
**Regulatory Analysis of Post-Fire Operator Manual
Actions Proposed Rule - 10 CFR Part 50 - Appendix R**

**U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation**

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Executive Summary

The NRC is considering amending its fire protection regulations in 10 CFR Part 50, Appendix R, Paragraph III.G.2, to allow the use of manual actions by nuclear power reactor operators to achieve hot shutdown conditions in the event of fires in certain plant areas, provided the actions are evaluated against specific criteria developed by NRC staff that have been determined to be acceptable.

The fire protection regulations applicable to currently licensed nuclear power plants depend on when the reactor was licensed. The requirements of Appendix R, Paragraph III.G.2, are only applied to all reactors licensed to operate prior to January 1, 1979, by 10 CFR 50.48 (b). For reactors licensed to operate on or after January 1, 1979, the requirements of GDC-3 and 10 CFR 50.48 (a) apply; for these reactors, the staff uses regulatory guidance in Branch Technical Position CMEB 9.5-1 to review licensees' fire protection programs.

10 CFR Part 50, Appendix R, Paragraph III.G.2 specifies three acceptable methods for protecting the safe shutdown capability of one of the redundant shutdown trains from a fire when located in the same fire area as its redundant train:

- Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier;
- Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustible or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area; or
- Enclosure of the cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

Currently, licensees relying on operator manual actions which have not been reviewed and approved by NRC under the exemption provisions contained in § 50.12 are generally considered to be in non-compliance with NRC regulations. However, the NRC believes that certain manual actions relied upon by licensees are safe and effective when performed under appropriate conditions.

The NRC considered three alternatives to address the use of operator manual actions to ensure at least one means of achieving and maintaining safe shutdown conditions during or after any postulated fire for reactors licensed before January 1, 1979.

Option 1 (No Action). Licensees would conform to the existing requirements of 10 CFR Part 50 Appendix R, Paragraph III.G.2. The NRC staff would notify nuclear power plant licensees that using operator manual actions to achieve and maintain a safe shutdown condition is not permitted as an alternative to providing fire barrier or separation protection from a fire in a location where redundant trains are located in the same fire area unless a licensee has an exemption under the provisions of § 50.12. All unapproved operator manual actions would be considered violations of 10 CFR Part 50, Appendix R, Paragraph III.G.2.

Option 2 (Regulatory Guidance). Under this option, the existing regulations at 10 CFR Part 50, Appendix R, Paragraph III.G.2 would remain unchanged, but the regulatory guidance would be clarified. NRC would issue a regulatory information summary in conjunction with an update of the applicable regulatory guidance and inspection guidance on the use of operator manual actions. However, the criteria of Paragraph III.G.2 would still need to be met unless a licensee had an NRC-approved exemption under the provisions of § 50.12. All operator manual actions not covered by an approved exemption would be considered a violation.

Option 3 (Proposed). The existing fire protection regulations at 10 CFR Part 50, Appendix R, Paragraph III.G.2 would be revised to explicitly permit the use of operator manual actions in lieu of using fire barrier or separation protection to achieve and maintain safe shutdown in the event of a fire where redundant trains are located in the same fire area. The regulations and associated guidance would include generic acceptance criteria on the use of operator manual actions. Use of operator manual actions would be predicated on the requirement that the area where the fires occur has fire detectors and an automatic fire suppression system installed in the fire area and if the manual actions relied upon are consistent with all of the criteria.

To determine the impacts of the three options above, the staff proposed two baselines. The Main baseline reflects the effects of the rule on the date of publication, that is, full compliance with all existing regulations. The Industry Practices baseline reflects a more “real world” assessment of compliance.

Table ES-1 summarizes the net present values associated with each alternative and baseline analyzed.

Table ES-1. Net Present Value of Regulatory Alternatives

Baseline	Option 1 No Action	Option 2 Regulatory Guidance	Option 3 Proposed Alternative
Main	--	(\$42,240)	\$13,992,793
Industry Practices	--	(\$42,240)	\$16,839,000

Option 3, the Proposed alternative, was determined to be the most preferable based on best professional judgment and quantitative analysis because it (1) improves effectiveness and efficiency of the NRC regulatory process by assuring adequate and uniform operator manual actions; (2) eliminates the need for some licensees to request exemptions from Paragraph III.G.2 or make equipment modifications; and (3) reduces NRC costs by reducing the number of exemption requests to be reviewed.

This regulatory analysis does not consider enforcement discretion specific to operator manual actions. Generic enforcement discretion associated with fire-induced circuit failures, including manual actions, are being considered as compensatory measures pending the final rule.

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1.0 Introduction

The NRC is considering amending its fire protection regulations in 10 CFR Part 50, Appendix R, Paragraph III.G.2, to allow the use of manual actions by nuclear power plant operators to achieve hot shutdown conditions in the event of fires in certain plant areas, provided the actions are evaluated against specific criteria developed by NRC staff that have been determined to be acceptable.

