



DRAFT REGULATORY GUIDE

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DRAFT REGULATORY GUIDE DG-1139

RISK-INFORMED, PERFORMANCE-BASED FIRE PROTECTION FOR EXISTING LIGHT-WATER NUCLEAR POWER PLANTS

A. INTRODUCTION

This regulatory guide provides guidance for use in complying with the requirements that the U.S. Nuclear Regulatory Commission (NRC) has promulgated for risk-informed, performance-based fire protection programs that meet the requirements of Title 10, Section 50.48(c), of the *Code of Federal Regulations* (10 CFR 50.48(c)) and the referenced 2001 Edition of the National Fire Protection Association (NFPA) standard, NFPA 805, "Performance-Based Standard for Fire Protection for Light-Water Reactor Electric Generating Stations."

In accordance with 10 CFR 50.48(a), each operating nuclear power plant must have a fire protection plan that satisfies General Design Criterion (GDC) 3, "Fire Protection," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." In addition, before the adoption of 10 CFR 50.48(c), plants that were licensed to operate before January 1, 1979, needed to meet the requirements of Appendix R, "Fire Protection Program for Nuclear Power Facilities Operation Prior to January 1, 1979," to 10 CFR Part 50, as stated in 10 CFR 50.48(b). Plants licensed to operate after January 1, 1979, were required to comply with 10 CFR 50.48(a), as well as any plant-specific fire protection license condition and technical specifications.

Title 10, Section 50.48(c), of the *Code of Federal Regulations* incorporates NFPA 805 by reference, with certain exceptions, and allows licensees to voluntarily adopt and maintain a

This regulatory guide is being issued in draft form to involve the public in the early stages of the development of a regulatory position in this area. It has not received staff review or approval and does not represent an official NRC staff position.

Public comments are being solicited on this draft guide (including any implementation schedule) and its associated regulatory analysis or value/impact statement. Comments should be accompanied by appropriate supporting data. Written comments may be submitted to the Rules and Directives Branch, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Comments may be submitted electronically through the NRC's interactive rulemaking Web page at <http://www.nrc.gov/what-we-do/regulatory/rulemaking.html>. Copies of comments received may be examined at the NRC Public Document Room, 11555 Rockville Pike, Rockville, MD. Comments will be most helpful if received by **December 15, 2004**.

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fire protection program that meets the requirements of NFPA 805 as an alternative to meeting the requirements of 10 CFR 50.48(b) or the plant-specific fire protection license conditions. Licensees who choose to comply with NFPA 805 must submit an application for license amendment to the NRC, in accordance with 10 CFR 50.90. Title 10, Section 50.48(c)(3), of the *Code of Federal Regulations* describes the required content of the application.

The Nuclear Energy Institute (NEI) developed NEI 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)," Revision F, dated July 2004, to assist licensees in adopting NFPA 805 and making the transition from their current fire protection licensing basis to one based on NFPA 805. This regulatory guide endorses NEI 04-02, Revision F, because it provides acceptable methods for implementing NFPA 805 and complying with 10 CFR 50.48(c), subject to the additional positions contained in Section C of this regulatory guide and the approval authority NFPA 805 grants to the authority having jurisdiction (AHJ). The NRC is the AHJ for nuclear power plant fire protection programs.

This draft regulatory guide endorses NEI 04-02, Revision F, with some exceptions and clarifications. The clarifications are necessary to address several key issues that are not fully addressed in Revision F of NEI 04-02. Following issuance of this draft regulatory guide for public comment, the staff plans to address the public comments, discuss their resolutions with NEI, and other interested members of the public, and convey the final comment resolutions to NEI. NEI plans to incorporate these comment resolutions, as well as NRC exceptions and clarifications, in Revision 0 of NEI 04-02. The staff plans to endorse Revision 0 of NEI 04-02 in the final regulatory guide.

Regulatory guides are issued to describe to the public methods that the NRC staff considers acceptable for use in implementing specific parts of the agency's regulations, to explain techniques that the staff uses in evaluating specific problems or postulated accidents, and to provide guidance to applicants. Regulatory guides are not substitutes for regulations, and compliance with regulatory guides is not required. Regulatory guides are issued in draft form to solicit public comment and involve the public in developing the agency's regulatory positions. Draft regulatory guides have not received complete staff review; therefore, they do not represent official NRC staff positions.

The information collections contained in this regulatory guide are covered by the requirements of 10 CFR Part 50, which were approved by the Office of Management and Budget (OMB) approval number 3150-0011. If an information collection tool does not display a currently valid OMB control number, the NRC may neither conduct nor sponsor, and a person is not required to respond to, the information collection.

