvious that there is a nexus between safety and having equipment out of service. When the maintenance rule was first promulgated in 1991, the NRC staff did not foresee the significant changes licensees would be making in maintenance practices. Typically, licensees would perform significant amounts of maintenance during refueling outages. To enhance operational efficiency in reaction to rate deregulation of the electric utility industry, licensees are shortening their refueling and maintenance outages by performing more maintenance while the plant is at power. At-power maintenance practices have evolved to the point that not only are major systems and components taken off line, but also multiple systems and components are taken off line simultaneously.

However, in the few cases in which the NRC staff has observed weak implementation or plant configurations for which the licensee did not adequately assess the configuration's safety impact, the NRC staff was unable to take actions to ensure that licensees perform appropriate assessments. Under current enforcement guidance, the NRC staff can involve this provision of paragraph (a)(3) in enforcement actions if the failure to perform an adequate assessment causes an event or contributes to the severity of or complicates recovery from an event. However, such a failure to perform a safety assessment can only be used as an escalating factor in enforcement actions otherwise taken as a result of the event, and it can not be used as a separate violation.

For these reasons, the NRC staff is proposing to amend 10 CFR 50.65(a)(3) to ensure that the total plant equipment out of service does not place the plant in a risk-significant configuration or degrade the plant's safety functions to an unacceptable level. The objective of the proposed rule is to require that the licensee assess the cumulative impact of out-of-service equipment on the capability of the plant to perform safety functions and that the licensee consider the results of the assessment before undertaking maintenance activities at nuclear power plants in order to ensure that the plants are not placed in risk-significant configurations or configurations that would degrade the performance of safety functions to an unacceptable level. **[50.109(c)(1)]** Additionally, in staff requirements memorandum 97-173, dated December 17, 1997, the Commission approved the staff's recommendation to develop this proposed rulemaking, provided the text for the revisions to 10 CFR 50.65, stated that "extended or protracted regulatory analysis of Alternative 1 (no rule change) is unnecessary," and directed that the regulatory analysis discussion of Alternative 3 (comprehensive rule change) be limited.

2.0 Identification and Preliminary Analysis of Alternative Approaches

2.1 ALTERNATIVE 1 -- MAKE NO CHANGE TO PARAGRAPH (A)(3) IN THE RULE

The first alternative considered is to maintain the status quo and not revise paragraph (a)(3). As noted in SECY 97-055, licensees have, for the most part, voluntarily incorporated the paragraph (a)(3) safety assessment provision in their maintenance rule implementation programs using the NRC Regulatory Guide 1.160 and NUMARC 93-01, because of the obvious connection between safety and out-of-service equipment. Additionally, some licensees have indicated a willingness to improve their programs to address weaknesses identified during inspections. Thus, the existing codified text could be considered sufficient. When inspections identify deficiencies in the programs of individual licensees, the staff could continue to encourage those licensees to improve their performance.

The obvious advantage of this alternative is that no additional burden would be placed on licensees or on the NRC staff to conduct such a rulemaking.

The disadvantages of Alternative 1 are that (1) licensees could remove the paragraph (a)(3) safety assessment provision in their maintenance rule implementation programs at their own discretion, (2) since the performance of a safety assessment is discretionary and not mandatory, licensees cannot take credit for their safety assessment programs under other risk-informed initiatives (unless they make the safety assessments a requirement through

the other initiative), (3) because the safety assessments are not required, some licensees could view any efforts to encourage the safety assessments as a potential backfit, and (4) the NRC staff cannot enforce this provision of the rule.

2.2 ALTERNATIVE 2 -- CHANGE PARAGRAPH (A)(3) OF THE RULE TO REQUIRE SAFETY ASSESSMENTS

Under 50.65(a)(4) of the proposed rule, before performing maintenance activities on SSCs within the scope of the rule, licensees would be required to conduct an assessment of the current plant configuration, as well as of expected changes to the plant configuration that will result from the planned maintenance activities, to determine the overall effect on performance of safety functions and would also be required to use the results of the assessment to ensure that the plant is not placed in a risk-significant configuration, i.e., a configuration for which the contribution to the incremental annual risk is not insignificant, or a configuration that would degrade safety functions to an unacceptable level. The SSCs that are subject to the requirements of the rule are those that are safety related, and certain non-safety-related SSCs as defined in 50.65(b) and (a)(1). Licensees have programs in place for meeting the guidance of Regulatory Guide 1.160 and NUMARC 93-01, which accepts the existing paragraph (a)(3) recommendation as part of its program. To comply with this proposed rule and complete this backfit, licensees would need to incorporate the rule changes into their existing programs.

