



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

January 18, 2005

SECRETARY

COMMISSION VOTING RECORD

DECISION ITEM: SECY-04-0233

TITLE: PROPOSED RULEMAKING--POST-FIRE OPERATOR  
MANUAL ACTIONS (RIN 3150 AH-54)

The Commission (with all Commissioners agreeing) approved the subject paper as recorded in the Staff Requirements Memorandum (SRM) of January 18, 2005.

This Record contains a summary of voting on this matter together with the individual vote sheets, views and comments of the Commission.

A handwritten signature in black ink, appearing to read "Annette L. Vietti-Cook".

Annette L. Vietti-Cook  
Secretary of the Commission

Attachments:

1. Voting Summary
2. Commissioner Vote Sheets

cc: Chairman Diaz  
Commissioner McGaffigan  
Commissioner Merrifield  
OGC  
EDO  
PDR

VOTING SUMMARY - SECY-04-0233

RECORDED VOTES

	APRVD	DISAPRVD	ABSTAIN	NOT PARTICIP	COMMENTS	DATE
CHRM. DIAZ	X				X	1/12/05
COMR. McGAFFIGAN	X				X	1/6/05
COMR. MERRIFIELD	X				X	1/12/05

COMMENT RESOLUTION

In their vote sheets, all Commissioners approved the staff's recommendation and provided some additional comments. Subsequently, the comments of the Commission were incorporated into the guidance to staff as reflected in the SRM issued on January 18, 2005.

NOTATION VOTE  
RESPONSE SHEET

TO: Annette Vietti-Cook, Secretary  
FROM: CHAIRMAN DIAZ  
SUBJECT: **SECY-04-0233 - PROPOSED RULEMAKING-POST-FIRE OPERATOR MANUAL ACTIONS (RIN 3150 AH-54)**

w/comments and edits

Approved  *LD* Disapproved \_\_\_\_\_ Abstain \_\_\_\_\_  
Not Participating \_\_\_\_\_

COMMENTS:

See attached comments and edits.

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SIGNATURE

*Jan 12, 05*  
\_\_\_\_\_  
DATE

Entered on "STARS" Yes  No \_\_\_\_\_

### Chairman Diaz' Comments on SECY-04-0233

I approve the rulemaking package, including the staff's recommendation to continue using the current enforcement discretion policy of EGM 98-02 and the guidance provided in IP 71111.05 in relation to operator manual actions, subject to the following comments and the attached edits. I have concerns with the staff's proposal for fire detection, automatic suppression, and time margins for operator manual actions.

In reviewing the staff's proposed rulemaking package, I believe that the requirement for fire detection and automatic suppression will significantly reduce the benefits of the proposed rule with respect to the underlying reason for undertaking the rulemaking (i.e., reducing the use of the exemption process and thereby allowing for more efficient use of resources by licensees and NRC). In addition, I do not believe that the staff has justified the requirement to provide a 100 percent time margin for each operator manual action (i.e., multiply the time it takes an operator to perform the action by 2).

Regarding detection and automatic suppression, I understand that, as written, many licensees would likely pursue exemptions from the rule in order to take credit for operator manual actions. The exemptions would be necessary because licensees may not have detection and/or automatic suppression systems in the areas that the rule would require such systems to be installed. For those licensees, the staff proposes to address the issues on a plant-specific basis through the exemption process. I do not believe that this is consistent with the reasons the Commission decided to undertake the rulemaking. Furthermore, it is not clear to me how such cases would be evaluated. The Commission recently approved a risk-informed and performance-based approach (i.e., NFPA 805) that could be used to address situations such as the use of operator manual actions in cases where fire detection and automatic suppression is not installed in the fire area. For such cases and consistent with the Commission's reason for undertaking this fire protection manual actions rulemaking, use of the risk-informed, performance-based approach in 10 CFR 50.48 (c) would be much more appropriate than the use of the exemption process for considering operator manual actions. The rulemaking package should be revised to discourage the exemption process and more clearly highlight the risk-informed, performance-based approach in 10 CFR 50.48(c) for addressing these cases. In addition, the staff should engage stakeholders to get a clear understanding of the likelihood that the proposed rule would achieve its underlying purpose, including the number of plants for which the proposed rule would address the operator manual actions issue. This information should be considered in deciding whether to proceed to final rulemaking.

Regarding the time margin requirement, I agree with the concept of including time margin to address uncertainties in the operator's ability to complete the action in a timely manner. However, I am not convinced that a 100 percent margin is sufficiently justified from a technical human factors perspective. A 100 percent time margin could prove to be too high or, more significantly, too low depending on the action to be performed and the uncertainties associated with that action. This approach is neither realistic nor performance based. While the staff clearly indicates that the inclusion of a 100 percent time margin in the proposed rulemaking package is not a final decision on this issue, I believe that the rulemaking package should be revised to include the range of options provided by the staff without recommending a preferred option. The options should be provided to solicit public comment on them and on other potential approaches for determining an appropriate time margin.

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The attached edits reflect the above comments, however, the staff should make conforming changes to the remainder of the package prior to issuing it for public comment.

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

RIN 3150 AH-54

Fire Protection Program - Post-Fire Operator Manual Actions

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AGENCY: U.S. Nuclear Regulatory Commission.

ACTION: Proposed rule.

SUMMARY: The Nuclear Regulatory Commission (NRC) proposes to amend its fire protection regulations in 10 CFR Part 50, Appendix R, paragraph III.G.2 for nuclear power facilities operating prior to January 1, 1979. The amendment would allow nuclear power plant licensees to use manual actions by plant operators as an alternative method to achieve hot shutdown conditions in the event of fires in certain plant areas, provided that the actions are evaluated against specified criteria and determined to be acceptable and that fire detectors and an automatic fire suppression system are provided in the fire area. The Commission <sup>believes that the</sup> proposed action would provide realistically conservative regulatory acceptance criteria for operator manual actions taken under paragraph III.G.2 of Appendix R to achieve and maintain <sup>not</sup> safe shutdown conditions. The NRC is also proposing and requesting comments on a draft regulatory guide to support this proposed rulemaking.

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DATES: Submit comments on the proposed rule <sup>and the draft regulatory guide,</sup> and the issue of an interim enforcement discretion policy by (insert date 75 days after publication in the *Federal Register*). Submit comments specific to the information collections aspects of this rule <sup>by</sup> (insert date 30 days after publication in the *Federal Register*). Comments received after these dates will be considered if

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copy documents for a fee. Selected documents, including comments, may be viewed and downloaded electronically via the NRC rulemaking web site at <http://ruleforum.inl.gov>.

Publicly available documents created or received at the NRC after November 1, 1999, are available electronically at the NRC's Electronic Reading Room at <http://www.nrc.gov/reading-rm/adams.html>. From this site, the public can gain entry into the NRC's Agencywide Document Access and Management System (ADAMS), which provides text and image files of NRC's public documents. If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS, contact the NRC Public Document Room (PDR) Reference staff at 1-800-397-4209, 301-415-4737 or by email to [pdr@nrc.gov](mailto:pdr@nrc.gov).

You may submit comments on the Information collections by the methods indicated in the Paperwork Reduction Act Statement.

For further information contact: David T. Diec, 301-415-2834, [dtd@nrc.gov](mailto:dtd@nrc.gov) or Alexander Klein, 301-415-3477, [ark1@nrc.gov](mailto:ark1@nrc.gov)

**SUPPLEMENTARY INFORMATION:**

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**II. Rulemaking Initiation**

**III. Proposed Action**

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~~Suppression Requirement as an Option to Appendix F, Paragraph III.G.2~~

B. Addition of Operator Manual Actions Acceptance Criteria to ~~Appendix F,~~

Paragraph III.F

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**C. Response to Stakeholder Comments on Operator Manual Action Acceptance**

**Criteria**

**IV. Interim Enforcement Discretion Policy**

**V. Section-by-Section Analysis of Substantive Changes**

**VI. Plain Language**

**VII. Voluntary Consensus Standards**

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**I. Background**

Section 50.48, Fire Protection, requires that each operating power plant must have a fire protection plan that satisfies Criterion 3 of Appendix A to 10 CFR part 50. Criterion 3 requires that structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions. The specific fire protection requirements for safe shutdown capability of plants are further discussed in paragraph G of Section III of Appendix R to 10 CFR Part 50. The more specific Section 50.48 and Appendix R requirements were added following a significant fire that occurred in 1975 at the Browns Ferry nuclear power plant. The fire damaged control,

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instrumentation, and power cables for redundant trains of equipment necessary for safe shutdown.

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In response to the fire, an NRC investigation was conducted and it was found that the independence of redundant equipment at Browns Ferry was negated by lack of adequate separation between cables for redundant trains of safety equipment. The investigators subsequently recommended that a suitable combination of electrical isolation, physical distance, fire barriers, and sprinkler systems should be used to maintain the independence of redundant safety equipment. In response to these recommendations, the NRC worked with

*St. Kitts*  
reactor licensees

for several years to identify and implement necessary plant fire protection improvements. In 1980, NRC promulgated Section 50.48 to establish fire protection requirements and Appendix R to 10 CFR Part 50 for certain generic issues, including

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paragraph III.G, fire protection of safe shutdown capability. The requirements for separation of cables and equipment associated with redundant safe shutdown trains were promulgated in paragraph III.G.2.

Paragraph III.G.2 of Appendix R requires that cables and equipment of redundant trains of safety systems in the same fire area be separated by either:

- a. a 3-hour fire barrier, or
- b. a horizontal distance of more than 20 feet with no intervening combustibles in conjunction with fire detectors and an automatic fire suppression system, or
- c. a 1-hour fire barrier combined with fire detectors and an automatic fire suppression system.

Appendix R applies to only those licensees who received operating licenses before January 1, 1979. Plants licensed after January 1, 1979, are not required to meet Appendix R.

These plants were licensed to meet Branch Technical Position CMEB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants," that contains criteria similar to the Appendix R requirements. Specific licensing basis information for these plants is usually contained in license conditions issued at time of licensing.

Because the rule was to apply to facilities which were already built, the NRC knew that compliance with various parts of Appendix R might be difficult at some facilities. Accordingly, the NRC included a provision which allowed licensees to submit alternative acceptable methods for protecting redundant equipment for NRC review and approval through an exemption process. <sup>During implementation of</sup> When implementing the Appendix R requirements, the NRC reviewed and approved a large number of exemptions for 60 licensees who proposed alternative acceptable methods of compliance in various areas, including numerous exemptions from paragraph III.G.2.

In the early 1990s, generic problems arose with Thermolag<sup>1</sup> fire barriers, which many licensees were using to comply with paragraph III.G.2 of Appendix R. Licensees were ultimately required to replace Thermolag material with other fire barriers. Several years later, fire protection inspectors began to notice that many licensees had not upgraded or replaced Thermolag fire barrier material (or had not otherwise provided the required separation distance between redundant safety trains) used to satisfy the paragraph III.G.2 criteria. Some licensees compensated by relying on operator manual actions<sup>2</sup> which had not been reviewed and approved by the NRC via the exemption process. Operator manual actions are not

<sup>1</sup>Thermolag is a brand-name for a particular type of material used to construct fire barriers typically for protecting electrical conduits and cable trays. In the early 1990's, issues arose regarding the testing and qualification process used for this material. It was determined that barriers made of this material would not provide protection for the required periods of time.

<sup>2</sup>Operator manual actions are those integrated set of actions needed to ensure that a redundant train of systems necessary to achieve and maintain hot shutdown conditions located within the same area outside the primary containment is free of fire damage.

alternative specified in paragraph III.G.2 of Appendix R. However, they may be a means of achieving <sup>hot</sup> safe shutdown in the event of a fire under certain conditions.

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In 2002, the NRC met with nuclear industry licensees and informed them that the use of unapproved manual actions was not in compliance with paragraph III.G.2. During a meeting on June 20, 2002, the Nuclear Energy Institute stated that there was widespread use of operator manual actions throughout the industry based on industry understanding of past practice and existing NRC guidance. The industry also stated that licensees' use of unapproved manual actions had become prevalent even before the concerns arose with Thermomag material.

Shortly thereafter, the NRC developed criteria for inspectors to use in assessing the safety significance of violations resulting from unapproved operator manual actions. The criteria were

based on past practice and experience by NRC inspectors when reviewing operator manual actions used to comply with Appendix R, paragraph III.G.3, on alternate shutdown. Licensees were familiar with these criteria through their interactions with the NRC inspection process.