Currently, licensees relying on operator manual actions which have not been reviewed and approved by NRC under the exemption provisions contained in § 50.12 are generally considered to be in non-compliance with NRC regulations. However, the NRC believes that certain manual actions relied upon by licensees are safe and effective when performed under appropriate conditions.

The NRC considered three alternatives to address the use of operator manual actions to ensure at least one means of achieving and maintaining safe shutdown conditions during or after any postulated fire for reactors licensed before January 1, 1979. This Regulatory Analysis (RA) is part of the Commission's analysis of the options being considered and is a supporting document for the proposed rule. The purpose of this RA is to evaluate the costs and benefits associated with the regulatory changes being considered by the Commission. The NRC considers the regulatory analysis process an integral part of its statutory mission to ensure reasonable assurance for the protection of public health and safety, property, environmental quality, and national defense and security from civilian uses of nuclear materials. This document presents background material, describes the objectives of the proposed rule, outlines the alternatives being considered, and evaluates the values and impacts of the regulatory alternatives.

This regulatory analysis does not consider enforcement discretion specific to operator manual actions. Generic enforcement discretion associated with fire-induced circuit failures, including manual actions, are being considered as compensatory measures pending the final rule.

1.1 Background

Nuclear power plant fire protection regulations and associated guidelines prescribe fire protection features to ensure that at least one means of achieving and maintaining safe shutdown conditions will remain available during or after any postulated fire. The fire protection regulations applicable to currently licensed nuclear power plants depend on when the reactor was licensed. The requirements of Appendix R, Paragraph III.G.2, were only applied to reactors licensed to operate prior to January 1, 1979, by 10 CFR 50.48 (b). For reactors licensed to operate on or after January 1, 1979, the requirements of GDC-3 and 10 CFR 50.48 (a) apply; for these reactors the NRC staff reviewed the fire protection programs against the regulatory guidance in Branch Technical Position CMEB 9.5-1 or the Standard Review Plan (NUREG-0800), which incorporated provisions of Appendix R, Paragraph III.G.2. Most licensees committed in their fire protection plans to meet the Appendix R, Paragraph III.G. 2 equivalent regulatory guidance. These commitments are part of the licensing basis for reactors licensed on or after January 1, 1979, and are specified in a license condition.

10 CFR Part 50, Appendix R, Paragraph III.G.2 specifies three acceptable methods for protecting the safe shutdown capability of one of the redundant shutdown trains from a fire when located in the same fire area as its redundant train:

- Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier;
- Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustible or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area; or
- Enclosure of the cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

During recent inspections of licensee fire protection programs, concerns have arisen among NRC staff about licensee compliance with fire protection of redundant safe shutdown systems that are located in the same fire areas. NRC staff believes that instead of pursuing expensive and burdensome upgrading or replacement of the Thermo-Lag fire barriers that were originally installed to comply with Appendix R requirements, many licensees utilized operator manual actions to make available a second train of safe shutdown equipment. Such changes must be approved through the exemption or deviation process. Since the fire protection regulations were promulgated, the staff has approved numerous exemptions to the technical requirements of Appendix R (for pre-January 1, 1979, reactors) and deviations from associated guidance (for reactors licensed on or after January 1, 1979) that permitted specific operator manual actions as an acceptable alternative to the fire protection separation requirements.

However, NRC had not envisioned that licensees would implement a broader use of operator manual actions without NRC approval. Since the regulation cannot be reasonably interpreted to permit reliance upon operator manual actions with respect to redundant safe shutdown trains in Paragraph III.G.2. of Appendix R., any reactor licensed prior to January 1, 1979, which is using operator manual actions in lieu of fire barrier separation without an NRC-approved exemption is not in compliance with the regulations. Compliance with Appendix R, Paragraph III.G.2 (or equivalent) is not legally binding for reactors licensed on or after January 1, 1979. However, because of the lack of regulatory criteria on the use of operator manual actions for post-fire safe shutdown, reactors licensed on or after January 1, 1979, would have to develop and defend the criteria governing use of operator manual actions on a case-by-case basis, and demonstrate that they would not adversely impact the licensee's ability to achieve or maintain safe shutdown in the event of a fire.

In addition to the compliance issue, NRC staff is also concerned that some unapproved operator manual actions may not be feasible. Because there is no generic guidance on acceptable operator manual actions, it is unclear how each licensee established the feasibility and reliability of needed operator manual actions. The industry believes that most operator manual actions used by licensees for operation of a safe shutdown train during a fire do not involve any safety significant feasibility or reliability concerns and would likely be approved by the NRC if processed as an exemption or deviation request. The results from NRC fire protection inspections to date indicate that there is insufficient evidence that the generic use of these manual actions poses a safety concern. Thus the staff believes that use of unapproved manual actions (for all reactors) is typically a compliance issue and is not a significant safety issue.