The Commission's direction to the NRC staff for implementing this alternative would (1) add an introductory sentence to 10 CFR 50.65 clarifying that the rule applies under all conditions of operation, including normal shutdown; (2) delete the last sentence of paragraph (a)(3) of the rule and create a new paragraph (a)(4) that requires the performance of safety assessments; (3) specify that the scope of the requirement for performing those assessments covers all planned maintenance activities; (4) specify that the safety assessments are to examine the extant plant condition and the condition expected during the maintenance activity; and (5) specify that the results of the safety assessments are to be used to help the licensee ensure that the plant is not placed in risk-significant configurations or configurations that would degrade safety functions to an unacceptable level. **[50.109(c)(2)]**

The advantages of Alternative 2 are that (1) licensees would retain maximum flexibility to operate within configurations allowed by their current license as envisioned when the rule was originally issued; (2) there would be little or no burden on most licensees because licensees already have voluntary programs in place in accordance with NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," which the NRC endorsed by Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," and the weaknesses in those programs that led to the failures to perform safety assessments found during the baseline inspections could be corrected relatively easily; (3) if licensees fail to perform a safety assessment (as in the case of 5 of the 50 maintenance rule baseline inspections for which inspection reports had been issued as of April 20, 1998), the NRC staff could use enforcement to require corrective actions that ensure licensees perform the safety assessments in the future; and (4), when appropriate, licensees may be able to take credit for their paragraph (a)(4) safety assessment program in other regulatory initiatives.

The disadvantages of Alternative 2 are that (1) licensees are, in general, exercising their discretion to perform the safety assessments and, thus, the NRC may be unnecessarily expending resources on a rule change mandating the performance of a safety assessment already being performed voluntarily, and (2) it would not address the weaknesses identified during 19 of the 50 baseline inspections pertaining to the quality and technical adequacy of licensees' methods for performing the safety assessments.

2.3 ALTERNATIVE 3 -- MAKE COMPREHENSIVE REVISIONS TO PARAGRAPH (A)(3) OF THE RULE

The statements of consideration (SOC) for the maintenance rule noted that the safety assessments would be refined on the basis of technological improvement and experience. Therefore, as the third alternative, the staff considered a comprehensive revision of the paragraph (a)(3) safety assessment provision to incorporate the use of more modern technology and the experience with sophisticated techniques used by some utilities. To remain performance based, the rule would not prescribe a specific approach. Rather, it would provide considerations that assessment methodologies would have to address, while continuing to give licensees the flexibility to develop specific approaches that best suit the needs of each.

The advantages of Alternative 3 are that it would (1) require licensees to evaluate and control maintenance activities through technically advanced methods, (2) provide specific limits to the risk associated with preventive maintenance activities, and (3) establish a foundation upon which other risk-informed regulation could build. Thus, Alternative 3 would address the weaknesses pertaining to the quality and technical adequacy of licensees' methods for performing the safety assessments identified during the baseline inspections and allow the use of the enforcement policy to require corrective actions for any of the weaknesses.

The disadvantages of Alternative 3 are that (1) such a rule would have a broad impact on other current and future rules and, instead, should be separated from this maintenance rule and developed as a rule that would be used generically for other risk-informed regulation; (2) since it would likely result in the use of probabilistic methods, Alternative 3 would impose a substantial burden on both licensees and the staff; and (3) because of the greater burden on licensees, Alternative 3 may be less likely to have industry support relative to Alternative 2.

3.0 Estimation and Evaluation of Values and Impacts

3.1 ALTERNATIVE 1 -- MAKE NO CHANGE TO PARAGRAPH (A)(3) OF THE RULE

This alternative is the base case for this regulatory analysis. Therefore, the assumption is made that no licensee performs the pre-maintenance assessments that are recommended in 50.65(a)(3). Thus, there would be no impact upon licensees if this alternative is adopted, and there would be no additional resource burden on the NRC. Likewise, there would be no safety benefit to the public.

