



REGULATORY GUIDE

OFFICE OF NUCLEAR REGULATORY RESEARCH

REGULATORY GUIDE 1.205

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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 Plants."

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, plants that were licensed to operate before January 1, 1979, must meet the requirements of 10 CFR Part 50, Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979," except to the extent provided for in 10 CFR 50.48(b). Plants licensed to operate after January 1, 1979, are required to comply with 10 CFR 50.48(a), as well as any plant-specific fire protection license condition and technical specifications.

Section 50.48(c), which the Commission adopted in 2004 (69 FR 33536, June 16, 2004), incorporates NFPA 805 by reference, with certain exceptions, and allows licensees to voluntarily adopt and maintain a 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 10 CFR 50.48(c) must submit a license amendment application to the NRC, in accordance with 10 CFR 50.90. Section 50.48(c)(3) describes the required content of the application.

The U.S. Nuclear Regulatory Commission (NRC) issues regulatory guides to describe and make available to the public methods that the NRC staff considers acceptable for use in implementing specific parts of the agency's regulations, techniques that the staff uses in evaluating specific problems or postulated accidents, and data that the staff need in reviewing applications for permits and licenses. Regulatory guides are not substitutes for regulations, and compliance with them is not required. Methods and solutions that differ from those set forth in regulatory guides will be deemed acceptable if they provide a basis for the findings required for the issuance or continuance of a permit or license by the Commission.

This guide was issued after consideration of comments received from the public. The NRC staff encourages and welcomes comments and suggestions in connection with improvements to published regulatory guides, as well as items for inclusion in regulatory guides that are currently being developed. The NRC staff will revise existing guides, as appropriate, to accommodate comments and to reflect new information or experience. Written comments may be submitted to the Rules and Directives Branch, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

Regulatory guides are issued in 10 broad divisions: 1, Power Reactors; 2, Research and Test Reactors; 3, Fuels and Materials Facilities; 4, Environmental and Siting; 5, Materials and Plant Protection; 6, Products; 7, Transportation; 8, Occupational Health; 9, Antitrust and Financial Review; and 10, General.

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Plants (including those licensed after January 1, 1979) that do not adopt an NFPA 805 performance-based fire protection program, but use a risk calculation approach to evaluate plant changes that affect the fire protection program, must submit a license amendment application for those changes in accordance with 10 CFR 50.90. Pending NRC review and approval of the licensee's performance-based methods, the staff cannot accept that these methods will adequately demonstrate that a change "would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire."

The Nuclear Energy Institute (NEI) has developed NEI 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)," Revision 1, dated September 2005, to assist licensees in adopting 10 CFR 50.48(c) and making the transition from their current fire protection program (FPP) to one based on NFPA 805. This regulatory guide endorses NEI 04-02, Revision 1, because it provides methods acceptable to the NRC for implementing NFPA 805 and complying with 10 CFR 50.48(c), subject to the additional regulatory positions contained in Section C of this regulatory guide. The regulatory positions in Section C, below, include clarification of the guidance provided in NEI 04-02, as well as any NRC exceptions to the guidance. The regulatory positions in Section C take precedence over the NEI 04-02 guidance.

All references to NEI 04-02 in this regulatory guide refer to Revision 1 of that NEI guidance document. All references to NFPA 805 in this regulatory guide refer to the 2001 Edition of NFPA 805. Where "NFPA 805" is used in this regulatory guide to describe the FPP, license, etc., of a nuclear power plant, it means that the FPP, license, etc., is in accordance with 10 CFR 50.48(c).

This regulatory guide contains information collections that are covered by the requirements of 10 CFR Part 50 which the Office of Management and Budget (OMB) approved under OMB control number 3150-0011. The NRC may neither conduct nor sponsor, and a person is not required to respond to, an information collection request or requirement unless the requesting document displays a currently valid OMB control number.

B. DISCUSSION

Background

Title 10, Section 50.48(a), of the *Code of Federal Regulations*, requires all operating nuclear power plants to implement an FPP 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 (post-79 plants), 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 in certain sections of Appendix R to 10 CFR Part 50, or (2) Section 9.5.1, "Fire Protection Program," 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, and the guidance provided in the BTP and SRP are considered deterministic. 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 plant-specific exemptions to the requirements of Appendix R.