1.2 Objectives of the Proposed Rulemaking

10 CFR Part 50, Appendix R, Paragraph III.G.2 currently specifies three acceptable methods for protecting the safe shutdown capability of one of the redundant shutdown trains from a fire when located in the same fire area as its redundant train. The proposed change to Appendix R, Paragraph III.G. 2 is intended to (1) maintain safety and increase public confidence by defining technically acceptable generic criteria for operator manual actions which can be used to assess the feasibility and reliability of existing or future operator manual actions employed by licensees; (2) provide quality and uniformity in licensee assessments and documentation of the acceptability of plant-specific operator manual actions; (3) reduce unnecessary regulatory burden associated with the exemption or deviation process; and (4) result in more efficient use of resources by both licensees and the NRC with respect to resolving existing manual action compliance issues encountered during plant-specific inspections.

2.0 Identification and Preliminary Analysis of Alternative Approaches

The NRC is considering three options in its rulemaking to address this regulatory issue:

Option 1 (No Action). The fire protection requirements would continue to conform to the existing requirements of 10 CFR Part 50 Appendix R, Paragraph III.G.2. The staff would notify nuclear power plant licensees that using operator manual actions to operate a safe shutdown train is not permitted as an alternative to providing fire barrier protection from a fire in a location where redundant trains are located unless such changes have specifically received an NRC exemption under § 50.12. All operator manual actions not covered by an exemption would be considered a violation.

Option 2 (Regulatory Guidance). Under this option, the existing regulations at 10 CFR Part 50, Appendix R, Paragraph III.G.2 would remain unchanged, but the regulatory guidance would be clarified. NRC would issue a regulatory information summary in conjunction with an update of the applicable regulatory guidance and inspection guidance on the use of operator manual actions. However, the criteria of Paragraph III.G.2 would still need to be met unless a licensee had an NRC-approved exemption under the provisions of § 50.12. All operator manual actions not covered by an approved exemption would be considered a violation.

Option 3 (Proposed Alternative). Revise the existing regulations and associated guidance. The existing fire protection regulations at 10 CFR Part 50, Appendix R, Paragraph III.G.2 would be revised to explicitly permit the use of operator manual actions in lieu of using passive fire barrier or separation protection to achieve and maintain safe shutdown in the event of a fire where redundant trains are located in the same fire area. The regulations and associated guidance would include generic acceptance criteria on the use of operator manual actions. Use of operator manual actions would be predicated on the requirement that the area where the fires occur has fire detectors and an automatic fire suppression system installed in the fire area and if the manual actions relied upon are consistent with all of the criteria listed in Table 1.

Under the proposed rule, licensees would have to analyze and document that the use of operator manual actions would comply with the acceptance criteria and demonstrate that the operator manual actions are feasible, reliable, and do not adversely affect the ability to achieve or maintain safe shutdown. This documentation would not require prior review and approval by NRC, but could be subject to a review as an element of a comprehensive site inspection.

Table 1. Proposed Generic Acceptance Criteria for Operator Manual Actions

<i>Available Indications</i>	<p>Diagnostic indication, if credited to support operator manual actions, shall be capable of:</p> <ul style="list-style-type: none"> • Confirming that the action is necessary; • Being unaffected by the postulated fire; • Providing a means for the operator to detect whether spurious operation of safety-related equipment has occurred; and • Verifying that the operator manual action accomplished the intended objective.
<i>Environmental Considerations</i>	<p>Environmental conditions encountered while accessing and performing operator manual actions shall be demonstrated to be consistent with the following human factor considerations for visibility and habitability:</p> <ul style="list-style-type: none"> • Emergency lighting shall be provided as required in Appendix R, Section III.J, or by the licensee’s approved fire protection program, [e.g., lit with 8-hr battery-backed emergency lighting], and sufficient lighting shall be provided for paths to and from locations requiring any actions. • Radiation shall not exceed 10 CFR Part 20, Section 20.1201, limits. • Temperature and humidity conditions shall be evaluated to ensure that temperature and humidity do not adversely affect the capability to perform the operator manual action (See, e.g., NUREG/CR–5680, Vol. 2, “The Impact of Environmental Conditions on Human Performance”) or the licensee shall provide an acceptable rationale for why temperature/humidity do not adversely affect performing the manual actions. • Fire effects shall be evaluated to ensure that smoke and toxic gases from the fire do not adversely affect the capability to access the required equipment or to perform the operator manual action.
<i>Staffing and Training</i>	<p>There shall be a sufficient number of plant operators, under all staffing levels, to perform all of the required actions in the times required for a given fire scenario. The use of operators to perform actions shall be independent from any collateral fire brigade or control room duties they may need to perform as a result of the fire. Operators required to perform the manual actions shall be qualified and continuously available to perform the actions required to achieve and maintain safe shutdown. A training program on the use of operator manual actions and associated procedures during a postulated fire shall demonstrate that operators can successfully achieve these objectives.</p>
<i>Communications</i>	<p>To achieve and maintain safe shutdown, adequate communications capability shall be demonstrated for operator manual actions that must be coordinated with other plant operations, with this communications capability continuously available.</p>
<i>Special Equipment</i>	<p>Any special equipment required to support operator manual actions, including keys, self-contained breathing apparatus (SCBA), and personnel protective equipment, shall be readily available, easily accessible and demonstrated to be effective.</p>
<i>Procedures</i>	<p>Procedural guidelines on the use of required operator manual actions shall be readily available, easily accessible and demonstrated to be effective.</p>
<i>Local Accessibility</i>	<p>All locations where operator manual actions are performed shall be assessed as accessible without hazards to personnel, with controls needed to assure availability of any special equipment, such as keys or ladders, being demonstrated.</p>