*the NRC staff during implementation of*

These criteria were issued in the revision to Inspection Procedure 71-1-1-05 in March 2003.

While unapproved operator manual actions are still violations, actions meeting these interim criteria are viewed to have low or no safety significance.

The interactions between operators performing manual actions to respond to an in-plant fire and the types of actions taken by plant responders during a fire as a result of a security event were considered during the development of this rule. However, given that physical security overarches many aspects of plant operations, it was determined that security considerations should be considered in a broader context. The Commission is evaluating the merits of a more global approach to establishing regulatory requirements for safety-security interface.

II. Rulemaking Initiation

Instead of continuing the current practice of requiring all noncompliant licensees to submit individual exemption requests for staff review to determine if their operator manual actions are acceptable, the Commission <sup>believes</sup> has determined that amending Appendix R to 10 CFR Part 50 would be the most orderly and efficient way to provide an option for licensees to utilize acceptable operator manual actions in lieu of the separation or barrier requirements in paragraph III.G.2. In this way the NRC would codify conservative acceptance criteria for licensees to use in evaluating operator manual actions to ensure that the actions were both feasible and reliable. These criteria would maintain safety by ensuring that licensees perform thorough evaluations of the operator manual actions comparable to evaluations a licensee would provide to NRC for review and approval of an exemption request. The staff developed a rulemaking plan (SEGY-03-0100) and the Commission approved the staff plan on September 12, 2004. The rule change would revise 10 CFR Part 50, Appendix R, paragraph III.G.2 to allow licensees to implement acceptable operator manual actions after documenting that the actions met the regulatory acceptance criteria. Through the established Reactor Oversight Process (ROP), the NRC will continue to inspect licensees' methodologies for achieving and maintaining hot shutdown conditions in accordance with the requirements set forth in Section III.G.2 of Appendix R to 10 CFR Part 50. The NRC fire protection inspectors would verify that the licensees' operator manual actions met the NRC acceptance criteria and will evaluate the licensee's <sup>OP</sup> analysis, procedures and training, implementation, and demonstration of operator manual actions to ensure the licensee <sup>s have</sup> has adequately demonstrated the feasibility and reliability of a manual action.

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III. Proposed Action

The Commission proposes to allow the use of operator manual actions coincident with fire detectors and an automatic fire suppression system as an additional alternative method for compliance with paragraphs III.G.2(a), (b) or (c) of Appendix R. The Commission has determined that implementing any one of the alternatives in paragraph III.G.2 will provide reasonable assurance that at least one method for achieving and maintaining the hot shutdown condition will remain available during and after a postulated fire anywhere in the plant. The Commission proposes to add a new subparagraph G.2.(c-1) and a subpart P to paragraph III of Appendix R to 10 CFR Part 50. The new subparagraph G.2.(c-1) would establish operator manual actions, in conjunction with fire detectors and an automatic fire suppression system, as a fourth compliance option with paragraphs III.G.2(a), (b) or (c), provided that the operator manual actions satisfy the acceptance criteria in the new subpart P. The new subpart P would define operator manual actions and set forth the required acceptance criteria which must be met before a licensee could use operator manual actions outside the containment to comply with paragraphs III.G.2 of Appendix R. Compliance with these acceptance criteria is necessary to provide reasonable assurance of the feasibility and the reliability of the operator manual actions.

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The requirements in Appendix R are applicable only to licensees who received operating licenses before January 1, 1979. Post-January 1, 1979, licensees were licensed to meet GDC-3, §50.48(a), and Branch Technical Position 9.5-1, which contain criteria that are similar to the Appendix R requirements. Post-January 1, 1979 licensees who use operator manual actions without NRC approval may or may not be in compliance with applicable fire protection requirements. Compliance depends on the specific licensing commitments (usually specified in license conditions for these licensees), the change control process, and how the change was justified and analyzed to demonstrate that the operator manual actions are feasible and reliable and thus do not adversely affect the ability to achieve or maintain safe shutdown.

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A. Operator Manual Actions Alternative

The Commission proposes to add a new subparagraph (e-1) to paragraph III.G.2 of 10 CFR Part 50 to codify operator manual actions, with fire detectors and an automatic fire suppression system, as an additional alternative compliance method set forth in paragraph III.G.2. The Commission has determined that implementing any of the alternatives in III.G.2 will provide reasonable assurance that at least one method for achieving and maintaining hot shutdown condition will remain available during and after a postulated fire. The basis for this determination is provided below.

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The Commission's fire protection requirements constitute a defense-in-depth approach to protect safe shutdown functions. The overall objectives of the NRC's fire protection regulations are to minimize the potential for fires and explosions; to rapidly detect, control, and extinguish fires that do occur; and to ensure that the fires will not prevent the accomplishment of necessary safe shutdown functions and will not significantly increase the risk of radioactive releases to the environment. The NRC has concluded if these objectives are met, there is reasonable assurance that a licensed facility is providing adequate protection of public health and safety. These objectives are met by a set of NRC requirements for control of combustible materials and ignition sources, fire detection and suppression systems, fire brigade procedures and training, and physical separation of cables and equipment of redundant trains of safe shutdown equipment.

The physical separation requirements in paragraph III.G.2 of Appendix R are one component of the NRC's overall fire protection objectives. In paragraph III.G.2, the NRC specified three different methods for providing separation of cables and equipment of redundant trains of equipment located in the same fire area. These three options for compliance with paragraph III.G.2 offer sufficient but varying levels of protection. In general,

provide a more efficient and effective process and to ensure more uniform and consistent regulatory treatment of these cases, the NRC <sup>is proposing</sup> decided to codify conservative, state-of-the-art acceptance criteria for licensees to use in evaluating operator manual actions to ensure that they are both feasible and reliable. <sup>The NRC believes that</sup> codifying this alternative in the rule will be more efficient than using the exemption process, and will provide for enhanced safety by allowing resources to be focused on safety rather than administrative compliance.

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Something that is "feasible" is "capable of being accomplished or brought about, possible." Something that is "reliable" will "yield the same or compatible results in different experiments or statistical trials; dependably repeatable." To credit operator manual actions under <sup>Paragraph</sup> III.G.2 for outside containment, the licensee must prove to the satisfaction of the NRC not only that the actions can be successfully accomplished, but also that they <sup>can be</sup> successfully accomplished repeatedly by all personnel who are required to perform the actions. Together, proof that the operator manual actions are both feasible and reliable provides the level of reasonable assurance necessary for credited operator manual actions to be in compliance with

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Paragraph III.G.2.

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If shown to be feasible and reliable, operator manual actions are likely to be successfully achieved. Any potential increases in risk to the public due to their use will be minimal. Requiring the operator manual actions to meet the conservative set of acceptance criteria provides the NRC with reasonable assurance that such operator manual actions can be accomplished to safely shut down the plant in the event of fire. These criteria maintain safety by ensuring that licensees perform thorough evaluations of the required operator manual actions and pre-plan equipment needs. NRC fire protection inspectors will verify the licensees' documented operator manual actions that meet the NRC acceptance criteria through the existing triennial inspection process. The use of operator manual actions does not diminish the other defense-in-depth

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objectives of the NRC fire protection program (i.e., the requirements that minimize the potential for fires and explosions and those which provide for rapid controlling and extinguishing of fires that do occur). To support the objective for rapidly controlling and extinguishing fires, the NRC is requiring fire detectors and an automatic fire suppression system as part of the new operator manual actions option. Accordingly, the NRC has determined that the proposed rulemaking provides reasonable assurance that the public health and safety are protected, consistent with the assurance provided by compliance with the current three options in paragraphs III.G.2(a), (b) or (c).

#### B. Addition of Paragraph III.P, Operator Manual Actions Acceptance Criteria

The proposed paragraph III.P specifies the required acceptance criteria which must be met before a licensee may utilize operator manual actions to comply with paragraph III.G.2 of Appendix R. A detailed discussion of each criterion is provided further in this Statement of Consideration. These criteria are as follows:

#### III.P Operator Manual Actions.

- 1 For purposes of this section, operator manual actions means the integrated set of actions needed to ensure that a redundant train of systems necessary to achieve and maintain hot shutdown conditions located within the same area outside the primary containment is free of fire damage.
- 2 A licensee relying on operator manual actions must meet all of the following acceptance criteria:
  - (a) Analysis. The licensee shall prepare an analysis for each operator manual action which demonstrates its feasibility and reliability.



(1) The analysis must contain a postulated fire time line showing that there is sufficient time to travel to action locations and perform actions required to achieve and maintain the plant in a hot shutdown condition under the environmental conditions expected to be encountered without jeopardizing the health and safety of the operator performing the manual actions. The fire timeline shall extend from the time of initial fire detection until the time when the ability to achieve and maintain hot shutdown is reached, and shall include a time margin that accounts for all <sup>important</sup> variables, including (i) <sup>analyzed</sup> differences between the demonstrated and actual conditions and (ii) human performance uncertainties that may be encountered.

(2) The analysis must address the functionality of equipment or cables that could be adversely affected by the fire or its effects but still utilized to achieve and maintain hot shutdown.

(3) The analysis must identify all equipment required to accomplish the operator manual action under the postulated timeline, including (but not limited to) (i) all indications necessary to show the need for the operator manual actions, enable their performance, and verify their successful accomplishment, and (ii) any necessary communications, portable, and life support equipment.

(b) Procedures and training. Plant procedures must include each operator manual action required to achieve and maintain hot shutdown. Each operator must be appropriately trained on those procedures.

(c) Implementation. The licensee shall ensure that all systems and equipment needed to accomplish each operator manual action are <sup>available</sup> ~~operable~~ and readily

accessible consistent with the analysis required by paragraph 2(a). The number of operating shift personnel required to perform the operator manual actions shall be on site at all times.

(d) Demonstration. Periodically, the licensee shall conduct demonstrations using an established crew of operators to demonstrate that operator manual actions required to achieve and maintain the plant in a hot shutdown condition can be accomplished consistent with the analysis in paragraph 2(a) of this section. The licensee may not implement operator manual actions until they have been established by a demonstration to be consistent with the analysis. The licensee shall take prompt corrective action if any subsequent periodic demonstration determines that the operator manual actions can no longer be accomplished consistent with the analysis.

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The above acceptance criteria for operator manual actions are intended to assure the safe shutdown goals and objectives for operating reactors as required in Section 50.48. The primary objective for safe shutdown is to maintain fuel integrity (i.e., fuel design limits are not exceeded). For alternative or dedicated shutdown capability, the reactor coolant system process variables should be maintained within those predicted for a loss of normal ac power and fission product boundary integrity should not be affected.

The applications of these acceptance criteria are as follows: First, the criteria are the means by which the NRC will establish standards that provide a reasonable level of assurance that operator manual actions will be satisfactorily and reliably performed to bring the plant to a hot shutdown condition, thus protecting public health and safety. Second, a standard set of acceptance criteria will permit both the licensees and NRC to establish consistency as to what operator manual actions will be allowed. Third, the criteria will provide the parameters which

both the licensees and NRC will use to conduct evaluations and inspections in a thorough manner. The supporting basis for each criterion is discussed in detail below.

The acceptance criteria in the proposed rule are structured to ensure both feasibility and reliability of the operator manual actions. To credit operator manual actions, the licensee must prove not only that the actions can be successfully accomplished (are feasible), but also that they can be done so repeatedly (are reliable). Central to the approach is the preparation of an analysis that determines what actions must be taken in order to reach a safe shutdown condition. This analysis would also identify the time available (timeline) for successful performance of such actions. A demonstration of the accomplished operator manual actions within the established timeline verifies the feasibility of such actions. In order to also achieve reliability of the actions, the Commission is proposing a criterion for a time margin needed to complete the actions because of potential variations in fire characteristics, plant conditions, and human performance that the demonstration cannot adequately address. This concept is further described in the sections below.

#### Timeline Analysis

The Commission will require that a licensee perform an analysis to determine the feasibility and reliability of operator manual actions. As part of the analysis, there shall be a fire timeline, which extends from the initial fire detection to the achievement of maintainable hot shutdown conditions, to define the time boundaries of the analysis for the fire scenario in which the operator manual actions will be performed. The analysis must identify all actions that must be completed, the equipment needed, the number of people needed, the communications equipment required, and the time available to perform the actions before unsafe plant conditions occur (i.e., before exceeding safe shutdown goals and objectives). The proposed rule has more specific requirements on each of these aspects that are discussed in subsequent sections of this

notice. The Commission will require a licensee to show that a sufficient amount of extra time would be available for the required operator manual actions and that the process for determining the time available <sup>for</sup> for such actions adequately addressed the potential variations in fire characteristics, plant conditions, and human performance. This concept is referred to in this statement as a "time margin."