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 fire protection standard for nuclear power plants. This consensus standard could be endorsed in future rulemaking as an alternative set of fire protection requirements to the existing regulations set forth in 10 CFR 50.48. 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 to proceed 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 by reference the 2001 edition of NFPA 805, with certain exceptions, and allows licensees to apply for a license amendment to comply with NFPA 805 (69 FR 33536). The NRC may incorporate by reference future editions of NFPA 805. However, until the NRC does so, licensees who wish to use specific risk-informed or performance-based alternatives included in future editions of NFPA 805 must submit a license amendment application, 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, NEI worked with the industry and the NRC staff to develop implementing guidance for the specific provisions of NFPA 805 and 10 CFR 50.48(c). The NEI published such guidance in NEI 04-02, Revision 1, in September 2005. This regulatory guide provides the staff's position on NEI 04-02 and offers additional information and guidance to supplement the NEI document and assist licensees in meeting the Commission's requirements.

Interim Enforcement Discretion Policy

The Commission approved and published its interim enforcement discretion policy pertaining to discretion for licensees transitioning to NFPA 805 in the *Federal Register* on June 16, 2004 (see 69 FR 33684). In January 2005, the Commission revised that policy to extend the due date for a licensee to submit a letter stating its intent to adopt NFPA 805 until December 31, 2005 (see 70 FR 2662). In March 2006, the Commission revised the policy again to extend the available enforcement discretion from 2 to 3 years. This revision became effective upon publication in the *Federal Register* on April 18, 2006 (see 71 FR 19905). Additional information on the NRC enforcement policies can be found at <http://www.nrc.gov/what-we-do/regulatory/enforcement/enforce-pol.html>.

Fire Protection Program Changes

Prior to the promulgation of 10 CFR 50.48(c), plants typically adopted a standard fire protection license condition. Under this condition, the licensee can only make changes to the approved FPP, without prior Commission approval, if the changes do not adversely affect the plant's ability to achieve and maintain safe shutdown in the event of a fire. A new fire protection license condition, which will be imposed for licensees choosing to adopt NFPA 805, will define the bases for making changes to the approved NFPA 805 FPP without prior NRC approval. The NFPA 805 standard contains specific requirements for evaluating changes to the program. See Regulatory Position 3.1 in Section C of this regulatory guide for an acceptable fire protection license condition for plants adopting NFPA 805.

Appendices to NFPA 805

As discussed in the Statements of Considerations for the final rulemaking, which incorporated by reference NFPA 805 (69 FR 33536), the appendices to NFPA 805 are not considered part of the rule. However, Appendices A–D provide useful information for implementing the requirements of NFPA 805. The staff finds the specific guidance contained in those appendices to be acceptable to the extent that the guidance is specifically endorsed within the positions contained in Section C of this regulatory guide.

Fire Probabilistic Safety Assessment

Although a licensee may transition to an NFPA 805-based FPP without a fire probabilistic safety assessment (PSA)¹ model, the NRC anticipates that licensees will develop a plant-specific fire PSA for this purpose. The NRC recommends that licensees adopting an NFPA 805 license develop a plant-specific fire PSA as an integral part of their transition process. Without a fire PSA, licensees will not realize the full safety and cost benefits of transitioning to NFPA 805.

The NRC may revise this regulatory guide in the future to endorse, to the extent practical, specific risk assessment methods for use in implementing NFPA 805 and to provide additional guidance on PSA quality. That guidance may be based on updates to Regulatory Guide 1.200, the final ANS Fire PRA Standard, and the knowledge gained during the pilot programs planned for the first two plants that adopt a performance-based FPP in accordance with 10 CFR 50.48(c).

¹ The NRC considers probabilistic safety analysis (PSA) and probabilistic risk analysis (PRA) to be synonymous. PSA will be used in this regulatory guide. The term “fire PSA,” as used in this regulatory guide, encompasses all levels and types of PSAs, including pre-NUREG/CR-6850-based fire PSAs, fire individual plant examinations of external events (IPEEs), and enhanced internal events PSAs.