Table 1. Proposed Generic Acceptance Criteria for Operator Manual Actions

<i>Demonstration</i>	The capability to successfully accomplish required operator manual actions within the time allowable using the required procedures and equipment shall be demonstrated using the same personnel/crews who will be required to perform the actions during the fire; documentation of the demonstration shall be provided.
<i>Complexity and Number</i>	The degree of complexity and total number of operator manual actions required to effect safe shutdown shall be limited such that their successful accomplishment under realistically severe conditions is assured for a given fire scenario. The need to perform operator manual actions in different locations shall be considered when sequential actions are required. Analyses of the postulated fire time line shall demonstrate that there is sufficient time to travel to each action location and perform the action required to support the associated shutdown function(s) such that an unrecoverable condition does not occur.
<i>Equipment Pre-conditions</i>	Possible failure modes and damage that may occur to equipment used during a fire shall be considered to the extent that the equipment's subsequent use could be prevented, or at least made difficult. Credit for using equipment whose operability may have been adversely affected by the fire due to smoke, heat, water, combustion products or spurious actuation effects shall account for such possibilities (e.g., over-torquing an MOV due to a spurious signal, as discussed in Information Notice 92-18).

The NRC staff believes that amending Appendix R and associated guidance is a safe and acceptable method for protecting safe shutdown capability from a fire (in lieu of fire barrier separation). The criteria should provide a reasonable assurance that post-fire operator manual actions are uniformly evaluated by the licensee and should reduce variability and ambiguity in the licensing basis justifications for operator manual actions. By codifying the use of operator manual actions that meet feasibility and reliability criteria, the NRC will define what operator manual actions can be utilized without adversely affecting the ability to achieve and maintain safe shutdown in the event of a fire. Upon establishment of generic criteria, licensees could then use their fire protection program change control process to adopt operator manual actions without NRC approval. This course of action would permit licensees that currently rely on unapproved operator manual actions to achieve compliance through appropriate analysis and documentation against the feasibility and reliability acceptance criteria without NRC review and approval.

3.0 Analysis of Values and Impacts

This section describes the analysis conducted to identify and evaluate the benefits (values) and costs (impacts) of the proposed rule. Section 3.1 identifies the attributes that the proposed rulemaking is expected to affect. Section 3.2 describes the methodology used to analyze the benefits and costs associated with changes to the affected attributes. Section 3.3 presents the results of the analysis.

3.1 Identification of Affected Attributes

This section identifies the factors that affect the public and private sectors as a result of the proposed rulemaking. These factors are classified as "attributes" using the list of potential attributes provided in Chapter 5 of the NRC's "Regulatory Analysis Technical Evaluation Handbook."¹ Each attribute listed in Chapter 5 was evaluated, and the basis for selecting those attributes expected to be affected by the potential action is presented in the balance of this section.

- *Industry Operation.* The proposed action would decrease the number of exemption requests submitted by licensees.
- *Industry Implementation.* The proposed action would require licensees to prepare documentation of compliance with the proposed criteria.
- *NRC Operation.* The proposed action would significantly reduce NRC review of licensee exemption requests.
- *NRC Implementation.* Under some alternatives the NRC would need to prepare a guidance document.
- *Regulatory Efficiency.* The proposed action would enhance regulatory efficiency by establishing the process for using operator manual actions. The proposed action will also clarify which manual actions will be acceptable to NRC by codifying the generic acceptance criteria. Consequently, licensees will face less uncertainty in determining appropriate operator manual actions.

¹ NUREG/BR-0184, "Regulatory Analysis Technical Evaluation Handbook: Final Report," U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, January 1997.

- *Other Considerations.* The proposed rule could affect public confidence in the NRC. Although NRC believes that operator manual actions meeting the generic acceptance criteria will maintain an adequate level of safety (as do the three alternatives in Paragraph III.G.2), the public may perceive operator manual actions as providing less assurance of safe shutdown. Consequently, the public may perceive NRC to be unnecessarily relaxing safety standards.