3.2 ALTERNATIVE 2 -- CHANGE PARAGRAPH (A)(3) OF THE RULE TO REQUIRE SAFETY ASSESSMENTS

3.2.1 Impact of Alternative 2

If this alternative is adopted, all licensees would be required to perform an assessment of the effect that the resulting plant configuration would have on the safe operation of the facility. The degree of complexity of the assessments may differ from plant to plant, as well as from configuration to configuration within a plant. The characterization of the manpower cost to the licensees is complicated by the fact that the complexity of the assessment will depend upon a number of factors. For example, if a licensee is to take only one or two SSCs off line, the assessment required may involve checking

to see that the resulting configuration possesses the capability of adequately performing all required safety functions. Conversely, if the licensee plans to perform maintenance on numerous SSCs at the same time, a more complex assessment may be required. The complexity of the assessments to be performed will also be governed by other factors, such as plant type. It is envisioned that licensees will develop strategies to minimize the burden resulting from these assessments. One such strategy might be to develop sets of pre-assessed configurations. Once an assessment has been made of a configuration in which a number of SSCs are to be taken off line and it is shown that this configuration does not unacceptably increase the overall risk or degrade the performance of safety functions to an unacceptable level, this same set of SSCs may be taken off line in future maintenance outages if it can be shown that the resulting and the pre-assessed configurations are the same.

In Section 2.2 of this regulatory analysis, five modifications to the existing requirements in 50.65 are identified. Because of the nature of these existing requirements and the proposed modifications, the costs and impacts of these amendments are being treated together. For example, item (1), which adds an introductory sentence to the paragraph, specifies that the requirements apply to all conditions of operation, including normal shutdown. Since the existing language of the rule provides only a recommendation and not a requirement, this amendatory language will define the scope of the rule as all modes of operation, as opposed to the base case of no requirement for any mode of operation. Item (2) deletes the last sentence in paragraph (a)(3); however, this sentence does not specify a requirement, so the deletion has no effect. Items (3) and (4) are definitions of the scope of these proposed requirements, and their costs and benefits are included in the analysis to follow. Using the results of the pre-maintenance assessments to ensure that the facility is not placed in a higher than acceptable risk configuration or the capability to perform safety functions is not degraded to an unacceptable level, as required in item(5), will have an impact on plant operations. There will be times that the assessments will reveal that certain maintenance activities cannot be performed simultaneously and, thus, maintenance schedules will need to be modified accordingly. It is difficult, if not impossible, to quantify the effects, if any, of these modified maintenance activities without information concerning the equipment involved. However, the benefit of operating the facility in a risk-averse environment is seen to outweigh the inefficiencies that may be introduced through modified maintenance schedules.

To estimate the burden of this alternative to the industry, two types of costs have been considered: the costs associated with developing the assessment methodologies and the cost of using and maintaining them. This analysis assumes three levels of sophistication for the assessment methodologies. The first would be a basic deterministic type of analysis performed by plant operations, maintenance, or engineering, or one that might involve cross-checking predetermined non-complex matrices of SSCs to ascertain whether the planned maintenance would be detrimental to safety. The second would consider an intermediate level of analysis that would involve small groups of SSCs or equipment. It is possible that these intermediate- level assessments may also be performed in a deterministic fashion but would require far more analysis of the interrelationships between SSCs and the role they play in safety. In the event that larger numbers of SSCs will be taken off line for maintenance, a higher level of assessment, which takes into account the increase, if any, in risk, may be required. This level of assessment may require quantification of risk using probabilistic risk assessment (PRA) techniques. Thus, this regulatory analysis considers the costs associated with three levels of complexity associated with the assessment.

The first cost considered is the one-time[(1)] cost of developing the methodologies and the procedures for carrying out the various assessments. Estimates received from industry indicate that the cost of developing the basic assessment tools is approximately $20,000, and the cost of developing the high-complexity, PRA-type approach is approximately $300,000.[(2)] For the purpose of this analysis, it is assumed that the costs for the intermediate assessment development are approximately the same as the basic assessment. Another assumption is that each facility initially developed either a basic or an intermediate methodology. Although many facilities appear to be finding a benefit from moving to the high-complexity methodology, an estimate of the number that will move to the high level is difficult to acquire. Therefore, this analysis will develop the upper bound of costs, assuming all licensees will upgrade. Thus, assuming a total of 68 maintenance assessment programs[(3)] will be developed industry-wide at $320,000 per facility, this activity would incur a one-time cost of $22 million across the industry.