C. REGULATORY POSITION

1. NEI 04-02

This regulatory guide endorses the guidance of NEI 04-02, Revision 1, which provides methods acceptable to the staff for adopting an FPP consistent with the 2001 edition of NFPA 805 and 10 CFR 50.48(c), subject to the regulatory positions and exceptions contained herein. Future revisions of NEI 04-02 may be evaluated by the NRC, and acceptable revisions will be endorsed in accordance with the appropriate regulatory process.

NEI 04-02 provides the majority of the guidance applicable to implementing the regulatory requirements of 10 CFR 50.48(c) and NFPA 805. The guidance included in this regulatory guide is provided to emphasize certain issues; clarify the requirements of 10 CFR 50.48(c) and NFPA 805; clarify the guidance in NEI 04-02; and modify the NEI 04-02 guidance where required. Should a conflict occur between NEI 04-02 and this regulatory guide, the regulatory guide governs.

Since the purpose of this regulatory guide is to provide guidance for implementing the requirements of 10 CFR 50.48(c) and NFPA 805, the NRC's endorsement of NEI 04-02 excludes Section 6.0, "Implementing Guidance for Use of Tools and Processes Within Existing Licensing Basis," which provides guidance for using the risk-informed methods of NFPA 805 without adopting an NFPA 805 license.

In addition, the NRC's endorsement of NEI 04-02 does not imply the NRC's endorsement of the references cited in NEI 04-02. The guidance provided by these references has not necessarily been reviewed and approved by the NRC, except where specifically noted in this regulatory guide.

NEI 04-02, Appendix D, "Fire Modeling," and NFPA 805, Appendix C, "Application of Fire Modeling in Nuclear Power Plant Fire Hazard Assessments," contain detailed discussions that are useful in determining which fire models to use and in applying those fire models within their limitations. However, the NRC only endorses these appendices to the extent described in Regulatory Position 4.2. Analyses performed by licensees using the information in these appendices should include adequate technical justification for methodologies and data, as appropriate.

NFPA 805 refers to "the authority having jurisdiction (AHJ)" The NRC is the AHJ for purposes of nuclear health and safety and common defense and security.

2. License Transition Process

2.1 General

Neither 10 CFR 50.48(c) nor NEI 04-02 mandates a specific schedule for implementing an FPP that meets 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.

2.2 License Amendment Request

Section 4.6.1 of NEI 04-02 provides a list of key items that should be included in the license amendment request. In addition to the items listed in NEI 04-02, the submittal should include a description of all FPP changes, as defined in Regulatory Position 3.2.1, that are to be included in the transition to the NFPA 805 license.

Certain aspects of the plant's FPP may not have been specifically approved by the NRC (e.g., through an approved 10 CFR 50.12 exemption request). This has resulted in uncertainty in licensees' fire protection licensing bases. Licensees may elect to submit uncertain elements of their plant's FPP, such as the crediting of operator manual actions and circuit analysis methods, in order to obtain explicit approval of these elements under 10 CFR 50.48(c). NEI 04-02 provides guidance on elements of the FPP that licensees may want to address in the license amendment request for this purpose. The submittals addressing these FPP elements should include sufficient detail to allow the NRC to adequately assess whether the licensee's treatment of these elements meets 10 CFR 50.48(c) requirements.

10 CFR 50.48(c)(2)(vii) allows a licensee to request NRC approval (by license amendment) of the use of NFPA 805 performance-based methods in determining the licensee's compliance with the fire protection program elements and minimum design requirements in Chapter 3 of NFPA 805. 10 CFR 50.48(c)(4), allows a licensee to request NRC approval (by license amendment) of the use of alternative risk-informed or performance-based methods (i.e., methods that differ from those prescribed by NFPA 805) to demonstrate compliance with 10 CFR 50.48(c). Regulatory Position 3.2.3 provides guidance for including such requests in the license amendment request for transitioning to NFPA 805.

The total risk increase associated with all FPP noncompliances (based on current deterministic FPP regulations) that the licensee does not intend to bring into compliance and the total risk change associated with plant changes planned for the transition to NFPA 805 should be estimated and reported in the license amendment request. The baseline FPP risk for the estimate of the net risk change is that for a plant that is fully compliant with the current deterministic regulations for the FPP, including NRC-approved exemptions/deviations. The risk increase may be combined with risk decreases associated with retaining or making changes to fire protection features (fire protection systems and procedures relied upon to meet FPP nuclear safety and radioactive release performance criteria) not required by NFPA 805 when estimating the total risk change to be reported in the license amendment request.