The proposed rulemaking is *not* expected to affect the following attributes:

- *Environmental Considerations*
- *Public Health (Routine)*
- *Public Health (Accidental)*
- *Other Government*
- *Occupational Health (Accidental)*
- *Occupational Health (Routine)*
- *Offsite Property*
- *Onsite Property*
- *General Public*
- *Improvements in Knowledge*
- *Antitrust Considerations*
- *Safeguards and Security Considerations.*

3.2 Analytical Methodology

This section describes the methodology used to analyze the benefits and costs associated with the proposed rule. The benefits of the rule include any desirable changes in affected attributes while the costs include any undesirable changes in affected attributes.

This analysis relies on a qualitative (rather than quantitative) evaluation of several of the affected attributes (regulatory efficiency and other considerations) due to the difficulty in quantifying the impact of the proposed rulemaking. These attributes would be affected by the proposed regulatory option through the greater efficiency of the rule and public perceptions of the protectiveness of the regulatory option.

The remaining attributes (industry implementation and NRC implementation) are evaluated quantitatively. Quantitative analysis requires a baseline characterization of factors such as the number of pre-January 1, 1979, reactors, the number of these licensees using operator manual actions, the cost to prepare and review an exemption request, the cost to document compliance with the proposed generic acceptance criteria, and a range of other current licensee practices. Sections 3.2.1–3.2.6 describe the most significant analytical data, variables, and assumptions used in the quantitative analysis of these attributes.

3.2.1 Licensee Baselines for Analysis

This regulatory analysis measures the incremental benefits and costs of the proposed rulemaking relative to a baseline, which is how the world would be if the proposed regulation were not imposed. The baseline used in this analysis assumes full licensee compliance with existing NRC requirements. This is consistent with NUREG/BR-0058, “Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission,” Rev. 3, which states that, “...in evaluating a new requirement for existing plants, the staff should assume that all existing NRC

and Agreement State requirements have been implemented.” Section 3.3.1 presents the estimated incremental benefits and costs associated with the proposed rule relative to this baseline. Unless otherwise noted, the estimated benefits and costs presented in this document reflect this baseline and are referred to as the “Main Analysis.”

This regulatory analysis also contains several sensitivity analyses prepared in accordance with NRC’s regulatory analysis guidelines. The purpose of the primary sensitivity analysis is to account for the fact that some licensees are currently not in full compliance with existing Paragraph III.G.2 provisions. NRC staff believes that instead of pursuing expensive and burdensome upgrading or replacement of the Thermo-Lag fire barriers that were originally installed to comply with Appendix R requirements, many licensees are utilizing operator manual actions to make available a second train of safe shutdown equipment, under the impression that these operator manual actions are sufficient to comply with existing regulations. Such changes, however, must be approved through the exemption or deviation process at § 50.12. Therefore, this sensitivity analysis considers an alternative baseline that reflects industry practices, that is, in accordance with licensees’ current practices.

Finally, in accordance with OMB Circular No. A-4, each analysis is evaluated at both a 3 percent and a 7 percent discount rate. The two discount rates are applied to each of the baselines over a period of 30 years, which is the average estimated remaining life of pre-January 1, 1979, licensed facilities. The results of the discount rate analysis are presented after the results of each analysis.

3.2.2 Affected Universe

Only the 52 nuclear power reactors licensed before January 1, 1979, are subject to the requirements of 10 CFR Part 50 Appendix R, Paragraph III.G.2. However, the universe (i.e., number of licensees) affected by this rulemaking varies depending on the baseline considered. Under the Main analysis baseline, full compliance with existing regulations is assumed, so only licensees making modifications in the future will be affected. For the Main Analysis, five licensees per year are assumed to make such modifications. Under the Industry Practices baseline, all 52 reactors licensed before January 1, 1979, could be affected by this proposed rulemaking. Whether a licensee is affected under the Industry Practices baseline depends on the licensee’s current practices under the existing regulations.

Under each of the baseline analyses described in section 3.2.1, NRC implementation and operation activities may be affected. The effects on NRC resulting from the behavior of licensees under each of the baselines are described separately below.

3.2.3 Types of Costs Incurred

There are five types of costs that might be incurred by either licensees or the NRC in the baseline or regulatory alternatives.

- A licensee may have to prepare and submit an exemption request. Based on industry information, it is assumed that each exemption request would require 2,500 hours to prepare.² Using an estimated average labor rate of \$88/hour, the total cost for a licensee to prepare an exemption request is \$220,000.