It is anticipated that the aforementioned methodologies will require some modifications over time because of the possibility of changes in plant equipment and the availability of improved technologies and up-to-date PRA data. Industry estimates to both use and maintain the methodologies are $50,000 and $25,000 for the basic and high-complexity assessments, respectively. The higher cost for the basic assessments reflects the need to follow up with PRA-type assessments in the event that a more basic matrix approach is not sufficient. Again, it is assumed that the cost for basic and intermediate assessments is the same. The NRC staff estimates that currently one-third of its licensees use and maintain a high complexity assessment methodology and two-thirds use a basic or intermediate level technique. However, to bound the impacts on the conservative side, this analysis assumes that all 68 facilities will utilize either a basic or intermediate level assessment methodology augmented by a high complexity methodology. Therefore, the use and maintenance cost for each facility would be $75,000 per program, or $5.1 million across the industry, annually. If we assume that the average life expectancy of existing nuclear power plants is 20 years per facility, the discounted flow of funds at a 7-percent real discount rate is $54 million. As an alternative analysis, using a 3-percent discounted rate, the value would be $75.6 million.

Another impact considered was differences in facility type, design, and age. Facility type and design will have an impact on the amount of maintenance needed and thus the number of pre-maintenance assessments that a facility would be required to perform. The larger or more complex facility designs will have more SSCs and thus require more maintenance. However, these designs also have larger electrical outputs and thus the impact of the differences in plant design and complexity would have a negligible effect when considered across the rate paying population. **[50.109(c)(8)]**

For the most part, however, these are sunk costs already expended in voluntary compliance with the original version of 10 CFR 50.65 as issued in 1991. The principal cost associated with implementation of this proposed rulemaking would be administrative in nature, dealing with changes to procedures and other documents to indicate the shift to and changes in paragraph (a)(4) and the modest retraining necessary for the appropriate personnel. **[50.109(c)(5)]**

3.2.2 Value of Alternative 2

Maintenance of plant SSCs is necessary even if a pre-assessment of the resulting configuration is not required. Thus, the value of such a requirement is

found in improvement in safety that results from performing the assessments. If a plant is put in an unsafe configuration because equipment is off line for maintenance, demands may be made on safety and recovery systems that cannot be met. This circumstance may result in damage to the plant and possibly off site releases to the public, or it could cause excessive actuation of safety system SSCs that are rarely called upon.

The proposed rule does not require any change in the design or construction of any nuclear power plant. Neither does the proposed rule apply to activities associated with the planning, design, or installation of plant modifications. Therefore, there will be no plant installation, downtime, or construction costs associated with the proposed rule to be borne by licensees. **[50.109(c)(5)]**

When the maintenance rule was first promulgated in 1991, the NRC staff did not foresee the significant changes licensees would be making in maintenance practices. To enhance operational efficiency in reaction to the rate deregulation of the electric utility industry, licensees are shortening their refueling and maintenance outages by performing more maintenance while the plant is at power. At-power maintenance practices have evolved to the point that not only are major systems and components taken off line, but also multiple systems and components are taken off line simultaneously. This on-line maintenance could result in an increased likelihood of an accident or transient while the equipment is rendered unavailable, compared to risk that occurs from expected random equipment failures. The pre-maintenance assessments, along with the specifications regarding their scope and their use, which the Commission proposes to require are intended to cause licensees to manage the risk associated with removing SSCs from service to perform maintenance by ensuring their plants are not placed in risk-significant conditions or conditions in which the performance of safety functions are degraded to unacceptable levels. It is this risk avoidance feature of this alternative that provides a significant safety benefit over Alternative 1 and provides the protection to the public health and safety that the NRC is required to maintain. **[50.109(c)(6)]**

Maintenance of plant equipment while the plant is operating at power (i.e., on-line maintenance) has become a common practice in the nuclear power industry. This practice has been caused, in large part, by the licensees' desire to maximize plant availability by minimizing plant refueling and maintenance outage durations. During on-line maintenance activities, the plant risk associated with an accident that would result in damage to the reactor fuel or the release of fission products to the environment will increase because of the unavailability of the equipment taken out of service. Pilot studies by the NRC as well as the industry's maintenance rule implementation assessments have both shown that the risk impact of maintenance activities can vary substantially, depending on the combinations of equipment allowed to be out of service concurrently and the duration of the activities. Since imprudently planned and managed maintenance activities have the potential for subjecting a plant to an unacceptable incremental contribution to the annual risk, it is important that the provisions of this proposed rule be implemented to ensure that on-line maintenance is carefully managed to achieve a balance between the benefits of the on-line maintenance and the potential impacts on safety. Hence, the proposed rule would require that the on-line maintenance process be carefully evaluated, planned, and executed to avoid risk-significant configurations, or configurations that would degrade safety functions to an unacceptable level, and thereby would ensure an acceptable margin of safety. Furthermore, the proposed rule would focus attention on methods to evaluate, both prospectively and in real time, the risk impacts of plant configurations so that undesirable risk impacts from maintenance are avoided. Since this is a risk-informed and performance-based rule, licensees would have flexibility in their selection of evaluation methods and decision criteria as long as they meet the requirement of the proposed rule that unacceptable risk impacts from maintenance configurations be avoided. However, the staff will provide guidance in Regulatory Guide 1.160 Revision 3 (proposed) that will describe methods acceptable to the staff for meeting the requirements of this proposed rule**. [50.109(c)(3)]**