B. DISCUSSION

Background

Title 10, Section 50.48(a), of the *Code of Federal Regulations* requires that all operating nuclear power plants implement a fire protection program that satisfies GDC 3 of Appendix A to 10 CFR Part 50. In addition to the requirements of 10 CFR 50.48(a), plants licensed to operate before January 1, 1979, must meet the requirements of Appendix R to 10 CFR Part 50, to the extent described in 10 CFR 50.48(b). Nuclear power plants that were licensed to operate after January 1, 1979, must comply with 10 CFR 50.48(a), as well as any plant-specific fire

protection license conditions and technical specifications. Fire protection license conditions typically reference NRC safety evaluation reports (SERs), which are the products of the staff's initial licensing reviews against either (1) Appendix A to Branch Technical Position (BTP) Auxiliary Power Conversion Systems Branch (APCSB) 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants," and the criteria of certain sections of Appendix R to 10 CFR Part 50; or (2) Section 9.5.1, "Fire Protection Programs," of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (SRP). The SRP closely follows the structure and requirements of Appendix R to 10 CFR Part 50.

The fire protection requirements of GDC 3, Appendix R, the BTP, and the SRP are considered deterministic requirements. The industry and some members of the public have described these requirements as prescriptive and creating unnecessary regulatory burden. The NRC has issued approximately 900 exemptions to the requirements of Appendix R to 10 CFR Part 50, and approved numerous deviations from the licensing requirements for post-1979 plants.

In SECY-98-058, "Development of a Risk-Informed, Performance-Based Regulation for Fire Protection at Nuclear Power Plants," dated March 26, 1998, the staff proposed to the Commission that the staff work with the NFPA and industry to develop a risk-informed, performance-based consensus standard for fire protection at nuclear power plants. This consensus standard could then be endorsed in a future rulemaking as an alternative set of fire protection requirements. In SECY-00-0009, "Rulemaking Plan, Reactor Fire Protection Risk-Informed, Performance-Based Rulemaking," dated January 13, 2000, the NRC staff requested and received Commission approval for proceeding with a rulemaking to permit reactor licensees to adopt NFPA 805 as a voluntary alternative to existing fire protection requirements. On February 9, 2001, the NFPA Standards Council approved the 2001 Edition of NFPA 805 as an American National Standard for performance-based fire protection for light-water nuclear power plants.

Effective July 16, 2004, the Commission amended its fire protection requirements in 10 CFR 50.48 to add 10 CFR 50.48(c), which incorporates the 2001 edition of NFPA 805 by reference, with certain exceptions, and allows licensees to apply for a license amendment to comply with NFPA 805. [See Volume 69, page 33536 of the *Federal Register* (69 FR 33536)]. The NRC cannot adopt future editions of NFPA 805 without rulemaking. However, licensees may request to use specific risk-informed or performance-based alternatives included in future additions of NFPA 805 by submitting a license amendment, in accordance with 10 CFR 50.48(c)(4).

In parallel with the Commission's efforts to promulgate a rule endorsing risk-informed, performance-based fire protection provisions of NFPA 805 and to follow the provisions of the Federal Advisory Committee Act which are designed to encourage the public and industry to have more meaningful involvement in the regulatory process, NEI worked with industry and the staff to develop implementing guidance for the specific provisions of NFPA 805 and the rule. The NEI published such guidance in NEI 04-02, Revision F, in July 2004. This regulatory guide provides the NRC's position on NEI 04-02 and offers additional information and guidance to supplement the NEI document and assist the licensees in meeting the Commission's requirements.

Fire Protection Program Transition

The staff endorses a “safe-today, safe-tomorrow” approach for plants that transition to a risk-informed, performance-based fire protection program in accordance with 10 CFR 50.48(c). With this approach the staff does not require licensees to re-assess the acceptability of license amendments, exemptions or deviations that have been previously approved by the NRC for the plant. However, a minimal review should be performed to ensure that the conditions described in the original exemption or amendment request are still relevant and representative of the current plant operations and configuration. The overall objective of this approach is to enable licensees to transition to a risk-informed, performance-based fire protection program without undue burden, while enhancing plant safety and providing a clear licensing basis.

To enhance plant safety, licensees are encouraged to disposition any noncompliances identified by the licensee during the transition process. To accommodate licensees during this transition period while they evaluate the implication of 10 CFR 50.48(c) and the original licensing basis remains in effect, the NRC will grant, under specific circumstances, enforcement discretion for issues identified by the licensee during the transition, unless they are highly risk-significant (i.e., greater than 1×10^{-4} /year in core damage frequency increase).

As discussed in the background information above, licensees must submit an application for license amendment to change their fire protection licensing basis to adopt 10 CFR 50.48(c) and NFPA 805. As stated in 10 CFR 50.48(c)(3)(ii), the licensee must implement the methodology in Chapter 2 of NFPA 805 and modify the fire protection program required by 10 CFR 50.48(a) to reflect compliance with NFPA 805 before changing its current program or modifying the plant. The rule does not require the licensee to submit the revised fire protection program for NRC review or approval. The NRC will evaluate the licensee’s compliance with NFPA 805 as part of the normal reactor oversight process (ROP).