- For every exemption request submitted, NRC review is required. This analysis assumes that it will take 110 hours to review an exemption request, at an average rate of \$88/hour, for a total cost of \$9,680 to review each exemption request.
- A licensee may have to document compliance with the new generic acceptance criteria. Based on industry information, it is assumed that it would take 300 hours to prepare the documentation.² Using an estimated average labor rate of \$88/hour, the total cost for a licensee to document compliance with the generic acceptance criteria is \$26,400.
- A licensee may have to make equipment modifications to come into compliance with 10 CFR Part 50 Appendix R, Paragraph III.G.2. Although the costs of such modifications are likely to vary, this analysis assumes that the average cost is approximately \$250,000 per licensee for equipment modifications.
- NRC may have to prepare regulatory guidance. Excluding the cost of deriving the criteria (which are assumed to be developed as part of the rulemaking process and thus not counted), this analysis assumes that it would take approximately 320 contractor hours and 160 NRC staff hours to prepare such guidance. The overall cost of preparing such guidance, assuming an average labor rate of \$88/hour is \$42,240.

To determine the benefits or costs associated with a regulatory alternative, incremental costs (the cost relative to the baseline) are calculated. These costs are equal to the costs for all affected entities under the regulatory alternative less the costs for all entities under the baseline. Section 7.0 (p.15) contains calculations that support the costs used in the paragraphs and tables that follow. In the next section, the expected behavior of each distinct group is described under both the baselines and regulatory alternatives.

3.2.4 Assumptions and Methodology for Main Analysis

In the Main Analysis, all licensees are assumed to be in compliance with existing requirements, in 10 CFR Part 50, Appendix R, Paragraph III.G.2. Thus, the addition of a new option for complying with Paragraph III.G.2 is not expected to result in a change in behavior. However, over time, some licensees may need to make modifications to their procedures or equipment. This analysis assumes that in the future, five reactors per year will make changes using operator manual actions that will meet the criteria in the preferred alternative. Table 2 presents assumed behavior for these licensees under the baseline and each regulatory alternative.

² NEI provided estimates for the hours required by licensees to prepare an exemption request and to document compliance under the proposed rule.

Table 2. Expected Future Licensee Behavior Under the Main Analysis

Number of Reactors	Baseline	Option 1 No Action	Option 2 Regulatory Guidance	Option 3 Proposed Alternative
2/year	Make equipment modifications to meet III.G.2	Make equipment modifications to meet III.G.2	Make equipment modifications to meet III.G.2	Document compliance with new criteria
3/year	Submit exemption request	Submit exemption request	Submit exemption request	Document compliance with new criteria

For two reactors per year, it is assumed that changes could be addressed using operator manual actions through an exemption process in the No Action or Regulatory Guidance alternatives except that approval of the request will not be received quickly enough to implement the planned operator manual actions according to outage schedules or other schedule requirements. In order to meet their schedule, these licensees would have to implement costly plant equipment modifications to comply with Paragraph III.G.2. However, these facilities would also have to make the costly plant modifications in the baseline, and thus incur no incremental costs or savings. Under the Proposed alternative, these licensees will have to document compliance with the new criteria, and thus will incur a total savings of \$447,200/year relative to the baseline.

It is assumed that three reactors per year would have submitted an exemption request under the baseline, No Action alternative and Regulatory Guidance alternative, but will document compliance under the Proposed alternative. These licensees will incur a total net savings of \$580,800. NRC will experience a savings of \$29,040/year because it will not have to review those requests under the Proposed alternative.

Under the Regulatory Guidance and Proposed alternatives, NRC will incur a one-time cost of \$42,240 to prepare the regulatory guidance.

3.2.5 Assumptions and Methodology for Industry Practices Analysis

All of the costs and savings incurred under the Main Analysis will be incurred in the Industry Practices baseline. However, in addition to those costs, there could be additional costs for the industry to come into full compliance with the regulations. This analysis assumes, based on NRR technical staff input, that the 52 reactors licensed before January 1, 1979, can be divided into the following five groups:

- Group A consists of five reactors assumed to be in full compliance with the provisions of Paragraph III.G.2 directly or have been granted an exemption.
- Group B consists of 14 reactors that use operator manual actions that will comply with the new generic acceptance criteria.
- Group C consists of 14 reactors that use equipment or procedures that do not meet either the requirements of Paragraph III.G.2 or the new generic acceptance criteria, but would be judged to provide an adequate level of safety under the exemption procedures currently in place.

- Group D consists of 14 reactors that believe their procedures would be approved by NRC through the exemption process. However, NRC would reject their exemption request and equipment modifications would be needed to comply with Paragraph III.G.2.
- Group E consists of five reactors that would not submit an exemption request, but would need to make equipment modifications to come into compliance with III.G.2.

Table 3 presents the expected behavior for the 52 reactors built before 1979, subject to this rulemaking using the groups described above.