Proper demonstration requires that the licensee meet all operator manual action acceptance criteria other than Time Margin (this is evaluated after all other criteria, including requirements in Section 2(d), have been met) and show that at least one randomly-selected, established crew can successfully perform the actions within an acceptable time frame. For example, if there are questions about whether operators can reach the locations where they must perform the manual actions, these questions should be addressed to the extent practicable during the demonstration. However, successful demonstration does not fully determine reliability for the operator manual actions.

Additional factors must be considered to show that the actions can be performed reliably under the variety of conditions that could occur during a fire. For example, factors that the licensee may not be able to recreate in the demonstrations could cause further delay under real fire conditions (i.e., the demonstration would likely fall short of actual fire situations). Furthermore, typical and expected variability among individuals and crews could lead to variations in operator performance. Finally, variations in the characteristics of the fire and related plant conditions could alter the time available for the operator actions.

In order to ensure that a particular action could be performed reliably, licensees must show that a sufficient amount of extra time (i.e., a time margin) would be available for the action and that the process for determining the time available for the action adequately addressed the potential variations in fire characteristics and plant conditions. The time margin ensures that

operator manual actions can be performed reliably: (1) through well-thought out demonstrations that the actions are feasible, (2) by ensuring that there is extra time available for given actions with respect to the fire scenario, and (3) by adequately addressing all other related acceptance criteria.

The analysis should reflect consideration of realistically conservative scenarios and such variables as environment and human performance uncertainties should be accounted for and considered in the time margin. These variables are applied through the demonstration to show that there is ample time, including a margin consistent with the requirement in Section 2(a) above, available to complete an action before serious equipment damage would occur and affect safe shutdown. For example, a licensee may perform a worst case demonstration that requires the operator to wear a self-contained breathing apparatus (SCBA), if there is a reasonable expectation that the operators will need to pass through a zone containing smoke in order to reach the location where the operator manual action is to be carried out.

The NRC considers the use of a time margin as an appropriate safety factor for ensuring realistically reliable operator manual actions (i.e., there is a high confidence of a low probability of failure). The rule would require time margin to account for all variables including differences between the demonstrated and actual conditions and for human performance uncertainties that may be encountered.

The factors necessitating the time margin are:

1. The time margin should account for what the licensee is not likely to be able to recreate in the demonstration that could cause further delay (i.e., where the demonstration falls short).

2. The time margin should account for the variability of fire and related plant conditions.

3. The time margin should account for the variability in human performance among individuals and between different crews and for the effects of human-centered factors that could become relevant during fire scenarios.

These factors are important considerations for the time margin for the following reasons:

- 1. They address likely limitations of the demonstration.
- 2. The demonstration can replicate only a subset of all possible fires and resulting variability in fire and plant conditions.
- 3. Some degree of human performance variability is to be expected, some of which could further delay the times to perform the desired actions during real fire situations.

In order to establish a standard to show time margin, it was necessary to establish a time margin (or margins) for fire-related operator manual actions to ensure that they would be

successful a very high percentage of the time. In other words, if the licensee can meet all of the

operator manual action acceptance criteria, which include demonstrating that at least one randomly-selected, established crew can successfully perform the actions, and show that the actions can be performed within an acceptable time frame that allows for adequate time margin to cover potential variations in plant conditions and human performance, then the operator manual action rule would be met. For example, as long as it can be shown that there is an "X-percent" time margin to perform the particular operator manual action, plant damage or an

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undesirable plant condition will still be avoided and all of the other criteria have been met, then there is confidence to conclude that the action will be performed reliably.

The establishment of an appropriate time margin requires a supported technical basis.

While the best technical basis for a time margin would be empirical data from which it could be derived, a database search was unable to find relevant data that could be used directly for or

generalized to the operator manual actions of interest. To further develop this concept, the NRC convened an initial expert panel to identify a time margin for inclusion in this proposed rule statement for further stakeholder consideration and feedback.

The expert panel members concluded that a time margin factor of at least 2 would allow

*ensure that the*  
for a "high confidence of a low probability of failure" for operator manual actions in response to

*be sufficiently reliable*  
fire. For example, if the operator manual action can be shown typically to take less than 15

minutes, then at least 30 minutes (15x2) should be available to achieve and maintain safe

shutdown. A time margin factor of at least 2 is assumed to absorb delays that might be caused by the following set of factors (1) the need to recover from or respond to unexpected difficulties

or random problems associated with instruments or other equipment, or communication devices;

(2) environmental and other effects that are not easily replicated in a demonstration, such as radiation, smoke, toxic gas effects, and increased noise levels; (3) limitations of the

demonstration to account for all possible fire locations that may lend the need for such operator manual actions; (4) inability to show or duplicate the operator manual actions because of safety

considerations while at power; and (5) individual operator performance factors, such as physical size and strength, cognitive differences, time pressure, and emotional responses. In addition,

the time margin includes adequate time for personnel to recover from any initial errors in conducting the actions. Section C.3.2 of DG-1136 "Guidance for Demonstrating the Feasibility

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and Reliability of Operator Manual Actions in Response to Fire" provides further details about the Commission's vision of how the time margin provision would be implemented.

For purposes of this proposed rule, the Commission is using the time margin recommended by the expert panel as discussed in DG-1136. This serves as a basis for obtaining stakeholder input. It is for this reason that the panel's opinion is included in this statement and in the draft Regulatory Guide, but the Commission is open to other proposals for determining time margin. The factor of 2 should not be construed as a final decision.

The Commission recognizes that the time margin concept could also consist of a range of multiplicative values. For example, instead of a single multiplicative value of 2, perhaps a range of multiplicative values (e.g., 2-4 times) could determine adequate time margin. This may be appropriate where additional factors were identified that may influence the time line. These factors may be those unknown and not considered by the expert elicitation panel and which may result in a lower or higher multiplicative factor. The Commission can also foresee situations where a licensee may be able to define a different multiplicative value for different scenarios. For example, an operator manual action consisting of a single action by one plant operator could have a different multiplicative value than a scenario that involves more than one plant operator or where several sequential actions are necessary.

As with the discussion of the range of multiplicative values above, the time margin concept may have to include a minimum additive time (predetermined minimum amount of time added to the demonstrated time) necessary for certain situations. For example, the time in the demonstration is shown to be short (e.g., <5 minutes for a single operator manual action), a single multiplicative value of 2 is applied resulting in an additional time of <5 minutes. There may be situations where the resulting <5 minutes of margin may not be adequate to address the factors that may cause a delay as identified above. In such situations it may be more



appropriate to apply a minimum additive time (e.g., 10 minutes) to account for factors that may cause a delay with the operator manual action.

**Request for Comment 1: (Time Margin)**

The time margin factor is offered in this statement as a best estimate and basis for obtaining stakeholder feedback. The Commission requests opinions specifically on the time margin aspects because of stakeholder interest in this subject and the Commission's desire to consider all stakeholders' input for this important criterion.

Specifically, the Commission asks the following questions:

(A) Considering the factors for time margin discussed above (including the conditional dependence on a worst-case demonstration meeting all the other acceptance criteria), should the time margin consist of a single multiplicative factor (e.g., 2 times), or a range of multiplicative factors (e.g., 2-4 times)? Please provide a basis for your proposed time frames or factors.

(B) If a range is appropriate, what should the range be and what parameters or variables should be considered in determining which part of the range is applicable in a given situation? Please provide a basis for your proposed time frames or factors.

(C) Should there be a minimum additive time (e.g., 10 minutes) for situations where the time in the demonstration is so short that a multiplicative factor would not properly account for the required time margin (e.g., a time in the demonstration of < 5 minutes). Please provide a basis for your proposed time frames or factors.

(D) Are there other means of establishing margin (e.g., through consideration of conservative assumptions in the thermal hydraulic timeline)? Please provide a technical basis.

**Environmental Factors**



access and manipulate SSCs in the successful accomplishment of required operator manual actions. Similarly, life support equipment, such as self-contained breathing apparatuses (SCBA), may need to be worn to permit access to and egress from the locations where the operator manual actions must be performed since the routes could be negatively affected by fire effects, such as smoke, that propagate beyond the fire-involved area. Portable equipment must be considered in the analysis by identifying necessary equipment and ensuring their availability to the plant operators during the time needed to achieve and maintain hot shutdown. For example, if SCBA is necessary then the analysis should list the equipment and confirm that the equipment can be used in the plant areas (i.e., access and egress to tight areas are not impeded by the use of SCBA) and are available for the time required (e.g., portable bottle air supply provides sufficient time to perform the action). Such equipment should be identified and addressed as per paragraph c.2 of the regulatory guide DG-1136, "Guidance for Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire."

Procedures and Training

Subsection 2(b) of the proposed criteria requires plant procedures to include all manual actions that each operator receive training on these manual actions. The role of written plant procedures in the successful performance of operator manual actions is three-fold: (1) assist the operators in correctly diagnosing the type of plant event that the fire may trigger, usually in conjunction with indications, thereby permitting them to select the appropriate operator manual actions (or prescribe actions to be taken should a fire occur in a given fire area); (2) direct the operators as to which preventive and mitigative manual actions are appropriate to place and maintain the plant in a stable hot shutdown condition; and (3) minimize the potential confusion that can arise from fire-induced conflicting signals, including spurious actuations, thereby minimizing the likelihood of personnel error during the required operator manual actions. Written



procedures should contain the steps to be performed, how the operator manual actions are performed and the tools and equipment needed to successfully perform the actions. Training on these procedures serves three supporting functions: (1) establishes familiarity with the procedures, equipment, and potential (simulated) conditions in an actual event; (2) provides the level of knowledge and understanding necessary for the personnel performing the operator manual actions to be well-prepared to handle departures from the expected sequence of events; and (3) provides the personnel with the opportunity to practice their response without exposure to adverse conditions, thereby enhancing confidence that they can reliably perform their duties in an actual event. Determining that operators are appropriately trained on procedures entails establishing, implementing, and maintaining a training program that incorporates the instructional requirements necessary to provide qualified operators to perform the manual actions. Licensees are already required to establish training programs for licensed operator and nuclear plant personnel in accordance with Sections 55.59 and 50.120 (of Part 50) respectively.

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The procedures and training provided to operators and nuclear plant personnel will ensure that the supporting functions and roles discussed above can be met. Such procedures and training should be identified and addressed as per paragraph c.2 of the regulatory guide DG-1136, "Guidance for Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire." The Commission expects plant procedures to be available at or near the locations where the operator manual actions are to occur so that they are easily accessible to the operators.

Implementation and Staffing

Subsection 20) of the proposed criteria requires that equipment and personnel necessary for feasible and reliable operator manual actions must be readily available and accessible. The equipment is <sup>available</sup> operable when its functionality is not adversely affected by the fire

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or its effects. Accessible means that the personnel should be able to find and reach the locations of the components and be able to manipulate the components. Accessibility and <sup>availability</sup> operability of equipment must be considered in the analysis by identifying necessary equipment, ensuring operators are knowledgeable of equipment locations, determining that accessibility of such equipment, and that the equipment will not be adversely affected by a fire or its effects. For example, operators may rely upon valves to achieve and maintain hot shutdown conditions. If the functionality of the valves is adversely affected by the fire or if the valves are not accessible for manipulation then the functionality of such valves may be degraded, thereby preventing the performance of the required operator manual actions.



The intent of the staffing requirement is to ensure that qualified personnel will be on site at all times such that hot shutdown conditions can be achieved and maintained in the event of a fire. An individual expected to perform the operator manual actions may not have collateral duties, such as fire fighting or security, during the evolution of the fire scenario. This individual should be exclusively available for the performance of required operator manual actions. Therefore, operating shift staffing levels should include enough personnel on watch for the performance of any operator manual actions that could arise as a result of a fire. The fire brigade would not be expected to perform actions other than those associated with fire fighting. Otherwise, the potential for interfering with either their fire fighting activities or the operator manual actions could exist, such that successful performance of one or the other, or both, could be impaired. For example, during a fire, an individual who is part of the five-person fire brigade could not perform the required operator manual actions because that individual is expected to participate in the fire fighting efforts.

policy published for comment (68 FR 66501 and 69730) and in a subsequent public meeting on June 23, 2004. The comments on these criteria involved the demonstration using the same personnel/crews who are required to perform the manual actions during the fire; the application of plant procedures; the application of a fire detection and suppression system; and the application of operator manual actions criteria in all provisions of paragraph III.G.