The NFPA 805 standard is structured to allow licensees to transition much, if not all, of their existing programs, with modification to address additional or new elements of NFPA 805 that are not addressed by current regulations. Licensees need to address the basic elements of NFPA 805 as they transition their fire protection programs from the current licensing basis to one based on NFPA 805. These elements include (1) the nuclear safety performance criteria that must be met for all modes of operation, (2) the radioactive material release performance criteria that must be met, (3) compliance with the fundamental fire protection program and design elements, and (4) the specific documentation, quality, and configuration management provisions of the NFPA standard that must be met. The NEI implementation guide, NEI 04-02, and the positions contained in this regulatory guide present guidance to assist the licensee in this transition.

Title 10, Section 50.48(c), of the *Code of Federal Regulations* does not include specific schedule requirements for implementing a fire protection program meeting the provisions of NFPA 805. However, licensees who wish to take advantage of the Commission’s interim enforcement discretion policy for fire protection will need to establish an implementation schedule consistent with the enforcement policy.

Transition Identified Noncompliance and Interim Enforcement Discretion Policy

The NRC report, NUREG-1600, “General Statement of Policy and Procedure for NRC Enforcement Actions,” updated on August 13, 2004, describes the Commission’s general enforcement policy. In SECY-04-0050, “Final Rule: Revision of 10 CFR 50.48 to Allow Performance-Based Approaches Using National Fire Protection Association (NFPA) Standard 805 (NFPA 805), ‘Performance-Based Standard for Fire Protection for Light-Water Reactor

Electric Generating Plants,' 2001 Edition," the NRC staff requested that the Commission approve, for public notice, an interim enforcement policy for licensees that adopt NFPA 805, in accordance with 10 CFR 50.48(c). The SECY paper provides the underlying basis and criteria for enforcement discretion. The Commission approved and published the interim enforcement policy in the *Federal Register* on June 16, 2004 (see 69 FR 33684). The most current enforcement policy and the interim enforcement policy on discretion may be found at <http://www.nrc.gov/what-we-do/regulatory/enforcement/enforce-pol.html>.

The enforcement discretion begins upon receipt of a letter of intent from the licensee stating its intention to adopt NFPA 805 and providing a schedule for completion of the plant assessment. The enforcement discretion period would be in effect for up to 2 years, and if the licensee submits a license amendment request, would continue until the NRC completes its approval of the amendment request, which could potentially extend beyond the 2-year period. In addition, for licensees that submit a letter of intent within 6 months¹ of the effective date of 10 CFR 50.48(c), enforcement discretion would be applied to cover corrective action implementation for certain existing and identified noncompliances, until the licensee completes its transition to 10 CFR 50.48(c).

For those plants that submit a letter of intent, but subsequently decide not to complete the transition to NFPA 805, the enforcement policy requires the licensee to inform the NRC of this decision and withdraw its letter of intent. Any violations that are identified and corrected before the date of the letter would be unaffected by the withdrawal. The staff will consider the continuation of enforcement discretion for violations that are identified before the withdrawal on a case-by-case basis to ensure that timely corrective actions are taken commensurate with the safety significance of the issue. Any violations occurring after withdrawal of the letter of intent would be dispositioned in accordance with normal enforcement practices.

Fire Protection Program Changes

Prior to the promulgation of 10 CFR 50.48(c) and NFPA 805, plants typically have adopted a standard fire protection license condition. Under this condition, the licensee can only make changes to the approved fire protection program, without prior Commission approval, if the changes would not adversely affect the plant's ability to achieve and maintain safe shutdown in the event of a fire. This license condition is no longer applicable for plants that adopt NFPA 805 and complete the transition to the new NFPA 805-based license conditions. The NFPA 805 standard contains separate requirements for evaluating changes to the program. See Regulatory Position 2.2 for an acceptable fire protection license condition for plants adopting NFPA 805.

Appendices to NFPA 805

The appendices to NFPA 805 provide additional information and clarification related to the requirements in the standard (Appendix A), guidance on the performance of nuclear safety analyses (Appendix B), guidance on the application of fire modeling (Appendix C), and guidance on the use of probabilistic safety assessment (PSA) in NFPA 805 applications (Appendix D). Appendix E to NFPA 805 provides guidance on plant damage and business interruption that is outside the scope of 10 CFR 50.48(c) and this regulatory guide.

¹ The NRC is currently considering a request (ADAMS Accession #ML04010132), which NEI submitted for an 18-month extension.

As discussed in the Statements of Consideration for the proposed rulemaking (see 67 FR 66578), and restated in the comment resolution for the final rulemaking that amended 10 CFR 50.48 to incorporate NFPA 805 by reference (see 69 FR 33536), the appendices to NFPA 805 are not considered part of the rule. However, Appendices A, B, C, and D provide useful information for implementing the requirements of NFPA 805. The staff finds the specific guidance contained within the appendices to be acceptable to the extent that this guidance is endorsed within the positions contained in Section C of this regulatory guide.