Table 3. Expected Immediate Licensee Behavior Under Industry Practices Analysis

Group	Number of Reactors	Baseline	Option 1 No Action	Option 2 Regulatory Guidance	Option 3 Proposed Alternative
A	5	NA	NA	NA	NA
B	14	Submit exemption request	Submit exemption request	Submit exemption request	Document compliance with new criteria
C	14	Submit exemption request	Submit exemption request	Submit exemption request	Submit exemption request
D	14	Submit exemption request and make equipment modifications to meet III.G.2	Submit exemption request and make equipment modifications to meet III.G.2	Submit exemption request and make equipment modifications to meet III.G.2	Submit exemption request and make equipment modifications to meet III.G.2
E	5	Make equipment modifications to meet III.G.2			

As can be seen, although all 52 reactors built before 1979 are subject to the rule, only the fourteen reactors in group B will experience a change in behavior and have a resulting savings under the Proposed alternative. For all groups under the No Action alternative, Regulatory Guidance alternative, and groups A, C, D, and E under the Proposed alternative, licensee behavior is the same as in the baseline. So although these licensees will incur costs to come into compliance with Paragraph III.G.2, they will not incur any incremental costs associated with the proposed alternative. Under the proposed alternative, these 14 reactors in Group B will incur a net savings of \$193,600 each or a total one-time savings to industry of \$2,710,400. NRC will incur a one-time savings of \$135,520 from not having to review these 14 exemption requests. However, NRC will incur a one time cost of \$42,240 to prepare the regulatory guidance in the Regulatory Guidance and Proposed alternatives.

3.3 Results

This section presents the analytical results, which are organized into three separate sections as follows:

- Section 3.3.1 presents findings on the overall benefits and costs of the proposed rulemaking under the Main Analysis.
- Section 3.3.2 discusses a sensitivity analysis addressing recent industry practices.
- Section 3.3.3 presents a summary of the incremental values and impacts of each alternative and baseline considered.

3.3.1 Main Analysis

Option 1: No Action Alternative

Under the No Action alternative (Option 1), NRC would not modify 10 CFR Part 50, Appendix R, Paragraph III.G.2. There are no costs or savings associated with this option. Thus, relative to existing requirements, no values or impacts would result from Option 1.

Option 2: Regulatory Guidance Alternative

Under the Regulatory Guidance alternative (Option 2), NRC would not modify 10 CFR Part 50, Appendix R, Paragraph III.G.2, but would issue regulatory guidance. This option would qualitatively improve regulatory efficiency (by describing in guidance the types of operator manual actions NRC would approve through the exemption process). NRC would incur a one-time cost of \$42,240.

Option 3: Proposed Alternative

Under this option, new criteria would be established outlining acceptable operator manual actions, as a new option for complying with 10 CFR Part 50, Appendix R, Paragraph III.G.2. Industry would incur an annual savings of \$1,028,000 from not having to implement plant modifications or prepare exemption requests and NRC would incur a savings of \$29,040 from not having to review these requests. NRC would incur a one-time cost of \$42,240. Thus, the total net present value using a 7 percent discount rate is \$13,992,793. Using a discount rate of 3 percent, the net present value would be \$21,297,764.

3.3.2 Industry Practices Analysis

Option 1: No Action Alternative

Under the No Action alternative (Option 1), NRC would not modify 10 CFR Part 50, Appendix R, Paragraph III.G.2. Thus, relative to existing requirements, no values or impacts would result from Option 1.

Option 2: Regulatory Guidance Alternative

Under the Regulatory Guidance alternative (Option 2), NRC would not modify 10 CFR Part 50, Appendix R, Paragraph III.G.2 but would issue regulatory guidance. This option would

qualitatively improve regulatory efficiency (by describing in guidance the types of operator manual actions NRC would approve through the exemption process). NRC would incur a one-time cost of \$42,240.

Option 3: Proposed Alternative

Under this option, new criteria would be established outlining acceptable operator manual actions, as a new way to comply with 10 CFR Part 50, Appendix R, Paragraph III.G.2. Industry would experience savings of \$1,028,000 per year. NRC would experience savings of \$29,040 per year. In addition, industry would experience a one-time savings of \$2,710,400 and NRC would experience a one-time savings of \$93,280. The total net present value using a 7 percent discount rate is \$16,839,000. Using a discount rate of 3 percent, the net present value would be \$24,144,000.

3.3.3 Summary of Values and Impacts

Tables 4 and 5 summarize the values of the Regulatory Guidance alternative and the Proposed alternative for each of the analyses described above. Numbers in parentheses indicate impacts (costs) rather than values (benefits).