Systems and features not required by NFPA 805 but credited in the risk assessment to meet NFPA 805 performance criteria should be included in the FPP monitoring program. The total change in risk associated with the transition to NFPA 805 should be consistent with the acceptance guidelines in Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis."

Upon completing the transition to an NFPA 805 licensing basis, the baseline FPP risk will be the risk of the plant as-designed and operated according to the NRC-approved FPP licensing basis.

2.3 Existing Engineering Equivalency Evaluations

Section 2.2.7 of NFPA 805 describes the application of existing engineering equivalency evaluations (EEEEEs) when using a deterministic approach during the transition to an NFPA 805 FPP. One type of EEEEE, commonly referred to as a "Generic Letter 86-10 (GL 86-10) evaluation," allows licensees who have adopted the standard fire protection license condition (under their current FPP and in accordance with GL 86-10) to make changes to the approved FPP without prior NRC approval if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire. With the exception of evaluations of certain recovery actions and any deviations from NFPA 805 requirements, a GL 86-10 evaluation showing no adverse effect on safe shutdown and permitted under the licensee's current licensing basis is one acceptable means of meeting the NFPA 805 EEEEE acceptance criterion of "an equivalent level of fire protection compared to the deterministic requirements." However, EEEEEEs performed prior to transitioning to a performance-based FPP must be based on deterministic methods. If based on a risk calculation, the EEEEE will have to be evaluated using the licensee's approved NFPA 805 change evaluation process.

Operator manual actions credited for protection of redundant trains, in lieu of Appendix R III.G.2 protection, do not meet the deterministic requirements in Chapter 4 of NFPA 805. Consequently, unless specifically approved by the NRC, these operator manual actions should be addressed as plant changes in accordance with Section 2.4.4 of NFPA 805 using performance-based methods. The change process must include an evaluation of the risk impact associated with the operator manual action (either qualitative or quantitative), as appropriate. Quantitative risk calculations should be in accordance with Section 4.2.4.2 of NFPA 805 (a bounding calculation approach is acceptable). Recovery actions (NFPA 805 terminology for operator manual actions and repairs) that meet the required performance criteria of NFPA 805 and the criteria in this regulatory guide for making changes without prior NRC review and approval do not need to be submitted to the NRC for approval.

NEI 04-02, Section 4.1.1, "Transition Process Overview," notes that the licensee will review EEEEs during the transition process to ensure the quality level and basis for acceptability are still valid. Except as noted above, satisfactory results from this review will provide adequate basis to transition EEEEs as meeting the deterministic requirements of Chapter 4 of NFPA 805. Guidance for acceptable EEEEs is provided in NUREG-0800, Section 9.5.1, "Fire Protection," and in Regulatory Guide 1.189, "Fire Protection for Operating Nuclear Power Plants."

EEEEs that support deviations from the requirements and methods of NFPA 805 must be submitted for NRC approval in accordance with 10 CFR 50.48(c) and NFPA 805. Regulatory Position 3.2.4 also provides specific guidance regarding submittal requirements. Of the EEEEs that must be approved by the NRC, those that are preexisting and those performed during the transition to an NFPA 805 licensing basis should be submitted with the fire protection license amendment request.

2.4 Documentation of Prior NRC Approval

Chapter 3 of NFPA 805 notes that alternatives to the fundamental FPP attributes of Chapter 3, which were previously approved by the NRC, take precedence over the requirements in Chapter 3. The documentation which demonstrates prior NRC approval of an alternative to Chapter 3 requirements, as well as approval of noncompliances with existing license regulatory requirements, includes NRC approvals of exemption or deviation requests. Inspection reports, meeting minutes, and letters from licensees without a corresponding written NRC approval are examples of documents that do not represent NRC approval for this purpose. Documents listed in NEI 04-02, but not addressed in this regulatory position, do not necessarily represent NRC approval and must be evaluated by the NRC on a case-by-case basis. Changes to the approved FPP that have not been specifically reviewed and approved by the NRC are subject to review through the Reactor Oversight Process.