Demonstration Criterion

*requirement for the*  
A number of public comments indicated that the demonstration to use "the same personnel/crews who will be required to perform the actions during the fire" is unnecessarily restrictive. The Commission agrees that requiring all crews to demonstrate performance under all conditions is unnecessarily restrictive. The intent is to provide reasonable assurance that whatever crew is on duty at the time of a fire can reliably perform the required actions, allowing for variabilities and uncertainties. The Commission considers it sufficient that an established crew (i.e., one that typically works as a team) shows the ability to perform the required operator

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manual actions through documented demonstration. This demonstration should show that the crew can successfully perform all operator manual actions required by the entire fire scenario within the analyzed fire timeline. The demonstration should be part of the periodic operator training. To reasonably assure that the remaining crews (i.e., the ones that receive training but do not perform the demonstration during a particular training cycle) can reliably perform the actions, the "time margin" addressed in the analysis criterion is used to offset the variability among crews. In this way, the demonstration by the established crew with an appropriate margin, will reasonably assure that any of the crews could likewise perform the required actions.

Another means of determining margin is through consideration of conservative assumptions in the thermal-hydraulic time line (e.g., end-state).

Procedural Guidance vs. Guidance

A number of public comments suggested that the phrase "procedural guidance" be replaced by "guidance" (e.g., pre-fire plan). The Commission considers this term insufficient to provide feasible and reliable operator manual actions. In fact, the Commission has strengthened the wording from the original "procedural guidance" to "plant procedures" to reflect the need for formal written steps. Typically, plant operators should be capable of performing noncomplex manual actions without detailed instructions. However, there are fire scenarios which could conceivably be atypical such that what would "normally" be non-complex could prove to be difficult in an actual situation. The reading of procedures from the control room to direct remote activities could be impeded by communication difficulties or other control room activities. In addition, operators who perform actions outside the control room may require immediate feedback from the control room, and vice versa, to determine if certain actions have produced the intended results. The Commission expects plant procedures to be available at or near the locations where the operator manual actions are to occur so that they are easily accessible to the operators.

#### Need for Detection and Suppression Where Fire Occurs

There appeared to be some confusion on the part of a few commenters regarding where fire detection and automatic suppression would be required in conjunction with the addition of the option for operator manual actions in complying with paragraph III.G.2. Some thought they would be required in the areas where the operator manual actions would occur. The ~~requirement~~ <sup>requirement</sup> for fire detectors and an automatic fire suppression system applies only to the area where the fire occurs, not to the area(s) where the operator manual actions will take place.

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Only in the presumably rare case where the operator manual actions would also occur in the same fire area as the fire itself would fire detectors and an automatic fire suppression system have to be installed "in the area where the operator manual actions are taken" for these operator manual actions to receive credit. This is envisioned only if a very large fire area experiences a very localized fire such that the fire effects do not preclude access to egress from, and operator manual actions in, a distant location within the very large area.

A few commenters questioned whether the requirement for fire detection and automatic suppression installed in the area where the fire occurs should accompany the proposed compliance option for operator manual actions, and why this could not be left to the discretion of the licensees and review by the NRC, depending on the specific conditions to be encountered in that fire area. As discussed in the staff's proposed Appendix R, dated May 29, 1980, protective features shall be provided for fire areas that contain cables or equipment of redundant systems important to achieving and maintaining safe shutdown conditions to ensure that at least one means of achieving said conditions survive postulated fires. The protective features may consist of a combination of automatic and manual fire suppression capability, fire propagation retardants, physical separation, partial fire barriers, or alternative shutdown capability independent of the room. The Commission believes that the proposed operator manual action option in conjunction with fire detectors and an automatic fire suppression system is consistent with the requirement of protective features and maintains a similar defense-in-depth concept as with a 1-hr passive fire barrier or a 20-ft separation with no intervening combustibles.

*Paragraph*  
 The III.G.2 compliance option of a 3-hr passive fire barrier requires no fire detection or automatic suppression to be installed in the area where the fire occurs. To consider the option for operator manual actions as providing reasonable assurance at a level comparable to this, one must be convinced that the implementation of operator manual actions by itself is a sufficient level of defense-in-depth without the additional level of protection provided by fire detectors and an automatic fire suppression system. The reason that the 3-hr barrier was "exempted" from the additional need of fire detection and automatic suppression was the prevalent acknowledgment that a fire lasting longer than three hours, without intervention, is highly unlikely, if not incredible. Therefore, unlike a 1-hr barrier or a 20-ft separation without intervening combustibles, this compliance option was viewed sufficient unto itself without the

Without substantial additional justification such as can be provided by using the risk-informed, performance based option in the Fire Protection Regulations to 10 CFR 50.48.

additional level of defense-in-depth provided by the fire detection and automatic suppression.

Experience in both the nuclear and non-nuclear industry clearly indicates that human reliability is not at a level approaching that provided by a 3-hr barrier as the sole level of defense-in-depth.

Therefore, it is not reasonable to consider the implementation of operator manual actions ~~as~~

~~without sufficient~~ as a compliance option to III.G.2 ~~without the additional level of defense-in-depth provided by fire detection and automatic suppression.~~

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A few commenters indicated that requiring fire detection and automatic suppression in conjunction with operator manual actions if creditable under III.G.2 "does not enhance the ability of the operator to perform a manual action in another area of the plant that is unaffected by the fire ... [Furthermore], this new requirement is also more severe than Appendix R, Section III.G.3 because III.G.3 only requires a "fixed" suppression system, either manual or automatic, but does not require an automatic suppression system ..."

With regard to the first claim, the Commission believes that requiring fire detectors and an automatic fire suppression system in the fire area under consideration would enhance the ability of the operator to achieve and maintain safe shutdown from an unaffected area. The activation of detection and automatic suppression as indicated in the staff's statements of consideration for Appendix R to 10 CFR Part 50 (as amended 45 FR 79409) would ensure prompt and effective application of suppressant to a fire that could endanger safe shutdown capability. As a result, the Commission believes that the time until a fire could adversely affect the ability of the plant to achieve and maintain a safe shutdown may be extended, thereby enhancing the ability to perform feasible and reliable operator manual actions.

While a proposed requirement of automatic suppression for operator manual actions under paragraph III.G.2 may appear to be more severe than that of fixed suppression under paragraph III.G.3, ~~the Commission believes that~~ this difference is minor in practicality. Part 50, Paragraph 48(a)(1), Fire

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suppression capability; and <sup>CC</sup> (c) fixed fire suppression systems and alternative shutdown capability as shown on Table 1." In Table 1, the need for fixed fire suppression systems, automatic or manual, was based on four factors: (1) does the fire/water disable normal shutdown capability; (2) is shutdown available from the control room; (3) is shutdown required from an alternate panel (if not available in the control room); and (4) is the access for manual fire fighting "good" or "poor." A fixed fire suppression system was required whenever shutdown had to be performed at an alternate panel, except if (a) the only in-situ combustible was cable insulation; (b) measures were provided to retard propagation; and <sup>CC</sup> (c) separation between redundant systems was at least 10 feet horizontal and vertical of clean air space. These requirements were enhanced when they subsequently became Paragraphs 1, 2 and 3 of Section III.G in the final rule. It should be noted that even during the original rulemaking for Appendix R, the need for at least fixed fire suppression was recognized when shutdown operations would consist of ex-control room operator manual actions (which include those performed at an alternate panel).

In developing Appendix R, Section III.G, the NRC originally considered fire detection and automatic suppression, if not as the primary level of defense-in-depth, at least as an equal level of defense-in-depth in conjunction with fire-retardant coatings, and subsequently their successors, fire barriers and/or physical separation, as per the "Statements of Consideration, 10 CFR Part 50, Fire Protection Program for Operating Nuclear Power Plants," November 19, 1980:

The NRC staff has indicated to the Commission that there are requirements in which the protection afforded by Appendix R over and above that previously accepted, may be desirable. The Commission has decided that these requirements should be retroactively applied to all facilities . . . to take fully into account the increased knowledge and experience developed on fire protection matters over the last several years. The first of these [requirements] . . . is

related to fire protection features for ensuring that systems and associated circuits used to achieve and maintain a safe shutdown are free from fire damage. Appendix A to BTP CMEB 9.5-1 permits a combination of fire-retardant coatings and fire detection and suppression systems without specifying a physical separation distance to protect redundant systems, and such arrangements were accepted in some early fire protection reviews. As a result of some separate effects tests, the staff changed its position on this configuration, and subsequent plans have been required to provide additional protection in the form of fire barriers or substantial physical separation for safe shutdown systems. No credit for such coatings as fire barriers is allowed by Section III.G of Appendix R.

The NRC originally characterized fire-retardant coatings, and subsequently their successors, fire barriers and/or physical separation, as "additional," implying that detection and suppression were intended to be primary. The requirement that detection and suppression (automatic) be included with Appendix R, Paragraph III.G.2, operator manual actions is not only consistent with the corresponding options currently there, but also is consistent with NRC's original intent in developing Appendix R, Section III.G.

*Risk-informed, performance based option in 10CFR 50.48 is*  
 The NRC exemption process in Section 50.42 of the specific license conditions will remain available to those licensees who wish to demonstrate compliance that operator manual actions in particular situations provide a reasonable assurance that the public health and safety can be maintained without fire detection or automatic suppression.

Request for Comment 2:

After considering technical implications and historical background of the proposed criteria as discussed above, the Commission *has tentatively* decided that the proposed operator manual actions *should* require fire detectors and an automatic fire suppression system in the fire area to

By providing both of these options (i.e., the option proposed by this rulemaking and the risk-informed, performance based option currently allowed by 10CFR 50.48), the Commission believes that the use of the exemption process for operator manual actions should be discouraged and limited to situations that was not be covered by these options.

necessary to meet the underlying reasons  
 believes that such limitations are necessary to meet the underlying reasons  
 The Commission believes that such limitations are necessary to meet the underlying reasons  
 that underwriting this rulemaking effort.

permit operator manual actions as a compliance option under paragraph III.G.2, provided the acceptance criteria delineated in a new paragraph III.P are satisfied. The basis for the requirement is discussed above. However, because of the stakeholder interest in this subject, the Commission is asking specific feedback and opinions from stakeholders on requiring an automatic versus fixed fire suppression system in the fire area.

The Commission asks the following specific question:

- (A) Under the proposed option of using operator manual actions under III.G.2(c-1), when redundant trains are located in the same fire area, should the requirement for a suppression system in the fire area be automatic or fixed? Automatic suppression system is required in III.G.2(b) and (c). However, a fixed system is specified in III.G.3. Provide your rationale for why requiring fixed or automatic suppression would provide the appropriate level of protection.

#### Application of Operator Manual Actions Acceptance Criteria to Paragraphs III.G.1 and III.G.3

The proposed operator manual actions rulemaking would modify requirements in paragraph III.G.2 to permit operator manual actions as a compliance option under this paragraph, provided the acceptance criteria delineated in a new paragraph III.P are satisfied. The proposed rule language would not apply to paragraphs III.G.1 or III.G.3, although the term "operator manual actions" may be construed as applicable to the same types of actions taken under these paragraphs. This issue has been raised by stakeholders during discussions conducted thus far, and therefore, the Commission is providing background information about this subject and a specific request for comment.

Appendix R to 10 CFR 50, section III.G.1, requires fire protection features capable of limiting fire damage so that one train of systems necessary to achieve and maintain hot

There were two issues identified by stakeholders relative to operator manual actions. The first was specific operator manual actions within each individual paragraph III.G.1, III.G.2, and III.G.3. The second was the applicability of the proposed operator manual actions acceptance criteria to all provisions of paragraph III.G.

Operator manual actions, as currently outlined in the proposed rule, would be utilized as an additional option to satisfy paragraph III.G.2 requirements. However, based on stakeholder comments as discussed above, the NRC is asking feedback from stakeholders on the advantages and disadvantages of also applying operator manual action acceptance criteria to paragraphs III.G.1 and III.G.3.

The NRC determined that there are technical and backfit considerations associated with expanding the applicability of operator manual action acceptance criteria to paragraphs III.G.1 and III.G.3 as discussed below.