Similarly, because there is a potential risk to the public from an accidental offsite release of fission products during shutdown operations, maintenance performed during those operations, too, must be carefully managed. Even though the power level in the reactor is essentially zero, used fuel and contaminated materials present a potential hazard.

The maintenance rule does not prescribe the type, frequency, or duration of maintenance activities but rather would only require safety assessments before the performance of the maintenance. However, the safety assessment requirement is expected to greatly reduce the possibility of the plant's being operated in an unsafe configuration. This is likely to result in an overall reduction in occupational exposures. **[50.109(c)(4)]**

In addition to the benefit to public health and safety, other effects such as potential damage to plant SSCs and the possible need for the purchase of replacement energy will be avoided. This would result in a cost savings to the industry that in some measure would offset the increase in costs discussed in Section 3.2.1. While it is impractical to calculate the potential risk benefits of the proposed rule revision because of the variability, frequency, and repetitiveness of maintenance tasks associated with each plant configuration, the staff's qualitative assessment supports the beneficial impacts of the proposed rule change because of risk-aversion strategies resulting from the proposed change.

3.2.3 Impact of Alternative 2 on the NRC

The impact of Alternative 2 on the NRC would be twofold. The first impact would be the cost of implementing a rule change. On average, the NRC estimates that a rule change requires 1 person-year per year for 2 years. Although Alternative 2 appears to be a relatively straightforward amendment, it nonetheless would require about 2.0 NRC staff-years to complete. The deterministic analyses required by the basic and intermediate-complexity assessments should require little additional guidance to the licensees. However, additional guidance in the form of a regulatory guide is planned to provide licensees with insights on NRC's expectations for the high-complexity assessments that may require PRA techniques. There is currently a large body of PRA literature available to the public, and the development of NRC-approved guidance from this body of literature should not require more than 0.25 staff-years of effort.

The second impact would be the inspection and oversight of the assessments, both of which should be straightforward and require minimum extra resources. In actuality, the inspection of licensees' implementation of the paragraph (a)(3) safety assessments is already part of the NRC resident inspector core inspection program. Therefore, similar to the actual impact on the industry, the principal impact on the NRC would be administrative in nature and would deal with changes to inspection procedures and guidance documents to indicate the shift to, and changes, in paragraph (a)(4) and the modest retraining necessary for the appropriate personnel. Nevertheless, the NRC staff proposes to inspect the implementation of the proposed rulemaking at about 20 licensee sites selected from those licensees that had safety assessment weaknesses during initial inspections of maintenance rule

implementation. These approximately 20 proposed inspections would cost 1 staff year and $400,000 in contractual support.

Thus, the impacts on the NRC are estimated to be a one-time cost for rule and guidance development of 2.25 staff-years plus 1 staff-year and $400,000 for implementation inspection. These resources have been accounted for in the regional and headquarters budget estimates. **[50.109(c)(7)]**

3.3 ALTERNATIVE 3 -- MAKE COMPREHENSIVE REVISIONS TO PARAGRAPH (A)(3) OF THE RULE

3.3.1 Impact of Alternative 3

Alternative 3 is derived as a consequence of the original intent of the maintenance rule. The SOC for 10 CFR 50.65 stated that the expectation was that the assessments required by paragraph (a)(3) would be refined on the basis of improvements in technology and experience. Because an approach like this requires the broad use of probabilistic techniques, it is envisioned that the approach would take on a performance-based character. This approach would mandate specific limits on the risk associated with maintenance activities, such as limits on total risk, incremental risk per maintenance outage, or limits on cumulative risk per time period. Because this would be a non-prescriptive approach, it is not feasible to estimate the cost to the industry or to the NRC with any degree of certainty. Licensees will likely take varying approaches to implement such technologies, each requiring sophisticated methodologies and highly trained individuals to perform the assessments.