3. NFPA 805 Fire Protection Program

3.1 Standard License Condition

As specified in 10 CFR 50.48(c)(3)(i), the license amendment request must identify any license conditions to be revised or superceded. 10 CFR 50.48(c) and NFPA 805 identify aspects of a performance-based FPP that must be specifically approved by the NRC (referred to as the AHJ in NFPA 805) via a license amendment. It is the intent of 10 CFR 50.48(c) that certain changes may be made to the FPP without prior NRC review and approval. This intent is reflected in the regulatory analysis for 10 CFR 50.48(c), which states, "Licensees choosing to use the flexibilities provided by the rulemaking could use risk-informed and performance-based approaches and methods in NFPA 805, rather than submitting an exemption or deviation request each time they wish to depart from current requirements."

The NRC intends to provide this flexibility to make changes without prior NRC review and approval for licensees that transition to 10 CFR 50.48(c) by adopting the following fire protection license condition, which includes acceptance criteria for making changes to the licensee's fire protection program without prior NRC review and approval. The application of these risk acceptance criteria requires that the plant have an acceptable fire PSA that is in accordance with the guidance in Regulatory Position 4.3 and has been subjected to a peer or NRC review process assessed against a standard or set of acceptance criteria that is endorsed by the NRC:

(Name of Licensee) shall implement and maintain in effect all provisions of the approved fire protection program that comply with 10 CFR 50.48(a) and 10 CFR 50.48(c) as specified in the licensee amendment request dated _____ and as approved in the safety evaluation report dated _____ (and supplements dated _____). Except where NRC (AHJ) approval for changes or deviations is required by 10 CFR 50.48(c) and NFPA 805, the licensee may make changes to the fire protection program without prior approval of the Commission if those changes satisfy the provisions set forth in 10 CFR 50.48(a), 10 CFR 50.48(c), and the following:

- (a) Prior NRC review and approval is not required for a change that results in a net decrease in risk for both CDF and LERF. The proposed change must also be consistent with the defense-in-depth philosophy and must maintain sufficient safety margins. The change may be implemented following completion of the change evaluation.
- (b) Prior NRC review and approval is not required if the change results in a net calculated risk increase less than $1E-7$ /yr for CDF and less than $1E-8$ /yr for LERF. The proposed change must also be consistent with the defense-in-depth philosophy and must maintain sufficient safety margins. The change may be implemented following completion of the change evaluation. Change reports need not be submitted to the NRC for these changes.
- (c) Where the calculated plant change risk increase is $<1E-6$ /yr, but $\geq 1E-7$ /yr for CDF or $<1E-7$ /yr, but $\geq 1E-8$ /yr for LERF, the licensee must submit a summary description of the change to the NRC following completion of the change evaluation. The proposed change must also be consistent with the defense-in-depth philosophy and must maintain sufficient safety margins. If the NRC does not object to the change within 90 days, the licensee may proceed with implementation of the proposed change.

3.2 NFPA 805 Fire Protection Program Change Evaluation Process

3.2.1 *Definition of a Change*

NFPA 805 includes provisions for licensees to make changes to their approved FPP (once the transition to an NFPA 805 license is complete). In the context of an NFPA 805 FPP that complies with 10 CFR 50.48(c), a change may be any of the following:

- (a) a physical plant modification that affects the FPP
- (b) a programmatic change (e.g., change to a procedure, assumption or analysis) that affects the FPP
- (c) an in situ condition (physical or programmatic) that is an FPP regulatory noncompliance or a fire protection licensing-basis noncompliance, which the licensee does not intend to correct via a plant or programmatic modification

Noncompliances are based on the regulations that were applicable to the licensee prior to the transition to a 10 CFR 50.48(c) FPP. The requirements of 10 CFR 50.48(c) and the guidance provided in this regulatory guide for evaluating changes are applicable regardless of when the noncompliance is identified (during or after the transition to an NFPA 805 license).

For “changes” that involve acceptance of an existing unapproved condition (i.e., a noncompliance), appropriate compensatory measures should be established and should remain in place until the condition is accepted via applicable plant change processes, including the change process in the standard fire protection license condition.

3.2.2 *Fire Protection Program Change Evaluations*

The licensee should perform an engineering evaluation to demonstrate 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. The plant change evaluation process includes an integrated assessment of the acceptability of risk, defense-in-depth (DID), and safety margins, regardless of the methods or approaches used to evaluate the change.