A III.G.3-compliant Fire Area contains redundant trains of shutdown equipment or cables and one train has not been ensured to remain free of fire damage (per III.G.2 criteria), or redundant trains are vulnerable to damage as a result of fire suppression activities or the inadvertent actuation of fire suppression systems. As noted, paragraph III.L contains specific provisions concerning this alternate or dedicated shutdown capability. For instance, it contains criteria such as III.L.3 "Procedures shall be in effect . . .," and III.L.4 "The number of operating shift personnel . . . required to operate such equipment shall be on site at all times." However, they are not as comprehensive as the proposed acceptance criteria in paragraph III.P. The NRC believes that if it applied the <sup>proposed</sup> acceptance criteria <sup>in paragraph III.P</sup> to paragraph III.G.3, it may be necessary to modify paragraph III.L.

In addition, the NRC believes that operator manual actions previously approved for paragraph III.G.3 would need to be revisited in order to ensure that they satisfy the acceptance criteria as proposed for paragraph III.G.2.

Applying the same new acceptance criteria to all fire protection manual actions in paragraph III.G may require a generic backfit analysis since the current rule allows the use of manual actions at emergency control stations in III.G.1 with no codified acceptance criteria and in III.G.3 with less specific acceptance criteria. Section 50.109(a)(3) provides the standard for a backfit analysis that must show "a substantial increase in the overall protection . . . and that the direct and indirect costs of implementation . . . are justified in view of this increased protection." The extent of licensees' usage of manual actions is highly plant specific and the associated costs and benefits of backfitting are therefore difficult to quantify. Furthermore, applying the acceptance criteria to all paragraph III.G manual actions could invalidate the use of some existing manual actions. The subsequent hardware/fire barrier/program modifications that would then be needed could be very expensive. Thus, value-impact analyses in many cases would probably show that backfitting is not cost-beneficial.

Alternatively, if a generic analysis cannot justify the backfit under 10 CFR 50.109(a)(3), the NRC may be able to justify the backfitting as necessary for "adequate protection" under 10 CFR 50.109(a)(4)(ii). The NRC concludes that recent inspection experience has not shown major issues with respect to the use of operator manual actions, thus, not providing significant support to justify that the backfit is needed for adequate protection. Further, NRC inspections of potentially risk-significant ("greater than green") findings on such manual actions are already handled by the Reactor Oversight Process (ROP) corrective action program or are evaluated as plant-specific backfits, as applicable.

Regardless of the applicable section under 10 CFR 50.109, a backfit may ultimately enhance safety, as a result of a consistent set of rules. However, backfitting the operator manual actions' acceptance criteria to all plants may cause plants with existing operator manual actions previously approved under a different set of criteria to resubmit exemption requests for staff review and approval.

Applying new acceptance criteria on a forward-fit basis for operator manual actions under III.G.3 might be a means of addressing this backfit concern. Under this approach, application of the new acceptance criteria to III.G.3 would apply to operator manual actions that resulted from future licensing basis changes after the effective date of the new rule. The new acceptance criteria would thus apply to all III.G.2 operator manual actions, but to only a small percentage of the manual actions credited under III.G.3. This approach, however, may increase the regulatory complexity and burden associated with fire protection inspections and further complicate the fire protection licensing basis of each facility.

Applying the new acceptance criteria to all operator manual actions in III.G.2 and III.G.3, would make fire protection implementation and inspections more consistent, reliable and predictable. However, the NRC also notes that the existing requirements vary among plants for several reasons (as for instance that post-1979 plants were not specifically licensed to Appendix R), and thus these provisions would not apply to them absent other regulatory action, which would tend to offset the possible consistency gain.

### Request for Comment 3:

After considering a number of technical and regulatory implications, the Commission ~~has decided~~ decided to limit the applicability of this proposed rule on operator manual actions to paragraph III.G.2. However, because of the stakeholder interest in this subject, the Commission is also asking for specific feedback and opinions from stakeholders on applying operator manual

actions acceptance criteria to paragraphs III.G.1 and III.G.3. Depending on the comments received, the Commission may extend application of the criteria to paragraphs III.G.1 and III.G.3.

The Commission asks the following specific question:



- (A) Should the operator manual action acceptance criteria developed for III.G.2 also be applied to operator manual actions for III.G.1 and III.G.3? Are there advantages or disadvantages not noted by the Commission that should be considered? Please provide a discussion outlining the basis for your response taking into account the considerations outlined above.



#### IV. Interim Enforcement Discretion Policy

In SECY-03-0100, "Rulemaking Plan on Post-Fire Operator Manual Actions," dated

June 17, 2003, the staff recommended development of an Interim enforcement policy relying on preliminary acceptance criteria for manual actions. The staff proposed this strategy based on a belief that interim acceptance criteria could be developed that would be consistent with the manual actions acceptance criteria in the final rule. The Commission had previously approved a similar enforcement discretion policy related to a fitness-for-duty proposed rulemaking. In an SRM dated September 12, 2003, the Commission approved the staff's recommendation.

In March 1998, the staff issued EGM 98-02, "Enforcement Guidance Memorandum - Disposition of Violations of Appendix R, Sections III.G and III.L Regarding Circuit Failures," that provides enforcement guidance for issues related to fire-induced circuit failures, which encompasses the vast majority of manual actions as compensatory measures to satisfy the

new interim enforcement guidance developed in conjunction with the proposed rule may not be consistent with the requirements specified in the final rule.

The current applications of EGM 98-02 and IP 7111.05 are effective to ensure and maintain the overall plant safety by licensees through the use of adequate and appropriate compensatory measures in the form of operator manual actions implemented in accordance with the licensee's Fire Protection Program. Manual actions that fail to meet the criteria in the inspection procedure are not considered to be feasible or to be adequate compensatory measures. Such manual actions will result in the non-compliance being entered into the enforcement process. The new interim enforcement policy for the post-fire operator manual actions would utilize a disputed set of acceptance criteria and trigger additional reviews (by licensees and inspectors) of past findings, with the prospect of a third review being necessary upon issuance of the final rule. Issuing such an enforcement discretion policy at this time could also have the unintended consequence of preempting the rulemaking process without a clear safety benefit.

*believes that the current*  
Based on the above, the Commission considers continuing use of the current enforcement discretion policy of EGM 98-02 and the guidance in IP 7111.05 *is sufficient in the* and that a revision *interest* or additional policy to include specific operator manual actions acceptance criteria is not warranted.

**V. Section-by-Section Analysis of Substantive Changes**

**Part 50, Appendix R, paragraph III.G.2. Add an "or" at the end of the subparagraph c.**

The change is necessary for the introduction of a new option that recognizes operator manual actions as an alternative method to satisfy the requirements set forth in paragraph III.G.2.

*also  
policy*



Proposed subparagraph III.P.2.b contains requirements for plant procedures that must include each operator manual action required to achieve and maintain hot shutdown. It also includes operator training requirements for those procedures.

Proposed subparagraph III.P.2.c contains requirements that systems and equipment needed to accomplish operator manual actions are <sup>available</sup> operable and equipment is readily accessible consistent with the analysis required by subparagraph III.P.2(a). It also includes a requirement that the number of operating shift personnel required to perform the operator manual actions must be on site at all times.



Proposed subparagraph III.P.2.d contains requirements for periodic demonstrations of the operator manual actions and corrective actions.

### VI. Plain Language

A June 1, 1988, presidential memorandum entitled "Plain Language in Government

Writing" directed that the Government's writing be in plain language. This memorandum was published on June 10, 1988 (63 FRN 31883). In compliance with this directive, editorial changes

have been made in the proposed revision to improve the organization and readability of the existing language of the paragraph being revised. These types of changes are not discussed

further in this document. The NRC requests comments on the proposed rule specifically with respect to the clarity and readability of the language used. Comments should be sent to the address listed under the ADDRESSES heading of the preamble.

### VII. Voluntary Consensus Standards

submittals relying on human actions, the NUREG provides deterministic review criteria for evaluating the acceptability of human actions proposed by licensees.

The NRC notes that a separate rulemaking for 10 CFR 50.48<sup>(c)</sup>, "National Fire Protection Association Standard NFPA 805," has recently been completed which permits nuclear power plant licensees to develop a risk-informed, performance-based fire protection program consistent with voluntary consensus standard NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants." Appendix B of NFPA 805 specifies a method for assessing the feasibility of operator manual actions. The NRC believes that licensees who choose to implement the NFPA 805 approach could alternatively, with appropriate analysis and documentation, use it to justify the acceptability of certain operator manual actions in their fire protection programs.

In preparing the proposed rule, the NRC considered the applicability of the risk-informed approach and the deterministic review criteria presented in NUREG-1764 and Appendix B of NFPA 805 to help refine the regulatory requirements and the implementation guidance. The NRC is not aware of any other consensus standard that could be adopted to provide guidance or criteria for the use of operator manual actions, but will consider using an alternative standard if one is identified during the rulemaking process.

#### VIII. 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. Therefore, an environmental impact statement is not required. The basis for this determination is as follows:

This action would establish regulations that allow nuclear power plant licensees to use manual actions by plant operators as an alternative method to achieve hot shutdown conditions in the event of fires in certain plant areas, provided that the actions are evaluated against specified criteria and determined to be feasible and reliable, and that fire detectors and an automatic fire suppression system are provided in the fire area. This proposed action also provides conservative and thorough regulatory acceptance criteria for operator manual actions taken under Paragraph III.G.2 of Appendix R to achieve and maintain safe shutdown conditions.

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The proposed action will not significantly increase the probability or consequences of an accident. No changes are being made in the types or quantities of radiological effluents that may be released off site, and there is no significant increase in public radiation exposure since there is no change to facility operations that could create a new or affect a previously analyzed accident. The staff believes there will be no net change in occupational radiation exposure. Any potential increase in exposure to personnel performing or demonstrating operator manual actions will likely be offset by a reduction of occupational radiation exposure since fewer personnel will be required to install or maintain fire barriers in or near radiologically controlled areas.

With regard to nonradiological impacts, no changes are being made to nonradiological plant effluents and there are no changes in activities that could adversely affect the environment. Therefore, there are no significant non-radiological impacts associated with the proposed action.

The primary alternative to this action is the no-action alternative. The no-action alternative would result in licensees submitting exemptions to authorize the use of acceptable operator manual actions. The NRC's approval of these exemptions would have the same environmental impacts as the proposed action.

*proposed to use the risk-informed, performance-based alternative*  
*actions*  
*exemptions*

*Provided in 10266 50-48 05*

As required by the Regulatory Flexibility Act, as amended, 5 U.S.C. 605(b), the Commission certifies that this proposed rule, if adopted, would not have a significant economic impact on a substantial number of small entities. This proposed rule would affect only licensees authorized to operate nuclear power reactors. These licensees do not fall within the scope of the definition of "small entities" set forth in the Regulatory Flexibility Act or the Size Standards established by the Nuclear Regulatory Commission (10 CFR 2.810).

**XII. Backfit Analysis**

Section 50.109 (a)(1) defines backfitting as "the modification of or addition to systems, structures, components, or design of a facility . . . any of which may result from a new or amended provision in the Commission rules or the imposition of a regulatory staff position interpreting the Commission rules that is either new or different from a previously applicable staff position." The requirements in Appendix R are only applicable to licensees who received operating licenses before January 1, 1979. To resolve an existing regulatory compliance issue for these licensees under paragraph III.G.2 of Appendix R, the proposed rule represents a voluntary alternative to the current requirements. The proposed rule would allow the use of operator manual actions for achieving and maintaining safe shutdown during a fire in an area where redundant shutdown trains are located as an additional method beyond the three presently provided. Licensees who currently have approved operator manual actions will not be required to perform any additional actions (such as analysis or documentation). Licensees who employ operator manual actions but have not received NRC approval are in violation of paragraph III.G.2 of Appendix R. There is no backfitting as defined in 10 CFR 50.109(a)(1)

because licensees may choose to continue to meet paragraph III.G.2 through other provisions.



P. 1. For purposes of this section, operator manual actions means the integrated set of actions needed to ensure that a redundant train of systems necessary to achieve and maintain hot shutdown conditions located within the same area outside the primary containment is free of fire damage.

2. A licensee relying on operator manual actions must meet all of the following requirements.

(a) Analysis. The licensee shall prepare an analysis for each operator manual action which demonstrates its feasibility and reliability.

(1) The analysis must contain a postulated fire time line showing that there is sufficient time to travel to action locations and perform actions required to achieve and maintain the plant in a hot shutdown condition under the environmental conditions expected to be encountered without jeopardizing the health and safety of the operator performing the manual action. The fire time line shall extend from the time of initial fire detection until the time when the ability to achieve and maintain hot shutdown is reached, and shall include a time margin that accounts for all variables, including differences between the demonstrated and actual conditions, and (ii) human performance uncertainties that may be encountered.