C. REGULATORY POSITION

1. NEI 04-02

The guidance in NEI 04-02 provides methods acceptable to the staff for adopting a fire protection program consistent with the 2001 edition of NFPA 805, subject to the regulatory positions contained herein.

The NRC's endorsement of NEI 04-02 excludes Section 6.0, which provides guidance for using the methods of NFPA 805 within the existing (non-NFPA 805) fire protection licensing basis. The purpose of NEI 04-02 and this regulatory guide is to provide guidance for implementing a fire protection program that complies with 10 CFR 50.48(c). Neither the regulatory requirements of 10 CFR 50.48(c) nor NFPA 805 include provisions to use the methods and approaches of NFPA 805 within an existing fire protection licensing basis. Conversely, there are also no regulatory prohibitions or limitations on analytical methods used in developing the safety case for license amendments or exemptions, as long as they are technically valid, justified, and defensible as demonstrating adequate protection of the public. In making changes to the existing fire protection program, the licensee should follow the change process allowed under the standard fire protection license condition and should provide the necessary technical basis to support the change, regardless of the methods employed. In addition, the NRC's endorsement of NEI 04-02 does not imply its endorsement of the references cited in NEI 04-02.

2. Transition Process

2.1 Fire Protection Program Noncompliance

The Commission's interim enforcement policy (see 69 FR 33684) provides enforcement discretion policy for fire protection program noncompliances that exist or are identified during the transition to NFPA 805. Sections 2.3.3, 3.5, and 4.2.2 of NEI 04-02 discuss enforcement discretion during transition. For licensees who withdraw from 10 CFR 50.48(c), the staff will consider the continuation of enforcement discretion on a case-by-case basis to ensure that timely corrective actions are taken commensurate with the safety significance of the issue.

2.2 License Change Amendments

Section 4.6.1 of NEI 04-02 provides guidance for submitting license amendment requests to allow the adoption of NFPA 805. As specified in 10 CFR 50.48(c)(3)(i), the license change amendment request to adopt NFPA 805 must identify any license conditions to be revised

or superseded. The following license condition is an acceptable fire protection license condition for plants adopting NFPA 805:

(Name of Licensee) shall implement and maintain a fire protection program that complies with 10 CFR 48(a) and NFPA 805 as endorsed in 10 CFR 50.48(c)(2). The licensee may make changes to the fire protection program without prior approval of the Commission only if those changes are evaluated and determined to be acceptable as provided for in NFPA 805.

2.3 Transition of Previously Approved Fire Protection Program and Design Elements

Section 3.1 of NFPA 805 states that previously approved alternatives to the fundamental fire protection program attributes of NFPA 805, Chapter 3, take precedence over the requirements contained therein. Sections 2.3.1 and 2.3.2 of NEI 04-02 describe the application of this “previous approval” clause.

3. NFPA 805 Fire Protection Program

3.1 NFPA 805 Fire Protection Program Change Evaluation Process

Section 5.3 of NEI 04-02 addresses the evaluation of changes to a licensee’s fire protection program. In addition to addressing change process considerations, Section 5.3 of NEI 04-02, describes methods and tools for evaluating changes to the fire protection program. Regulatory Position 4 describes the NRC staff positions related to these methods and tools. The following regulatory positions are also applicable to the process of evaluating and implementing changes to the fire protection program following completion of the transition to an NFPA 805 license condition.

NEI 04-02 references NEI 02-03, “Guidance for Performing a Regulatory Review of Proposed Changes to the Approved Fire Protection Program,” as providing a generic regulatory review process that may be used to determine if a change to the approved fire protection program can be made without prior NRC approval. The version of NEI 02-03 currently available to the NRC has not been reviewed and endorsed by the NRC for application to a risk-informed performance-based fire protection program.

3.1.1 Configuration Control and Change Screening

The licensee could use 10 CFR 50.59(a)(1) to identify changes that require an evaluation. The licensee should evaluate identified fire protection program impacts before implementing any plant changes.

A licensee may use an appropriate screening process to screen changes that require additional evaluations for fire protection program impacts and demonstrating that NFPA 805 plant change evaluation criteria have been met. An appropriate screening process may include the following types of changes that may be screened:

- plant changes that have been determined not to impact the fire protection program
- changes to elements of the fire protection program that have been determined to be clearly equivalent to existing elements of the fire protection program (e.g., functionally identical or superior replacements of fire protection equipment described in the fire protection program)

- changes to the fire protection program that are clearly insignificant with respect to meeting nuclear safety and radioactive release performance criteria (e.g., descriptive or editorial changes to the fire protection program)

3.1.2 Fire Protection Program Change Evaluations

For changes that have not been screened, the licensee should perform an engineering evaluation to demonstrate the acceptability of the change in terms of the plant change evaluation criteria and compliance with the fire protection requirements of 10 CFR 50.48(a) and NFPA 805, as endorsed in 10 CFR 50.48(c).