Although the specific impacts of Alternative 3 have not been quantified, the burden to the licensee is believed to be much greater than Alternative 2. The NRC would promulgate the limits within which the risk of resultant plant configurations could be increased for maintenance activities instead of specifying the probabilistic techniques to be used. The licensee would need to research and evaluate various alternatives and determine which is suitable for its facility. A fair amount of trial and error is expected as various configurations are evaluated and certain maintenance activities are found to exceed NRC-specified limits. This trial and error, in turn may cause delays in maintenance activities and increase the likelihood of component failures.

3.3.2 Value of Alternative 3

Although it is impractical to calculate the potential risk benefits of this alternative, several qualitative values have been considered. Alternative 3 would limit maintenance activities through the use of mostly risk-based criteria and would require licensees to evaluate and control maintenance activities through much more rigorous, technically advanced methods. Also, it would establish a regulatory precedent for other risk-based requirements.

3.3.3 Impact of Alternative 3 on the NRC

The resource burden to the NRC of Alternative 3 is expected to be significantly greater than for the two lower options of Alternative 2. The NRC would need to develop the risk parameters to be used for setting the limits that risk may be increased while continuing to operate the facility safely. The specific limits must be developed, evaluated, and approved. Assessment methodologies used to estimate the change in risk parameters must be evaluated and approved by the NRC staff to assure their accuracy and reliability. Implementation of such a rule is expected to require extensive interactions between the staffs of the licensee and the NRC to fully understand and evaluate each methodology. Further, the burden of inspecting implementation and compliance with the regulation would be likewise complicated. For example, in a time of shrinking resources, Alternative 3 would necessitate extensive PRA training for region-based inspectors. Because the NRC continues to be a fully fee-recoverable agency, the increased burden would be transferred to the licensee.

Because of the burden that such an approach will place upon licensees, it is unlikely that the industry would support such an approach. Thus, the rulemaking process would be greatly affected, which would result in many industry and NRC interactions and many counter proposals by the industry requiring staff evaluation and Commission action. The resources required for such a rulemaking should be balanced against the incremental benefits. The NRC inspection program has demonstrated that, by and large, licensees are complying with an Alternative 2 type approach even though it is recommended and not required.

4.0 Discussion of Voluntary Compliance with the Safety Assessment Provision of 10 CFR 50.65(a)(3)

NRC's Regulatory Analysis Guidelines direct the NRC staff to not consider the cost of voluntary licensee actions as the cost basis for decisions concerning contemplated regulatory actions. However, the guidance indicates that a sensitivity analysis should be performed to estimate the actual incremental burden that would result from the action. All licensees have some form of pre-maintenance safety assessment program as recommended in 10 CFR 50.65(a)(3) and as provided in Regulatory Guide 1.160 and NUMARC 93-01. The first 50 maintenance rule baseline inspections for which reports had been issued as of April 20, 1998, found that approximately half of the licensees either had programs with weaknesses or had failed to perform the recommended safety assessments. This statistic would indicate that the methodologies for performing the assessments are in place in most facilities; however, the weaknesses in some programs would have to be corrected, and the compliance with 10 CFR 50.65(a)(3) would have to be assured. Thus, the one-time $320,000 cost per facility for methodology development and the annual $75,000 per facility for use and maintenance would seem to overstate the actual increase in cost as a result of this rulemaking.

5.0 Decision Rationale

Alternative 2 is judged to present a substantial increase in safety as opposed to Alternative 1. Although Alternative 2 has a non-trivial burden if voluntary compliance is disregarded, its burden is not nearly as great as that of Alternative 3, and the program to be implemented is, in large measure, already in place. Also, the industry is favorably disposed to Alternative 2, and its full implementation should be straightforward. The Nuclear Energy Institute (NEI, successor to NUMARC) supported Alternative 2 and provided proposed draft revisions of NUMARC 93-01 to the NRC on May 1, 1998. Alternative 1, clearly the least burdensome of the choices considered, will not correct the NRC's principal concern, which is that licensees would not perform pre-maintenance safety assessments and remove the paragraph (a)(3) safety assessment provision in their maintenance rule implementation programs at their own discretion. Alternative 3 is the most comprehensive of the alternatives, but it would create a serious increase in the burden to the licensees and the NRC (which would likewise be borne by the industry). Thus, the NRC is publishing Alternative 2 as a proposed rule for public comment and proposes to publish it as a final rule once the public comments have been analyzed and resolved. If published as a final rule, the proposed backfit will be imposed on a final basis. **[50.109(c)(9)]**