3.2.3 *Deviations from NFPA 805 Chapter 3 Requirements and Alternative Change Evaluation Methodologies*

10 CFR 50.48(c)(2)(vii) allows a licensee to request NRC approval (by license amendment) of the use of NFPA 805 performance-based methods in determining the licensee’s compliance with the fire protection program elements and minimum design requirements in Chapter 3 of NFPA 805. 10 CFR 50.48(c)(4) allows a licensee to request NRC approval (by license amendment) of the use of alternative risk-informed or performance-based methods (i.e., methods that differ from those prescribed by NFPA 805, to demonstrate compliance with 10 CFR 50.48(c).

Performance-based methods, including proposed alternative methods, applied to the licensee’s FPP, including evaluation of changes to the program, must ensure the following:

- (a) The required NFPA 805 performance goals, performance objectives, and performance criteria are satisfied.
- (b) Safety margins are maintained.
- (c) Fire protection defense-in-depth is maintained.

Alternative risk-informed, performance-based methods should be described in a license amendment request and must be approved by the NRC prior to incorporation in the licensee’s FPP. In addition to the guidance in NEI 04-02, Section 2.4, the license amendment request should include, as a minimum, the following:

- (a) detailed description of the alternative risk-informed, performance-based method
- (b) description of how the method will be applied, the aspects of the FPP to which it will be applied, and the circumstances under which it will be applied
- (c) acceptance criteria, including risk increase acceptance criteria, that the licensee will apply when determining whether the results of an evaluation that uses this methodology meet the required NFPA 805 performance goals, performance objectives, and performance criteria
- (d) for PSA-based methodologies, an explanation of how the PSA is of sufficient technical adequacy for evaluation of the changes to which it will be applied
- (e) for PSA-based methodologies, a description of the peer review and how the review findings have been addressed

The license amendment request should include complete and concise details of the proposed methodology to minimize the potential for misinterpretations. Where the alternative methods have been adequately described in the license amendment request and have been accepted by the NRC in an SER, these methods may be applied to the licensee's FPP. A licensee may apply these approved methods within the limits specifically described in the licensing basis to implement plant changes that affect the FPP without prior NRC review and approval.

The types of plant changes that may be approved without prior review and approval will be limited to those for which the risk assessment methods are adequate to demonstrate that any increase in risk will be below the appropriate thresholds. In addition, subsequent changes to the approved alternative methodology must be submitted for NRC review and approval (via a license amendment request) prior to being applied to the licensee's FPP.

3.2.4 *NRC Approval of Fire Protection Program Changes*

The following FPP changes must be submitted for NRC review and approval (via a license amendment request) prior to implementation, except where otherwise permitted by the approved fire protection license condition:

- (a) changes that are alternatives to the fundamental FPP attributes required by Chapter 3 of NFPA 805, which have not previously been approved by the NRC
- (b) changes that do not meet the acceptance criteria of the approved license condition
- (c) changes that have been evaluated using performance-based methods other than those described in Regulatory Position 4, included in NFPA 805, or described in the NRC-approved plant FPP
- (d) changes that involve, or require conforming changes to, a license condition or the plant's technical specifications

Following completion of the licensee's change evaluation, the licensee shall submit the request for approval of the change(s) to the NRC pursuant to 10 CFR 50.48(c) and 10 CFR 50.90. For "changes" that involve acceptance of an existing condition (i.e., a noncompliance), appropriate compensatory measures should be established and should remain in place until the license amendment is approved by the NRC.

3.2.5 *Plant Changes Without Prior NRC Approval*

This regulatory guide provides one acceptable approach for licensees to make FPP changes without prior NRC review and approval. NFPA 805 Section 2.4.4.1, "Risk Acceptance Criteria," notes that the change in public health risk from any plant change shall be acceptable to the AHJ. The risk acceptance criteria for plant changes as provided in the standard license condition in Regulatory Position 3.1 are acceptable to the NRC.

Where permitted by the approved fire protection license condition, plants that have an acceptable fire PSA that is in accordance with the guidance in Regulatory Position 4.3 and has been subjected to a peer review process assessed against a standard or set of acceptance criteria that is endorsed by the NRC, may make changes without prior NRC review and approval based on the criteria in Regulatory Position 3.1.