The risk evaluation should use the methods and tools described in Regulatory Position 4.3. Section 5.3.2.1 of NEI 04-02 contains a detailed discussion useful in evaluating changes in risk when using quantitative risk assessment methods and tools. The evaluation should demonstrate that adequate defense-in-depth and safety margin will be maintained.

As applicable to the fire protection program change being evaluated, the evaluation should address the following items:

- (a) For changes that impact the protection of plant structures, systems, and components necessary to meet performance criteria in the event of a fire, the evaluation should demonstrate that nuclear safety and radiological release performance criteria will continue to be met considering all relevant plant modes and configurations using, as appropriate for the change being evaluated, the approaches provided in NFPA 805, Chapter 4.

The licensee should demonstrate reasonable assurance that at least one success path necessary to achieve and maintain nuclear safety performance criteria remains free from fire damage, as defined in NFPA 805, Section 1.6.29, considering the effects of the fire and fire suppression activities.

When using fire modeling (see NFPA 805, Section 4.2.4.1) to demonstrate that at least one success path remains free from fire damage, the evaluation should demonstrate that the margin between the maximum expected fire scenario and the limiting fire scenario is sufficiently large to bound any uncertainties in the fire model engineering analysis. Section 2.4.7 of Appendix D to NEI-04-02 contains a detailed discussion that is useful in evaluating the margin between the maximum expected fire scenario and the limiting fire scenario.

- (b) For changes to the fire protection program that involve fundamental program and design elements, the evaluation should address how the change affects compliance with the requirements of NFPA 805, Chapter 3.
- (c) Section 5.3.2.1 of NEI 04-02 defines a Region IV that is not included in Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decision on Plant-Specific Changes to the Licensing Basis," Revision 1, dated November 2002, and notes that tracking of changes in Region IV is not required. Although the risk increases that meet the criteria of the NEI 04-02 Region IV do not need to be individually tracked, the plant design changes associated with the Region IV risk increases should be tracked and included in subsequent change evaluations to assess the cumulative risk.

- (d) All change evaluations should include an assessment against the risk acceptance criteria, regardless of whether the change evaluation uses the deterministic approach or the performance-based approach.

3.1.3 Monitoring Fire Protection Program Changes

The licensee should evaluate changes with respect to their impact on the monitoring program required by NFPA 805. This evaluation should address any changes to the monitoring program that are necessary to ensure that the assumptions made in the engineering evaluations for fire protection program changes are maintained and remain valid.

3.1.4 Approval of Fire Protection Program Changes

Changes to the fire protection program that have been screened, as described in Regulatory Position 3.5.1, or evaluated and determined to be acceptable, as described in Regulatory Position 3.5.2, may be implemented following appropriate approval as follows:

- (a) Any changes to the fire protection program that affect fundamental program and design elements (NFPA 805, Chapter 3) and that do not conform to the requirements of NFPA 805, Chapter 3, and that are not addressed by a previously approved fundamental fire protection program and design element (see Regulatory Position 2.3), require NRC approval. The licensee may submit a request for approval to the NRC for such a change to the fire protection program, pursuant to 10 CFR 50.48(c)(2)(vii) and 10 CFR 50.90 or 10 CFR 50.12, using the licensee's license amendment or exemption request process, as appropriate.
- (b) The following changes to the fire protection program that deviate from the requirements of 10 CFR 50.48(c), other than fundamental program and design elements, require NRC approval:
- changes to the fire protection program that do not meet the risk acceptance criteria described in Regulatory Position 3.5.2(a)
 - changes that have been evaluated using performance-based methods other than those described in Regulatory Position 4
 - changes that deviate from other specific NFPA 805 requirements

The licensee may submit a request for approval to the NRC for such a change to the fire protection program, pursuant to 10 CFR 50.48(c)(4) and 10 CFR 50.90 or 10 CFR 50.12, using the licensee's license amendment or exemption process, as appropriate.

- (c) Changes to the fire protection program that involve, or require conforming changes to, a license condition or the plant's technical specifications require NRC approval. The licensee may submit such a change to the fire protection program to the NRC for approval, pursuant to 10 CFR 50.90, using the licensee's license amendment process.

The licensee may approve changes to the fire protection program that do not require prior NRC approval, in accordance with applicable licensee procedures. The licensee may implement changes to the fire protection program that require prior NRC approval following

NRC issuance of the license amendment, in accordance with 10 CFR 50.90 or granting of an exemption request, in accordance with 10 CFR 50.12.

3.1.5 *Documentation of Changes*

The licensee should document descriptions of changes made to the fire protection program, reasons for the changes, and engineering evaluations related to the changes and retain them until termination of the license, in accordance with 10 CFR 50.48. The licensee should organize its change documentation so that changes can be readily identified and the associated documentation retrieved.