6.0 Implementation

The action evaluated in this regulatory analysis will be implemented through the promulgation of a final regulation, after the public comments have been obtained, evaluated, and resolved. A regulation has been selected as the appropriate mechanism for this implementation because regulatory guides do not constitute requirements and, with NRC orders, the benefit of public participation and comment are not utilized. The notice that publishes the final rule will specify that the rule will be effective 120 days after its publication in the *Federal Register* to coincide with the availability of regulatory guidance.

ATTACHMENT 3

The Honorable Dan Schaefer, Chairman
Subcommittee on Energy and Power
Committee on Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

The NRC has sent the enclosed proposed amendments to the Commission's rules in 10 CFR 50.65 to the Office of the *Federal Register* for publication. This rule, if promulgated, would require commercial nuclear power plant licensees to perform assessments of the cumulative safety impact of out-of-service equipment on the plant's capability to perform safety functions prior to removing equipment from service for undertaking maintenance activities. Although 10 CFR 50.65, the Maintenance Rule, presently addresses those safety assessments, the rule as written states they "should" be performed, the legal effect of which is to serve as a recommendation. This proposed rule would make them a requirement.

In today's environment of rate deregulation of the electric utility industry and the resulting pressure to enhance operational efficiencies and produce power, our nuclear power plant licensees are conducting more of their maintenance activities while at power than ever before. The Commission wants to ensure that these licensees consider risk in the prioritizing, planning, and scheduling of maintenance. A major portion of that consideration is based on the appropriate performance and use of the pre-maintenance safety assessments.

Sincerely,
Dennis K. Rathbun, Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Ralph Hall

The Honorable James M. Inhofe, Chairman
Subcommittee on Clean Air, Wetlands, Private
Property and Nuclear Safety
Committee on Environment and Public Works
United States Senate
Washington, DC 20510
Dear Mr. Chairman:

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Sincerely,
Dennis K. Rathbun, Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Senator Bob Graham

NRC PROPOSES TO REQUIRE NUCLEAR POWER PLANTS TO ASSESS SAFETY IMPACT BEFORE TAKING EQUIPMENT OUT OF SERVICE FOR MAINTENANCE

The Nuclear Regulatory Commission is proposing to revise its Maintenance Rule to require that nuclear power plant licensees assess the impact on safety before they take equipment out of service for maintenance. At present, the rule says that licensees "should" do such an assessment, but does not require it.

NRC is taking comments on the proposed rule change. Comments are due 75 days after the amendment is published in the *Federal Register*.

NRC has long been concerned about a trend in the nuclear power industry to take key equipment out of service for maintenance while a plant is on line, without a thorough risk evaluation. Published NRC reports on 50 inspections conducted since the Maintenance Rule was first adopted in 1991 show that all licensees checked have programs in place requiring a review of the safety impact on the plant before equipment is taken out of service for maintenance. But at five sites, licensees had not performed such assessments, and at 19 others safety assessment weaknesses were found.

The present rulemaking results from a directive given the NRC staff by the Commission after it was informed last year that the Maintenance Rule language on safety assessments is permissive, rather than mandatory. Also at the Commission's direction, the proposed amendment specifies that the Maintenance Rule applies during all conditions of plant operations, including normal shutdowns, and that safety assessments are to be performed for all planned maintenance activities.

Comments on the proposed rule should be mailed to the Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, Attention: Rulemakings and Adjudications Staff. They also may be hand-delivered to 11555 Rockville Pike, Rockville, MD, between 7:30 a.m. and 4:15 p.m. on Federal workdays. Comments may be transmitted via the NRC's interactive rulemaking web site through the NRC home page found at http://www.nrc.gov.

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1. The recurrent costs of updating the methodologies to account for new information and improved technologies will be accounted for separately.

2. Unless otherwise noted or assumed, cost estimates are based upon direct staff communications with licensee management.

3. There are approximately 100 operating reactors in the United States. However, many of these units will share maintenance assessment programs because they reside in multiple- reactor sites. The assumption is that only 68 programs will need to be developed.