When comparing the risk impact of a change to the risk thresholds, licensees should use the combined change in risk in accordance with Regulatory Position 3.2.6. The guidance for combining changes, provided in Section 2.1.2 of Regulatory Guide 1.174, is applicable. For changes with a calculated plant change risk increase of $<1E-6/yr$, but $\geq 1E-7/yr$ for core damage frequency (CDF), or $<1E-7/yr$, but $\geq 1E-8/yr$ for large early release frequency (LERF), the licensee must submit a summary description of the change to the NRC following completion of the change evaluation. The proposed change must also be consistent with the DID philosophy and must maintain sufficient safety margins. The summary description required for reporting changes should include the following information:

- summary of the change evaluation
- assumptions
- description of programmatic control elements (e.g., hot work permitting/fire watches and combustibles control) in place that support the analysis
- change (Δ) in CDF/LERF, including the change in individual parameters used to calculate the $\Delta CDF/\Delta LERF$
- effect of the change on safety margin
- effect of the change on defense-in-depth

The change description should be submitted in accordance with 10 CFR 50.4(a) and (b)(1). The submittal should be signed by the responsible officer for the licensee's FPP. If the NRC does not object to the change within 90 calendar days, the licensee may proceed with implementation of the proposed change.

3.2.6 Cumulative Risk of Changes

Section 2.4.4.1 of NFPA 805 requires licensees to evaluate the cumulative effect of plant changes (including all previous changes that have increased risk) on overall risk. Evaluation of the cumulative risks shall be performed in accordance with Section 3.3.2 of Regulatory Guide 1.174.

Section 2.4.4.1 further states that if more than one plant change is combined into a group for the purposes of evaluating acceptable risk, the evaluation of each individual change shall be performed along with the evaluation of combined changes. Following the transition to the NFPA 805 license, the total risk associated with multiple changes should be combined in accordance with Sections 2.1.1 and 2.1.2 of Regulatory Guide 1.174, when evaluating the combined change against the risk thresholds provided in this regulatory guide or the plant's fire protection license condition. For plants using PSA methods, approved changes should be incorporated in the periodic updates of the PSA model. Cumulative risk increase associated with all changes made after the transition is complete does not need to be calculated. Acceptability of total plant risk will be judged according to Regulatory Guide 1.174. Post-transition risk reductions for plant changes that are not related to the FPP may be used to offset risk increases attributable to FPP-related changes in accordance with Section 2.1.2 of RG 1.174, but must be pre-approved by the NRC as required by the standard fire protection license condition. Risk reductions for changes related to the FPP may be used as offsets without pre-approval by the NRC.

In accordance with the definition of a change in Regulatory Position 3.2.1, the licensee is required to track the net risk increase associated with any series of changes related to the same FPP issue, for all FPP changes that affect the same fire area of the plant, or for all FPP changes related to the same fire scenario, as applicable. For example, assume a licensee transitions with an automatically actuated suppression system in a particular area of the plant. Then the licensee subsequently makes two changes to this system at different times, first converting the automatic actuation to manual actuation, and later eliminating the system altogether. When calculating the net risk increase due to eliminating the system, the licensee should calculate the total risk increase from both changes (i.e., the increase in risk between an automatically actuated system and no system) when comparing the risk change to the risk thresholds. This applies no matter how distant in time the changes have been made relative to the date of the transition or to each other, whether or not each was performed prior to different periodic updates of the fire PSA.

3.3 Circuit Analysis

Industry guidance document NEI 00-01, Revision 1, "Guidance for Post-Fire Safe Shutdown Circuit Analysis," used in conjunction with NFPA 805 and this regulatory guide, provides one acceptable approach to circuit analysis for a plant that has transitioned to a 10 CFR 50.48(c) licensing basis. Where the deterministic requirements in Chapter 4 of NFPA 805 cannot be met for the protection of required circuits, circuit analysis assumptions regarding the number of spurious actuations, the manner in which they occur (e.g., sequentially or simultaneously), and the time between spurious actuations should be supported by engineering analysis and/or test results that are accepted by industry and the NRC. Aspects of circuit protection that do not conform to the deterministic requirements in Chapter 4 of NFPA 805 and were not previously approved by the NRC in accordance with Regulatory Position 2.4 may be evaluated using the NFPA 805 plant change process. Those evaluations of nonconformances that adequately demonstrate that the required performance criteria of NFPA 805 are met in accordance with this regulatory guide, do not need to be submitted to the NRC for approval.