Documentation of evaluations associated with changes to the fire protection program should (1) clearly describe the assumptions, identify the methods, and present the results of the evaluation in a manner that is easily understood and in sufficient detail to allow future review of the entire analyses, and (2) conform to the quality requirements of NFPA 805, Section 2.7.3.

3.2 Fire Protection Program Documentation

Section 2.7.1.2 of NFPA 805 requires a document that contains, at a minimum, fire hazards identification and nuclear safety capability assessment, on a fire area basis, for all fire areas that could affect the nuclear safety or radioactive release performance criteria defined in NFPA 805, Chapter 1. Supporting documentation can be referenced as described in NFPA 805, Section 2.7.1.3. The use of the term “design-basis document,” in the context of Section 2.7.1.2, is considered generic in this application and should not be confused with the plant’s design-basis document program. Program documentation should be adequate to demonstrate compliance with the provisions of NFPA 805. The licensee’s transition report, developed in accordance with the guidelines of NEI 04-02, is an important record of the assessment and transition of the licensee’s fire protection program and it should be incorporated in the document required under NFPA 805, Section 2.7.1.2, or included as a supporting document under NFPA 805, Section 2.7.1.3.

3.3 Radiation Release

Licensees should identify the sources of radioactive materials that could be released during a fire (e.g., wastes, resins, and spent fuel) and evaluate the fire protection provided for these sources and the adequacy of fire response procedures to manage or control radioactive release. Appendix G to NEI 04-02 specifically describes the need to manage potentially contaminated fire suppression runoff. Licensee fire response procedures should also address control or confinement of contaminated smoke and gases.

4. NFPA 805 Analytical Methods and Tools

4.1 General

Engineering analyses and associated methods that the licensee applies to demonstrate compliance with the nuclear safety and radioactive release performance criteria should have the requisite degree of technical and defensible justification, as dictated by the scope and complexity of the specific application. Persons qualified in the specific analytical methods should perform these analyses which should include any necessary verification and validation of methods used in the specific applications.

4.2 Fire Models

Section 2.4.1.2 of NFPA 805 requires that only fire models acceptable to the AHJ (NRC) be used in fire modeling calculations. Further, NFPA 805, Sections 2.4.1.2.2 and 2.4.1.2.3, state that the fire models shall only be applied within their analytical limitations and shall be verified and validated.

To the extent that the NRC finds certain fire models and calculational methods acceptable for use in performance-based analyses, licensees should only need to justify that the models and methods are appropriate for the specific applications. These analyses may use simple hand calculations, the methods of NUREG-1805, "Fire Dynamics Tools (FDT^s) Quantitative Fire Hazard Analysis Methods for the U.S. Nuclear Regulatory Commission Fire Protection Inspection Program," dated October 2004, or more complex computer models, depending on the specific conditions of the scenario being evaluated. Appendix C to NFPA 805 and Appendix D to NEI 04-02 contain detailed discussions that should be useful in evaluating and applying fire models and the associated methods.

The NRC's Office of Nuclear Regulatory Research (RES) and the Electric Power Research Institute (EPRI) are currently developing verification and validation (V&V) documents for specific fire models that will be acceptable, subject to review and approval by the NRC's Office of Nuclear Reactor Regulation, if they are used within the ranges identified in the V&V documents. The specific fire models to be documented include (1) NUREG-1805, "Fire Dynamics Tools (FDT^s)," (2) Fire-Induced Vulnerability Evaluation (FIVE), Revision 1, (3) the National Institute of Standards and Technology (NIST) Consolidated Model of Fire Growth and Smoke Transport (CFAST), (4) the Electricité de France (EdF) MAGIC code, and (5) the NIST Fire Dynamics Simulator (FDS). The NRC plans to revise this regulatory guide in the future to endorse the specific fire models cited above for use in implementing NFPA 805, and will identify the limitations and constraints for such applications.

Licensees may propose the use of fire models that have not been specifically approved by the NRC; however, verification and validation of the fire models are the responsibility of the licensee and subject to NRC review and approval, in accordance with 10 CFR 50.48(c)(4). Any fire model applied to the change evaluation process should conform to NFPA 805 requirements, and the licensee should verify that the applied model meets those requirements.

4.3 Fire Probabilistic Safety Assessment/Risk Analysis

Section 2.4.3.3 of NFPA 805 requires that the probabilistic safety assessment approach, methods, and data be acceptable to the AHJ. Methods previously reviewed by the NRC for the fire PSA should continue to be acceptable when used within the appropriate bounds and limitations of the particular method. To the extent that the NRC finds certain PSA methods acceptable for use in meeting NFPA 805 requirements, licensees should only need to justify the methods that are appropriate for the specific applications. These analyses may use screening methods or more complex quantitative PSA methods, depending on the specific conditions of the scenario being evaluated. Appendix D to NFPA 805 provides useful information for implementing the requirements of NFPA 805; specific guidance contained within this appendix is acceptable to the staff for the use and application of PSA, when applied in accordance with the positions presented in Section C of this regulatory guide.