(2) The analysis must address the functionality of equipment or cables that could be adversely affected by the fire or its effects but still utilized to achieve and maintain hot shutdown.

X

(3) The analysis must identify all equipment required to accomplish the operator manual actions under the postulated time line, including (but not limited to), *(i)* all indications necessary to show the need for the operator manual actions, enable their performance and verify their successful accomplishment, and *(ii)* any necessary communications, portable, and life support equipment.

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(b) Procedures and training. Plant procedures must include each operator manual action required to achieve and maintain hot shutdown. Each operator must be appropriately trained on those procedures.

(c)

Implementation. The licensee shall ensure that all systems and equipment needed to accomplish each operator manual action are *available* and readily accessible consistent with the analysis required by paragraph 2(a). The number of operating shift personnel required to perform the operator manual actions shall be on site at all times.

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(d) Demonstration. Periodically, the licensee shall conduct demonstrations using an established crew of operators to demonstrate that operator manual actions required to achieve and maintain the plant in a hot shutdown condition can be accomplished consistent with the analysis in paragraph 2(a) of this section. The licensee may not *rely upon* implement operator manual actions until they have been established by a demonstration to be consistent with the analysis. The licensee shall take prompt corrective action if any subsequent periodic demonstration determines that the operator manual actions can no longer be accomplished consistent with the analysis.

NOTATION VOTE

RESPONSE SHEET

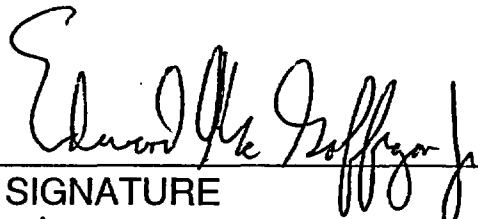
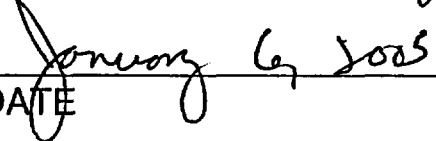
TO: Annette Vietti-Cook, Secretary  
FROM: COMMISSIONER MCGAFFIGAN  
SUBJECT: **SECY-04-0233 - PROPOSED RULEMAKING-POST-FIRE OPERATOR MANUAL ACTIONS (RIN 3150 AH-54)**

Approved  Disapproved \_\_\_\_\_ Abstain \_\_\_\_\_

Not Participating \_\_\_\_\_

COMMENTS:

See attached comments.

  
\_\_\_\_\_  
SIGNATURE  
  
\_\_\_\_\_  
DATE

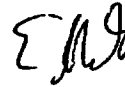
Entered on "STARS" Yes  No \_\_\_\_\_

## **Commissioner McGaffigan's Comments on SECY-04-0233**

I approve the staff's recommendations to issue the proposed rule contained in SECY-04-0233 for publication and to continue to use the current enforcement discretion policy during the rulemaking process.

While I might not agree with all the positions in the proposed rule, I am mindful of the fact that it is just that: a "proposed" rule. I fully expect that the public comment period will allow all interested stakeholders to weigh in on the merits or demerits of any or all of the many elements of the proposed rule. Those comments, and the staff's actions to address them, should provide a robust public record that will allow the Commission to draft and publish a strong final rule.

Among the areas that I feel such a record would be of particular benefit to the Commission are the algorithms for the "time margin concept" and the requirements for automatic fire suppression.





NOTATION VOTE

RESPONSE SHEET

TO: Annette Vietti-Cook, Secretary  
FROM: COMMISSIONER MERRIFIELD  
SUBJECT: **SECY-04-0233 - PROPOSED RULEMAKING-POST-FIRE OPERATOR MANUAL ACTIONS (RIN 3150 AH-54)**

Approved  Disapproved  Abstain

Not Participating

COMMENTS:

*see attached comments*

  
SIGNATURE

*1/12/05*  
DATE


Entered on "STARS" Yes  No

**Commissioner Merrifield's Vote on SECY-04-0233  
Proposed Rulemaking - Post-Fire Operator Manual Actions**

I approve issuing the proposed rule for public comment, subject to the attached edits. In addition, I agree that uncertainties need to be considered when determining how long it takes to carry out a particular manual action to ensure that action can be carried out in time to ensure the public health and safety, and I understand that determining how to best account for those uncertainties is difficult, but I have some concerns about the proposal to require licensees to multiply the time it takes to carry out a manual action by a factor of two to provide sufficient margin to account for the uncertainties. I am also concerned that the proposal requiring licensees to have automatic fire suppression in the area where the fire occurs, when taking credit for operator manual actions, could result in a large number of exemption requests, which would undermine the benefit of this rulemaking.

However, I am satisfied that the questions asked by the staff in the proposed rule, in conjunction with further interactions with stakeholders through public meetings or workshops once the proposed rule is issued, offers stakeholders sufficient opportunity to comment on both of these areas of concern so that the Commission will be fully informed when deciding the provisions to be included in the final rule.

I also approve the staff's recommendation to continue using the current enforcement discretion policy described in EGM 98-02, "Enforcement Guidance Memorandum - Disposition of Violations of Appendix R, Sections III.G and III.L Regarding Circuit Failures," until the final rule is published, rather than developing an interim enforcement policy.



4/12/05

- C. Response to Stakeholder Comments on Operator Manual Action Acceptance Criteria
- IV. Interim Enforcement Discretion Policy
- V. Section-by-Section Analysis of Substantive Changes
- VI. Plain Language
- VII. Voluntary Consensus Standards
- VIII. Finding of No Significant Environmental Impact: Environmental Assessment
- IX. Paperwork Reduction Act Statement
- X. Regulatory Analysis
- XI. Regulatory Flexibility Certification
- XII. Backfit Analysis

#### I. Background

Section 50.48, Fire Protection, requires that each operating power plant must have a fire protection plan that satisfies Criterion 3 of Appendix A to 10 CFR part 50. Criterion 3 requires that structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions. The specific fire protection requirements for safe shutdown capability of plant are further discussed in paragraph G of Section III of Appendix R to 10 CFR Part 50. The more specific Section 50.48 and Appendix R requirements were added following a significant fire that occurred in 1975 at the Browns Ferry nuclear power plant. The fire damaged control,

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instrumentation, and power cables for redundant trains of equipment necessary for safe shutdown.

In response to the fire, an NRC investigation was conducted and it was found that the independence of redundant equipment at Browns Ferry was negated by lack of adequate separation between cables for redundant trains of safety equipment. The investigators subsequently recommended that a suitable combination of electrical isolation, physical distance, fire barriers, and sprinkler systems should be used to maintain the independence of redundant safety equipment. In response to these recommendations, the NRC <sup>interacted</sup> worked with reactor licensees for several years to identify and implement necessary plant fire protection improvements. In 1980, NRC promulgated Section 50.48 to establish fire protection requirements and Appendix R to 10 CFR Part 50 for certain generic <sup>fire protection program</sup> issues, including paragraph III.G, fire protection of safe shutdown capability. The requirements for separation of cables and equipment associated with redundant safe shutdown trains were promulgated in paragraph III.G.2.

Paragraph III.G.2 of Appendix R requires that cables and equipment of redundant trains of safety systems in the same fire area be separated by either:

- a. a 3-hour fire barrier, or
- b. a horizontal distance of more than 20 feet with no intervening combustibles in conjunction with fire detectors and an automatic fire suppression system, or
- c. a 1-hour fire barrier combined with fire detectors and an automatic fire suppression system.

Appendix R applies to only those licensees who received operating licenses before January 1, 1979. Plants licensed after January 1, 1979, are not required to meet Appendix R.

These plants were licensed to meet Branch Technical Position CMEB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants," that contains criteria similar to the Appendix R requirements. Specific licensing basis information for these plants is usually contained in license conditions issued at time of licensing.

Because the rule was to apply to facilities which were already built, the NRC knew that compliance with various parts of Appendix R might be difficult at some facilities. Accordingly, the NRC included a provision which allowed licensees to submit alternative acceptable methods for protecting redundant equipment for NRC review and approval through an exemption process. When implementing the Appendix R requirements, the NRC reviewed and approved a large number of exemptions for 60 licensees who proposed alternative acceptable methods of compliance in various areas, including numerous exemptions from paragraph III.G.2.

In the early 1990s, generic problems arose with Thermolag<sup>1</sup> fire barriers, which many licensees were using to comply with paragraph III.G.2 of Appendix R. Licensees were ultimately required to replace Thermolag material with other fire barriers. Several years later, fire protection inspectors began to notice that many licensees had not upgraded or replaced Thermolag fire barrier material (or had not otherwise provided the required separation distance between redundant safety trains) used to satisfy the paragraph III.G.2 criteria. Some licensees compensated by relying on operator manual actions<sup>2</sup> which ~~had not been~~ <sup>were not</sup> reviewed and approved by the NRC <sup>through</sup> ~~via~~ the exemption process. Operator manual actions are not an <sup>A</sup> license ~~license~~

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<sup>1</sup>Thermolag is a brand-name for a particular type of material used to construct fire barriers typically for protecting electrical conduits and cable trays. In the early 1990's, issues arose regarding the testing and qualification process used for this material. It was determined that barriers made of this material would not provide protection for the required periods of time.

<sup>2</sup>Operator manual actions are those integrated set of actions needed to ensure that a redundant train of systems necessary to achieve and maintain hot shutdown conditions located within the same area outside the primary containment is free of fire damage.

an acceptable

alternative specified in paragraph III.G.2 of Appendix R. However, <sup>such actions</sup> they may be a means of achieving safe shutdown in the event of a fire under certain conditions.

X

In 2002, the NRC met with nuclear <sup>power plant</sup> industry licensees and informed them that the use of unapproved manual actions was not in compliance with paragraph III.G.2. During a meeting on June 20, 2002, the Nuclear Energy Institute <sup>representative</sup> stated that there was widespread use of operator manual actions throughout the industry based on <sup>the</sup> industry understanding of past practice and existing NRC guidance. The industry <sup>representative</sup> also stated that licensees' use of unapproved manual actions had become prevalent even before the concerns arose with Thermolag material.

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*Subsequent to the public meeting,*

~~Shortly thereafter,~~ the NRC developed criteria for inspectors to use in assessing the safety significance of violations resulting from <sup>licensee use of</sup> unapproved operator manual actions. The criteria were based on past practice and experience by NRC inspectors when reviewing operator manual actions used to comply with Appendix R, paragraph III.G.3, on alternate <sup>reactor capability</sup> shutdown. Licensees were familiar with these criteria through their interactions with the NRC inspection process.

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These criteria were issued in the revision to Inspection Procedure 71111.05 in March 2003. While unapproved operator manual actions are still violations, <sup>those that</sup> ~~meeting~~ these interim criteria are viewed to have low or no safety significance.

X

The interactions between operators performing manual actions to respond to an in-plant fire and the types of actions taken by plant responders during a fire ~~are~~ <sup>ing from</sup> result of a security event were considered during the development of this rule. However, given that physical security overarches many aspects of plant operations, it was determined that security considerations should be considered in a broader context. <sup>accidental</sup> The Commission is evaluating the merits of a more global approach to establishing regulatory requirements for <sup>the</sup> safety-security interface <sup>at nuclear facilities.</sup>

X

X

*to revise the fire protection regulations*

X

## II. Rulemaking Initiation

Instead of continuing the current practice of requiring all noncompliant licensees to submit individual exemption requests for staff review to determine if their operator manual actions are acceptable, the Commission has determined that amending Appendix R to 10 CFR Part 50 would be the most orderly and efficient way to provide an option for licensees to utilize acceptable operator manual actions in lieu of the separation or barrier requirements in paragraph III.G.2. In this way the NRC would codify conservative acceptance criteria for licensees to use in evaluating operator manual actions to ensure that the actions were both feasible and reliable. These criteria would maintain safety by ensuring that licensees perform thorough evaluations of the operator manual actions comparable to evaluations a licensee would provide to NRC for review and approval of an exemption request. The staff developed a rulemaking plan (SECY-03-0100) and the Commission approved the staff plan on September 12, 2004. The rule change would revise 10 CFR Part 50, Appendix R, paragraph III.G.2 to allow licensees to implement acceptable operator manual actions after documenting that the actions met the regulatory acceptance criteria. Through the established Reactor Oversight Process (ROP), the NRC will continue to inspect licensees' methodologies for achieving and maintaining hot shutdown conditions in accordance with the requirements set forth in Section III.G.2 of Appendix R to 10 CFR Part 50. The NRC fire protection inspectors ~~would~~ <sup>will</sup> verify that the licensees' operator manual actions met the NRC acceptance criteria and will evaluate the licensee's analysis, procedures and training, implementation, and demonstration of operator manual actions to ensure the licensee has adequately demonstrated the feasibility and reliability of a manual action.