Table 4. Values of the Regulatory Guidance Alternative

Analysis	Values to Industry		Values to NRC		Net Present Value
	One Time	Annual	One-Time	Annual	
Main	--	--	(\$42,240)	--	(\$42,240)
Industry Practices	--	--	(\$42,240)	--	(\$42,240)

Table 5. Values of the Proposed Alternative

Analysis	Values to Industry		Values to NRC		Net Present Value
	One Time	Annual	One-Time	Annual	
Main	--	\$1,028,000	(\$42,240)	\$29,040	\$13,992,793
Industry Practices	\$2,710,400	\$1,028,000	\$93,280	\$29,040	\$16,839,000

4.0 Backfit Analysis

To resolve an existing regulatory compliance issue, 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. Licensees that meet existing Paragraph III.G.2, or currently have approved operator manual actions should not be required to perform any additional actions (such as analysis or documentation). Pre-January 1, 1979, reactors that employ operator manual actions but have not received NRC approval are in violation of the current regulations. The NRC position on the use of operator manual actions under Appendix R, Paragraph III.G.2 has not changed. There is no backfitting as defined in 10 CFR 50.109

(a)(1) with respect to pre-January 1, 1979, reactors who are currently relying on operator manual actions to comply with Paragraph III.G.2 and who have not previously received an exemption approving such use.

Reactors licensed on or after January 1, 1979, that use operator manual actions without NRC approval may or may not be in compliance with GDC-3, § 50.48 (a), the license condition or licensees' current fire protection program. Compliance for such reactors depends on the specific licensing commitments, the change control process, and how the change was justified and analyzed to demonstrate that the operator manual actions are feasible and do not adversely affect the ability to achieve or maintain safe shutdown. For non-compliant reactors (licensed on or after January 1, 1979), the proposed rule would provide another possible option that could be used to demonstrate compliance. Therefore, licensees relying on operator manual actions would have regulatory certainty that they are in compliance with applicable NRC requirements provided that they have documentation that demonstrates the acceptability of operator manual actions in accordance with established acceptance criteria. While such documentation of manual action acceptability in the fire hazards analysis would represent additional requirements, they are strictly voluntary for non-compliant licensees. Licensees could elect to comply with the currently specified physical fire barrier separation requirements. Therefore, it has been determined that the proposed rule would not constitute a backfit as defined in 10 CFR 50.109 (a)(1).

5.0 Decision Rationale

For each of the options identified, the values and impacts associated with amending the fire protection requirements in 10 CFR Part 50, Appendix R, Paragraph III.G.2 have been considered. Option 3 was determined to be the most preferable based on best professional judgment and quantitative analysis because it (1) improves effectiveness and efficiency of the NRC regulatory process by assuring adequate and uniform operator manual actions; (2) eliminates the need for licensees to request exemptions from Paragraph III.G.2 or make equipment modifications and thereby reduces licensees' costs; and (3) reduces costs for the NRC by eliminating the need to review exemption requests.

6.0 Implementation

This action would be enacted through a Proposed Rule Notice, public comments, and a Final Rule, with promulgation of the Final Rule by approximately one year after publication of the Proposed Rule. No impediments to implementation of the recommended alternatives have been identified.

A revision to associated regulatory guidance such as Branch Technical Position CMEB 9.5-1, the Standard Review Plan (NUREG-0800), and possibly Regulatory Guide 1.189, "Fire Protection for Operating Nuclear Power Plants) would be required. Revisions to fire protection inspection plans and enforcement guidance may also be required.

The estimated resources entailed in this rulemaking would be on the order of 3 FTEs. These resources will come principally from NRR and RES. These resources are within FY 2004 budget allocations and the proposed FY 2005 budget.

NRR . . . 2.5 FTE
Other . . . 0.5 FTE

7.0 SUPPORTING CALCULATIONS

One Time Savings

Licensees:

Exemption Effort 14 reactors x 2500 hours x \$88.00/hour = \$ 3,080,000

Minus Documentation 14 reactors x 300 hours x \$88.00/hour = (\$ 369,600)

Savings to Licensees = **\$2,710,400**

NRC:

Exemption Reviews 14 reactors x 110 x \$88.00/hour = \$ 135,520

Minus Develop Reg. Guide (160 hrs+320 contractor hrs) x \$88.00/hour = (\$ 42,240)

Savings to NRC = **\$ 93,280**

Annual Savings

Licensees:

Equip. Mod Savings 2 reactors x \$250,000	= \$ 500,00
Minus Documentation 2 reactors x 300 hours x \$88.00/hour	=(<u>\$ 52,800</u>)
Savings to Licensees	= \$ 447,200
Exemption Requests 3 reactors x 2500 hours x \$88.00/hour	= \$ 660,000
Minus Documentation 3 reactors x 300 hours x \$88.00/hour	=(<u>\$ 79,200</u>)
Savings to Licensees	= \$ 580,800
Total Annual Savings to Licensees (5 reactors)	= \$ 1,028,000

NRC:

Exemption Reviews 3 reactors x 110 hours x \$88.00/hour	= \$ <u>29,040</u>
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Net Present Value Over 30 Years (Including One Time Savings)

With a 7% discount rate	= \$ 16,838,712
With a 3% discount rate	= \$ 24,143,684