When licensees choose to rely on information in an internal events-based PSA/probabilistic risk assessment (PRA) model to quantify risk associated with fires, they should review the analysis to ensure that the model addresses applicable NFPA 805 requirements, including the engineering analysis requirements of NFPA 805, Section 2.4.2. Section D.3.4 of Appendix D to NFPA 805 provides useful guidance regarding fire-specific issues that should be addressed when applying internal events-based analyses to the assessment of risk from fires. Based on the review, the licensee should modify its internal events-based PSA/PRA model, as necessary, to meet applicable NFPA 805 requirements. It should be noted that the conditional core damage probability demonstrated by a plant's individual plant examination of external events (IPEEE), or the internal events PRA model supporting the plant's IPEEE, may be conservative since, in some cases, credit may not be taken for potential safe shutdown/core damage avoidance paths beyond Appendix R.

Where licensees choose to rely on past fire protection PSA (e.g., IPEEE for fires), the licensees should review these past analyses to determine their continued applicability and adequacy (e.g., inputs, assumptions, data) in meeting the NFPA 805 requirements. Licensees may reconsider scenarios previously screened from analysis, if changes associated with NFPA 805 implementation or compliance alter the scope of the original analysis or the screening conclusions. One should note that some detailed fire PRAs implicitly model failure of fire detectors and manual/automatic suppression per fire area and scenario when assigning the fire initiation frequency to that particular scenario. If so, any "modification factor," typically called a "severity factor" and employed to compensate for the fire initiation frequency not implicitly accounting for detection or suppression, should not include considerations of these to avoid any non-conservative double-counting.

The NRC is currently developing additional guidance for application of risk analysis in support of NFPA 805 implementation. The NRC plans to revise this regulatory guide in the future to endorse the specific risk assessment methods for use in implementing NFPA 805.

4.4 Circuit Analysis

Section 2.4.2.2 of NFPA 805 dictates that the licensee identify circuits required for the nuclear safety functions.

Section 2.4.2.4 of NFPA 805 requires that licensees perform an engineering analysis to determine the effects of fire or fire suppression activities on the circuits identified according to Section 2.4.2.2 of NFPA 805 to demonstrate the plant's ability to achieve the nuclear safety performance criteria of NFPA 805, Section 1.5. Chapter 4 of NFPA 805 provides acceptable methods for determining the fire protection systems and features required to meet the performance criteria.

Appendix B to NFPA 805 describes an acceptable approach for identifying the circuits required for nuclear safety functions. The nuclear safety circuit analysis performed in accordance with Section B.3.2 of Appendix B to NFPA 805 should include consideration of possible equipment damage and the inability to restore equipment operability caused by spurious actuation, in accordance with the guidance provided in NRC Information Notice (IN) 92-18, "Potential for Loss of Remote Shutdown Capability During a Control Room Fire," dated February 2002 and Regulatory Guide 1.106, "Thermal Overload Protection for Electric Motors on Motor-Operated Valves," dated November 1975.

In addition, NEI 00-01, Revision 0, "Guidance for Post-Fire Safe-Shutdown Analysis," dated May 2003, provides guidance for circuit analysis. The Commission has evaluated the guidance for circuit analyses provided by NEI 00-01 and plans to endorse this guidance once it is revised to address NRC comments. The NRC will provide the results of that evaluation in a future generic communication.

D. IMPLEMENTATION

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

Except in those cases in which a licensee proposes or has previously established an acceptable alternative method for complying with specified portions of the NRC's regulations, the NRC staff will use the methods described in this guide to evaluate licensee compliance with the requirements of 10 CFR 50.48(c).

Regulatory Analysis

The NRC staff did not prepare a separate regulatory analysis for this regulatory guide. The regulatory basis for this guide is the regulatory analysis prepared for the amendments to 10 CFR Part 50, "Voluntary Fire Protection Requirements for Light-Water Reactors; Adoption of NFPA 805 as a Risk-Informed, Performance-Based Alternative," issued on June 16, 2004 (see 69 FR 33536), which examines the costs and benefits of the rule as implemented by this guide. A copy of this regulatory analysis is available for inspection and may be copied for a fee at the NRC's Public Document Room located at One White Flint North, 11555 Rockville Pike, Room O1-F15, Rockville, Maryland.

Backfit Analysis

As stated in the backfit analysis for the rulemaking (see 69 FR 33536), the rulemaking does not involve a backfit because it does not impose new regulatory requirements. Further, the adoption of NFPA 805 by a licensee is voluntary. Similar to the rule, this regulatory guide does not involve a backfit because it does not impose requirements on the licensees.