### III. Proposed Action

The Commission proposes to allow the use of operator manual actions coincident with fire detectors and an automatic fire suppression system as an additional alternative method for compliance with paragraphs III.G.2(a), (b) or © of Appendix R<sup>3</sup>. The Commission has determined that implementing any one of the alternatives in paragraph III.G.2 will provide reasonable assurance that at least one method for achieving and maintaining the hot shutdown condition will remain available during and after a postulated fire anywhere in the plant. The Commission proposes to add a new subparagraph G.2.(c-1) and a subpart P to paragraph III of Appendix R to 10 CFR Part 50. The new subparagraph G.2.(c-1) would establish operator manual actions, in conjunction with fire detectors and an automatic fire suppression system, as a fourth compliance option with paragraphs III.G.2(a), (b) or ©, provided that the operator manual actions satisfy the acceptance criteria in the new subpart P. The new subpart P would define operator manual actions and set forth the required acceptance criteria which must be met before a licensee could use operator manual actions outside the containment to comply with paragraphs III.G.2 of Appendix R. Compliance with these acceptance criteria is necessary to provide reasonable assurance of the feasibility and the reliability of the operator manual actions.

fix this throughout

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<sup>3</sup> The requirements in Appendix R are applicable only to licensees who received operating licenses before January 1, 1979. Post-January 1, 1979, licensees were licensed to meet GDC-3, §50.48(a), and Branch Technical Position 9.5-1, which contain criteria that are similar to the Appendix R requirements. Post-January 1, 1979 licensees who use operator manual actions without NRC approval may or may not be in compliance with applicable fire protection requirements. Compliance depends on the specific licensing commitments (usually specified in license conditions for these licensees), the change control process, and how the change was justified and analyzed to demonstrate that the operator manual actions are feasible and reliable and thus do not adversely affect the ability to achieve or maintain safe shutdown.



fix this

the 3.

A. Operator Manual Actions Alternative

The Commission proposes to add a new subparagraph (c)(1) to paragraph III.G.2 of 10 CFR Part 50 to codify operator manual actions, <sup>the use of</sup> ~~with~~ <sup>in conjunction</sup> fire detectors and an automatic fire suppression system, as an additional alternative compliance method set forth in

X  
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paragraph III.G.2. ~~The Commission has determined that~~ implementing any of the alternatives in III.G.2 will provide reasonable assurance that at least one method for achieving and maintaining <sup>the reactor in a</sup> hot shutdown condition will remain available during and after a postulated fire. The basis for this determination is provided below.

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The Commission's fire protection requirements constitute a defense-in-depth approach to protect safe shutdown functions. The overall objectives of the NRC's fire protection regulations are to minimize the potential for fires and explosions; to rapidly detect, control, and extinguish fires that do occur; and to ensure that the fires will not prevent the accomplishment of necessary safe shutdown functions and will not significantly increase the risk of radioactive releases to the environment. The NRC has concluded if these objectives are met, there is reasonable assurance that a licensed facility is providing adequate protection of public health and safety. These objectives are met by a set of NRC requirements for control of combustible materials and ignition sources, fire detection and suppression systems, fire brigade procedures and training, and physical separation of cables and equipment of redundant trains of safe shutdown equipment.

The physical separation requirements in paragraph III.G.2 of Appendix R are one component of the NRC's overall fire protection objectives. In paragraph III.G.2, the NRC specified three different methods for providing separation of cables and equipment of redundant trains of equipment located in the same fire area. These three options for compliance with paragraph III.G.2 offer sufficient but varying levels of protection. In general,

provide a more efficient and effective process and to ensure more uniform and consistent regulatory treatment of these cases, the NRC decided to codify conservative, state-of-the-art acceptance criteria for licensees to use in evaluating operator manual actions to ensure that they are both feasible and reliable. Codifying this alternative in the rule will be more efficient than using the exemption process, and will provide for enhanced safety by allowing resources to be focused on safety rather than administrative compliance.

Something that is "feasible" is "capable of being accomplished or brought about; possible." Something that is "reliable" will "yield the same or compatible results in different experiments or statistical trials; dependably repeatable." To credit operator manual actions under III.G.2 for outside containment, the licensee must prove to the satisfaction of the NRC not only that the actions can be successfully accomplished, but also that they <sup>can be</sup> ~~successfully~~ accomplished repeatedly by all personnel who are required to perform the actions. Together, proof that the operator manual actions are both feasible and reliable provides the level of reasonable assurance necessary for credited operator manual actions to be in compliance with III.G.2. X

If shown to be feasible and reliable, operator manual actions are likely to be successfully achieved, <sup>and</sup> any potential increases in risk to the public due to their use will be minimal. Requiring the operator manual actions to meet <sup>a</sup> ~~the~~ conservative set of acceptance criteria provides the NRC with reasonable assurance that such operator manual actions can be accomplished to safely shut down the plant in the event of <sup>a</sup> ~~the~~ fire. These criteria maintain safety by ensuring that licensees perform thorough evaluations of the required operator manual actions and pre-plan equipment needs. NRC fire protection inspectors will verify <sup>that</sup> ~~the~~ licensees' documented operator manual actions ~~that~~ meet the NRC acceptance criteria through the existing triennial inspection process. The use of operator manual actions does not diminish the other defense-in-depth X

Be consistent throughout

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- (1) The analysis must contain a postulated fire time line showing that there is sufficient time to travel to action locations and perform actions required to achieve and maintain the plant in a hot shutdown condition under the environmental conditions expected to be encountered without jeopardizing the health and safety of the operator performing the manual actions. The fire timeline shall extend from the time of initial fire detection until the time when the ability to achieve and maintain hot shutdown is reached, and shall include a time margin that <sup>reasonably</sup> accounts for all variables, including (i) differences between the demonstrated and actual conditions and (ii) human performance uncertainties that may be encountered. X
- (2) The analysis must address the functionality of equipment or cables that could be adversely affected by the fire or its effects, but still <sup>be available</sup> utilized to achieve and maintain hot shutdown. X
- (3) The analysis must identify all equipment required to accomplish the operator manual action <sup>within</sup> ~~under~~ the postulated timeline, including (but not limited to (i) all indications necessary to <sup>identify</sup> ~~show~~ the need for the operator manual actions, enable their performance, and verify their successful accomplishment, and (ii) any necessary communications; portable, and life support equipment.

(b) Procedures and training. Plant procedures must include each operator manual action required to achieve and maintain hot shutdown. Each operator must be appropriately trained on those procedures.

(c) Implementation. The licensee shall ensure that all systems and equipment needed to accomplish each operator manual action are operable and readily

accessible consistent with the analysis required by paragraph 2(a). The number of operating shift personnel required to perform the operator manual actions shall be on site at all times.

- (d) Demonstration. Periodically, the licensee shall conduct demonstrations using an established crew of operators to demonstrate that operator manual actions required to achieve and maintain the plant in a hot shutdown condition can be accomplished consistent with the analysis in paragraph 2(a) of this section. The licensee may not implement <sup>any</sup> operator manual actions ~~until they have been~~ <sup>it has</sup> established by a <sup>ed</sup> demonstration to be consistent with the analysis. The licensee shall take prompt corrective action if any subsequent periodic demonstration <sup>indicates</sup> ~~determines~~ that the operator manual actions can no longer be accomplished consistent with the analysis. X

The above acceptance criteria for operator manual actions are intended to assure the safe shutdown goals and objectives for operating reactors as required in Section 50.48. The primary objective for safe shutdown is to maintain fuel integrity (i.e., fuel design limits are not exceeded). For alternative or dedicated shutdown capability, the reactor coolant system process variables should be maintained within those predicted for a loss of normal ac power and fission product boundary integrity should not be affected.

The applications of these acceptance criteria are as follows. First, the criteria are the means by which the NRC will establish standards that provide a reasonable level of assurance that operator manual actions will be satisfactorily and reliably performed to bring the plant to a hot shutdown condition, thus protecting public health and safety. Second, a standard set of acceptance criteria will permit both the licensees and NRC to establish consistency as to what operator manual actions will be allowed. Third, the criteria will provide the parameters which

X notice. The Commission will require a licensee to show that a sufficient amount of extra time would be available for the required operator manual actions and that the process for determining the time available ~~particular~~ for such actions adequately addressed the potential variations in fire characteristics, plant conditions, and human performance. This concept is referred to in this statement as a "time margin."

Proper demonstration requires that the licensee meet all operator manual action acceptance criteria other than Time Margin (this is evaluated after all other criteria, including requirements in Section 2(d), have been met) and show that at least one randomly-selected, established crew can successfully perform the actions within an acceptable time frame. For example, if there are questions about whether operators can reach the locations where they must perform the manual actions, these questions should be addressed to the extent practicable during the demonstration. However, successful demonstration does not fully determine reliability for the operator manual actions.

Additional factors must be considered to show that the actions can be performed reliably under the variety of conditions that could occur during a fire. For example, factors that the licensee may not be able to recreate in the demonstrations could cause further delay under real fire conditions (i.e., the demonstration would likely fall short of actual fire situations). Furthermore, typical and expected variability among individuals and crews could lead to variations in operator performance. Finally, variations in the characteristics of the fire and related plant conditions could alter the time available for the operator actions.

In order to ensure that a particular action could be performed reliably, licensees must show that a sufficient amount of extra time (i.e., a time margin) would be available for the action and that the process for determining the time available for the action adequately addressed the potential variations in fire characteristics and plant conditions. The time margin ensures that

operator manual actions can be performed reliably: (1) through well-thought out demonstrations that the actions are feasible, (2) by ensuring that there is extra time available for given actions with respect to the fire scenario, and (3) by adequately addressing all other related acceptance criteria.

The analysis should ~~reflect consideration of~~ <sup>include</sup> realistically conservative scenarios and such variables as environment and human performance uncertainties should be ~~accounted for and~~ considered in the time margin. ~~These variables are applied through the demonstration to show that there is ample time, including a margin consistent with the requirement in Section 2(a) above, available to complete an action before serious equipment damage would occur and affect safe shutdown.~~ For example, a licensee may perform a worst case demonstration that requires the operator to wear a self-contained breathing apparatus (SCBA), if there is a reasonable expectation that the operators will need to pass through a zone containing smoke in order to reach the location where the operator manual action is to be carried out.

The NRC ~~considers the~~ <sup>is</sup> use of a time margin as an appropriate safety factor for ensuring realistically reliable operator manual actions (i.e., there is a high confidence of a low probability of failure). The rule would require time margin to account for all variables including differences between the demonstrated and actual conditions and for human performance uncertainties that may be encountered.

The factors necessitating the time margin are:

1. The time margin should account for what the licensee is not likely to be able to recreate in the demonstration that could cause further delay (i.e., where the demonstration falls short).

appropriate to apply a minimum additive time (e.g., 10 minutes) to account for factors that may cause a delay with the operator manual action.

Request for Comment 1: (Time Margin)

The time margin factor is offered in this statement as a best estimate and basis for obtaining stakeholder feedback. The Commission requests opinions specifically on the time margin aspects because of stakeholder interest in this subject and the Commission's desire to consider all stakeholders' input for this important criterion.

Specifically, the Commission asks the following questions:

(A) Considering the factors for time margin discussed above (including the conditional dependence on a worst-case demonstration meeting all the other acceptance criteria), should the time margin consist of a single multiplicative factor (e.g., 2 times), or a range of multiplicative factors (e.g., 2-4 times)? Please provide a <sup>technical</sup> basis for your proposed time frames or factors. X

(B) If a range is appropriate, what should the range be and what parameters or variables should be considered in determining which part of the range is applicable in a given situation? Please provide a basis for your proposed time frames or factors.

Fix → (C) Should there be a minimum additive time (e.g., 10 minutes) for situations where the time in the demonstration is so short that a multiplicative factor would not properly account for the required time margin (e.g., a time in the demonstration of < 5 minutes). Please provide a basis for your proposed time frames or factors. X

(D) Are there other means of establishing margin (e.g., through consideration of conservative assumptions in the thermal hydraulic timeline)? Please provide a technical basis.

Environmental Factors

### Communications Equipment

Subsection 2(a)(3)(ii) of the proposed criteria requires the analysis to identify all communications equipment necessary to accomplish the operator manual actions.

Communications equipment may be needed to provide feedback between operators in ~~and~~ <sup>and personnel out in the plant</sup> ~~personnel outside~~ the main control room to ensure that any activities requiring coordination between them are clearly understood and correctly accomplished. The unpredictability of fires can force staff to deviate from planned activities, hence the need to consider constant and effective communications. Communications may be needed in the performance of sequential operator manual actions (where one action must be completed before another can be started) and provide verification that procedural steps have been accomplished, especially those that must be conducted at remote locations. Communications must be considered in the analysis by identifying the necessary communications equipment and ensuring their availability to the plant operators for the time needed to achieve and maintain hot shutdown. For example, if portable radios are to be used for communications then the analysis should list the equipment and confirm that the equipment can be used in the plant areas (i.e., capable of receiving and transmitting in the necessary plant areas) and are available for the time required (e.g., battery power life has been considered for the time period necessary). Such communications should be identified and addressed as per paragraph c.2 of the regulatory guide DG-1136, "Guidance for Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire."

### Portable Equipment

Subsection 2(a)(3)(ii) of the proposed criteria requires the analysis to identify all portable equipment necessary to accomplish the operator manual actions. Portable equipment, especially tools such as keys to open locked areas, ladders to reach high locations, torque devices to turn valve handwheels, and electrical breaker rackout tools, can be essential to



access and manipulate SSCs <sup>to</sup> ~~in the successful accomplishment of~~ required operator manual actions. Similarly, life support equipment, such as self-contained breathing apparatuses (SCBA), may need to be worn to permit access to and egress from the locations where the operator manual actions must be performed since the routes could be negatively affected by fire effects, such as smoke, that propagate beyond the fire-involved area. Portable equipment must be considered in the analysis by identifying necessary equipment and ensuring their availability to the plant operators during the time needed to achieve and maintain hot shutdown. For example, if SCBA is necessary then the analysis should list the equipment and confirm that the equipment can be used in the plant areas (i.e., access and egress to tight areas are not impeded by the use of SCBA) and are available for the time required (e.g., portable bottle air supply provides sufficient time to perform the action). Such equipment should be identified and addressed as per paragraph c.2 of the regulatory guide DG-1136, "Guidance for Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire." X

### Procedures and Training

Subsection 2(b) of the proposed criteria <sup>that all manual actions be included in</sup> ~~requires plant procedures to include all manual~~ <sup>plant procedures, and</sup> ~~actions~~ that each operator receive <sup>to the appropriate</sup> ~~training~~ on these manual actions. The role of written plant procedures in the successful performance of operator manual actions is three-fold: (1) assist the operators in correctly diagnosing the type of plant event that the fire may trigger, usually in conjunction with indications, thereby permitting them to select the appropriate operator manual actions (or prescribe actions to be taken should a fire occur in a given fire area); (2) direct the operators <sup>to the appropriate</sup> ~~as to which~~ preventive and mitigative manual actions are appropriate to place and maintain the plant in a stable hot shutdown condition; and (3) minimize the potential confusion that can arise from fire-induced conflicting signals, including spurious actuations, thereby minimizing the likelihood of personnel error during the required operator manual actions. Written X

or its effects. Accessible means that the personnel should be able to find and reach the locations of the components and be able to manipulate the components. Accessibility and operability of equipment must be considered in the analysis by identifying necessary equipment, ensuring operators are knowledgeable of equipment locations, determining that accessibility of such equipment, and that the equipment will not be adversely affected by a fire or its effects. For example, operators may rely upon valves to achieve and maintain hot shutdown conditions. If the functionality of the valves is adversely affected by the fire or if the valves are not accessible for manipulation then the functionality of such valves may be degraded, thereby preventing the performance of the required operator manual actions.

The intent of the staffing requirement is to ensure that qualified personnel will be on site at all times such that hot shutdown conditions can be achieved and maintained in the event of a fire. An individual expected to perform the operator manual actions <sup>must</sup> ~~may~~ not have collateral duties, such as fire fighting or security, during the evolution of the fire scenario. This individual should be exclusively available for the performance of required operator manual actions. Therefore, operating shift staffing levels should include enough personnel on watch for the performance of any operator manual actions that could arise as a result of a fire. The fire brigade would not be expected to perform actions other than those associated with fire fighting. Otherwise, the potential for interfering with either their fire fighting activities or the operator manual actions could exist, such that successful performance of one or the other, or both, could be impaired. For example, during a fire, an individual who is part of the five-person fire brigade could not perform the required operator manual actions because that individual is expected to participate in the fire fighting efforts.

A few commenters questioned whether the requirement for fire detection and automatic suppression installed in the area where the fire occurs should accompany the proposed compliance option for operator manual actions, and why this could not be left to the discretion of the licensees and review by the NRC, depending on the specific conditions to be encountered in that fire area. As discussed in the staff's proposed Appendix R, dated May 29, 1980, protective features shall be provided for fire areas that contain cables or equipment of redundant systems important to achieving and maintaining safe shutdown conditions to ensure that at least one means of achieving said conditions survive<sup>s</sup> postulated fires. The protective features may consist of a combination of automatic and manual fire suppression capability, fire propagation retardants, physical separation, partial fire barriers, or alternative shutdown capability independent of the room. The Commission believes that the proposed operator manual action option in conjunction with fire detectors and an automatic fire suppression system is consistent with the requirement of protective features and maintains a similar defense-in-depth concept as with a 1-hr passive fire barrier or a 20-ft separation with no intervening combustibles.

The III.G.2 compliance option of a 3-hr passive fire barrier requires no fire detection or automatic suppression to be installed in the area where the fire occurs. To consider the option for operator manual actions as providing reasonable assurance at a level comparable to this<sup>option</sup>, one must be convinced that the implementation of operator manual actions by itself<sup>provides</sup> a sufficient level of defense-in-depth without the additional level of protection provided by fire detectors and an automatic fire suppression system. The reason that the 3-hr barrier was "exempted" from the additional need<sup>for</sup> of fire detection and automatic suppression was the prevalent acknowledgment that a fire<sup>at a nuclear power plant</sup> lasting longer than three hours, without intervention, is highly unlikely, if not incredible. Therefore, unlike a 1-hr barrier or a 20-ft separation without intervening combustibles, this compliance option was<sup>considered to be</sup> viewed sufficient unto itself without the

additional level of defense-in-depth provided by the fire detection and automatic suppression.

Experience in both the nuclear and non-nuclear industry clearly indicates that human reliability is not at a level approaching that provided by a 3-hr barrier as the sole level of defense-in-depth.

Therefore, it is not reasonable to consider the implementation of operator manual actions ~~by~~ <sup>X</sup> itself sufficient as a compliance option to III.G.2 <sup>3</sup> without the additional level of defense-in-depth <sup>X</sup> provided by fire detection and automatic suppression.

A few commenters indicated that requiring fire detection and automatic suppression in conjunction with operator manual actions is creditable under III.G.2 "does not enhance the ability of the operator to perform a manual action in another area of the plant that is unaffected by the fire ... [Furthermore], this new 'requirement' is also more severe than Appendix R, Section III.G.3 because III.G.3 only requires a 'fixed' suppression system, either manual or automatic, but does not require an 'automatic' suppression system ..."

With regard to the first claim, ~~the Commission believes that~~ requiring fire detectors and an automatic fire suppression system in the fire area under consideration would enhance the ability of the operator to achieve and maintain safe shutdown from an unaffected area. The activation of detection and automatic suppression as indicated in the staff's statements of consideration for Appendix R to 10 CFR Part 50 (as amended 45 FR79409) would ensure prompt and effective application of suppressant to a fire that could endanger safe shutdown capability. As a result, ~~the Commission believes that~~ <sup>it takes to</sup> the time until a fire could adversely affect <sup>licensee's</sup> the ability of the plant to achieve and maintain a safe shutdown may be extended, thereby <sup>reactor</sup> enhancing the ability to perform feasible and reliable operator manual actions. <sup>X</sup> <sup>X</sup>

While a proposed requirement of automatic suppression for operator manual actions under paragraph III.G.2 may appear to be more severe than that of fixed suppression under paragraph III.G.3, this difference is minor in practicality. Part 50, Paragraph 48(a)(1), Fire

related to fire protection features for ensuring that systems and associated circuits used to achieve and maintain a safe shutdown are free from fire damage. Appendix A to BTP CMEB 9.5-1 permits a combination of fire-retardant coatings and fire detection and suppression systems without specifying a physical separation distance to protect redundant systems, and such arrangements were accepted in some early fire protection reviews. As a result of some separate effects tests, the staff changed its position on this configuration, and subsequent plans have been required to provide additional protection in the form of fire barriers or substantial physical separation for safe shutdown systems. No credit for such coatings as fire barriers is allowed by Section III.G of Appendix R."

The NRC originally characterized fire-retardant coatings, and subsequently their successors, fire barriers and/or physical separation, as "additional," implying that detection and suppression were intended to be primary. The requirement that detection and suppression (automatic) be included with Appendix R, Paragraph III.G.2, operator manual actions is not only consistent with the corresponding options currently there, but also is consistent with NRC's original intent in developing Appendix R, Section III.G.

The NRC exemption process in Section 50.12 or the specific license conditions will remain available to those licensees who wish to demonstrate compliance that operator manual actions in particular situations provide a reasonable assurance that the public health and safety can be maintained without fire detection or automatic suppression.

Request for Comment 2:

After considering <sup>the</sup> technical implications and historical background of the proposed criteria as discussed above, the Commission <sup>believes</sup> ~~decided that~~ the proposed operator manual actions rulemaking will require fire detectors and an automatic fire suppression system in the fire area to

Fix

permit operator manual actions as a compliance option under paragraph III.G.2, provided the acceptance criteria delineated in a new paragraph III.P are satisfied. The basis for the requirement is discussed above. However, because of the stakeholder interest in this subject, the Commission is asking <sup>for</sup> specific feedback and opinions from stakeholders on requiring an automatic versus fixed fire suppression system in the fire area.

The Commission asks the following specific question:

- (A) Under the proposed option of using operator manual actions under III.G.2(c-1), when redundant trains are located in the same fire area, should the requirement for a suppression system in the fire area be automatic or fixed? <sup>An</sup> Automatic suppression system is required in III.G.2(b) and (c). However, a fixed system is specified in III.G.3. Provide <sup>the</sup> ~~your~~ rationale for why requiring fixed or automatic suppression would provide the appropriate level of protection <sub>x</sub> in the proposed III.G.2 (c-1). X

#### Application of Operator Manual Actions Acceptance Criteria to Paragraphs III.G.1 and III.G.3

The proposed operator manual actions rulemaking would modify requirements in paragraph III.G.2 to permit operator manual actions as a compliance option under this paragraph, provided the acceptance criteria delineated in a new paragraph III.P are satisfied. The proposed rule language would not apply to paragraphs III.G.1 or III.G.3, although the term "operator manual actions" may be construed as applicable to the same types of actions taken under these paragraphs. This issue has been raised by stakeholders during discussions conducted thus far, and therefore, the Commission is providing background information about this subject and a specific request for comment.

Appendix R to 10 CFR 50, section III.G.1. requires fire protection features capable of limiting fire damage so that one train of systems necessary to achieve and maintain hot

P. 1. For purposes of this section, operator manual actions means the integrated set of actions needed to ensure that a redundant train of systems necessary to achieve and maintain hot shutdown conditions located within the same area outside the primary containment is free of fire damage.

2. A licensee relying on operator manual actions must meet all of the following requirements:

(a) Analysis. The licensee shall prepare an analysis for each operator manual action which demonstrates its feasibility and reliability.

(1) The analysis must contain a postulated fire time line showing that there is sufficient time to travel to action locations and perform actions required to achieve and maintain the plant in a hot shutdown condition under the environmental conditions expected to be encountered without jeopardizing the health and safety of the operator performing the manual action. The fire time line shall extend from the time of initial fire detection until the time when the ability to achieve and maintain hot shutdown is reached, and shall include a time margin that accounts for all variables, including (i) differences between the demonstrated and actual conditions, and (ii) human performance uncertainties that may be encountered.

(2) The analysis must address the functionality of equipment or cables that could be adversely affected by the fire or its effects, but still <sup>be available</sup> ~~utilized to~~ achieve and maintain hot shutdown. X