REFERENCES

- BTP APCS 9.5-1**, "Guidelines for Fire Protection for Nuclear Power Plants," Branch Technical Position, Auxiliary Power Conversion Systems Branch, U.S. Nuclear Regulatory Commission, May 1, 1976.
- GL 86-10**, "Implementation of Fire Protection Requirements," Generic Letter, U.S. Nuclear Regulatory Commission, April 24, 1986.
- IN 92-18**, "Potential for Loss of Remote Shutdown Capability During a Control Room Fire," Information Notice, U.S. Nuclear Regulatory Commission, February 1992.
- NEI 00-01**, "Guidance for Post-Fire Safe-Shutdown Analysis," Revision 0, Nuclear Energy Institute, May 2003.
- NEI 04-02**, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)," Revision F, Nuclear Energy Institute, July 2004.
- NFPA 805**, "Performance-Based Standard for Fire Protection for Light-Water Reactor Electric Generating Stations," 2001 Edition, National Fire Protection Association, Quincy, MA.
- NUREG-0800**, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Section 9.5.1, "Fire Protection Program," October 2003.
- NUREG-1600**, "General Statement of Policy and Procedure for NRC Enforcement Actions," May 1, 2000.
- NUREG-1778**, "Knowledge Base for Post-Fire Safe-Shutdown Analysis," Draft for Comment, January 2004.
- NUREG-1805**, "Fire Dynamics Tools (FDT^s) Quantitative Fire Hazard Analysis Methods for the U.S. Nuclear Regulatory Commission Fire Protection Inspection Program," Draft Report for Comment, Volumes 1 and 2, June 2003.
- Regulatory Guide 1.106**, "Thermal Overload Protection for Electric Motors on Motor-Operated Valves," November 1975.
- Regulatory Guide 1.174**, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decision on Plant-Specific Changes to the Licensing Basis," Revision 1, November 2002.
- Regulatory Guide 1.189**, "Fire Protection for Operating Nuclear Power Plants," April 2001.
- RIS 2004-03**, "NRC Regulatory Issue Summary 2004-03: Risk-Informed Approach for Post-Fire Safe-Shutdown Associated Circuit Inspections," March 2, 2004.
- SECY-98-058**, "Development of a Risk-Informed, Performance-Based Regulation for Fire Protection at Nuclear Power Plants," March 26, 1998.

SECY-00-0009, “Rulemaking Plan, Reactor Fire Protection Risk-Informed, Performance-Based Rulemaking,” January 15, 2000.

SECY-02-132, “Proposed Rule: Revision of 10 CFR 50.48 to Permit Light-Water Reactors to Voluntarily Adopt National Fire Protection Association (NFPA) Standard 805, ‘Performance-Based Standard for Fire Protection for Light-Water Reactor Electric Generating Plants,’ 2001 Edition (NFPA 805), as an Alternative Set of Risk-Informed, Performance-Based Fire Protection Requirements,” July 15, 2002.

SECY-04-0050, “Final Rule: Revision of 10 CFR 50.48 to Allow Performance-Based Approaches Using National Fire Protection Association (NFPA) Standard 805 (NFPA 805), ‘Performance-Based Standard for Fire Protection for Light-Water Reactor Electric Generating Plants,’ 2001 Edition,” March 29, 2004.

U.S. Code of Federal Regulations, Title 10, *Energy*, Part 50, “Domestic Licensing of Production and Utilization Facilities.”

U.S. Code of Federal Regulations, Appendix A, “General Design Criteria for Nuclear Power Plants,” to Title 10, Part 50, of the *U.S. Code of Federal Regulations*.

U.S. Code of Federal Regulations, Appendix R, “Fire Protection Program for Nuclear Power Facilities Operation Prior to January 1, 1979,” to Title 10, Part 50, of the *U.S. Code of Federal Regulations*.

U.S. Code of Federal Regulations, Title 10, Section 50.48, “Fire Protection.”

U.S. Nuclear Regulatory Commission, “Voluntary Fire Protection Requirements for Light-Water Reactors; Adoption of NFPA 805 as a Risk-Informed, Performance-Based Alternative,” Proposed Rule, *Federal Register*, Vol. 67, No. 212, November 1, 2002, pp. 66578–66588.

U.S. Nuclear Regulatory Commission, “Voluntary Fire Protection Requirement for Light-Water Reactors; Adoption of NFPA 805 as a Risk-Informed, Performance-Based Alternative,” Final Rule, *Federal Register*, Vol. 69, No. 115, June 16, 2004, pp. 33536–33551.

U.S. Nuclear Regulatory Commission, “NRC Enforcement Policy,” Policy Statement: Revision, *Federal Register*, Vol. 69, No. 115, June 16, 2004, pp. 33684–33685.

GLOSSARY

NFPA 805, Section 1.6, contains definitions applicable to terminology used in the standard. Regulatory Guide 1.189 also contains a substantial list of definitions of fire protection terminology applicable to nuclear power generating stations. Where potential differences or conflicts exist between definitions in NFPA 805 and other fire protection regulatory documents, and where these definitions are important to the licensing basis, the licensee’s documentation should clearly identify the definition that is being applied.