Section B.2.1 of NEI 04-02 describes three thresholds that are applicable to the change in risk associated with multiple spurious actuations when performing the post-fire safe-shutdown circuit analysis, including change evaluations. The staff accepts the NEI thresholds for screening ($<1E-8/yr$ for ΔCDF and $<1E-9/yr$ for $\Delta LERF$) and for circuit protection ($<1E-6/yr$ for ΔCDF and $<1E-7/yr$ for $\Delta LERF$). However, for a risk increase $\geq 1E-7/yr$ but $<1E-6/yr$ for CDF, or $\geq 1E-8/yr$ but $<1E-7/yr$ for LERF, the actions required should be in accordance with the standard license condition in Regulatory Position 3.1. Although the NEI 04-02 thresholds assume no credit for recovery actions, the thresholds in the standard license condition may be applied after appropriate credit is given to feasible and reliable recovery actions.

Quantitative risk calculations must use the approach described in Section 4.2.4.2 of NFPA 805 (compare the noncompliance risk to the compliance risk based on the deterministic approach in Section 4.2.3 of NFPA 805). A bounding calculation approach reviewed and approved by the NRC is acceptable. New scenarios resulting from multiple spurious actuations that are identified should be entered into the corrective action program and evaluated for inclusion into the fire protection licensing basis.

The nuclear safety circuit analysis should address possible equipment damage caused by spurious actuation, as well as the inability to restore equipment operability, including the types of failures described in NRC Information Notice (IN) 92-18, "Potential for Loss of Remote Shutdown Capability During a Control Room Fire," dated February 1992, and Regulatory Guide 1.106, "Thermal Overload Protection for Electric Motors on Motor-Operated Valves," dated November 1975. The type of failure described in IN 92-18 is an example of a failure mechanism that may not have been considered during the post-fire safe-shutdown analysis. Protecting against this one type of failure does not preclude the requirement to address other possible fire-induced failure mechanisms.

3.4 Physical Protection and Security Orders

NRC requirements for physical protection of nuclear power plants are set forth in 10 CFR Part 73, “Physical Protection of Plant and Materials.” Those physical protection requirements are further supplemented by various security-related orders (e.g., EA-02-026, “Interim Safeguards and Security Compensatory Measures,” dated February 25, 2002; EA-03-086, “Revised Design-Basis Threat for Operating Power Reactors,” dated April 29, 2003; and other security-related orders for operating reactors, as applicable), advisories, other generic communications, and plant-specific security commitments. Licensees who implement changes to their plants shall ensure that compliance with the physical protection requirements, security orders and subsequent rulemaking, and adherence to commitments applicable to their plant are maintained.

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.

4.2 Fire Models

Section 1.6.18 of NFPA 805 defines a fire model as the “mathematical prediction of fire growth, environmental conditions, and potential effects on structures, systems, or components based on the conservation equations or empirical data.” Section 2.4.1.2.1 of NFPA 805 requires that only fire models acceptable to the AHJ (NRC) be used in fire modeling calculations. Further, Sections 2.4.1.2.2 and 2.4.1.2.3 of NFPA 805 require that the fire models shall be applied within their limitations and shall be verified and validated (V&V’d)..

Licensees are required to document that the fire models and methods used meet NRC requirements. Licensees shall also document that the models and methods used in performance-based analyses are used within their limitations and with the rigor required by the nature and scope of the analyses. These analyses may use simple hand calculations 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 discussions that are useful in determining which fire models to use and applying those fire models within their limitations; however, the NRC only endorses the fire models, methodologies, data, and examples in those appendices to the extent that they have been (or can be) adequately V&V’d, or to the extent that they are appropriate for the specific application.

The NRC’s Office of Nuclear Regulatory Research (RES) and the Electric Power Research Institute (EPRI) have documented the V&V for parts of five fire models in draft NUREG-1824/EPRI 1011999, “Verification and Validation of Selected Fire Models for Nuclear Power Plant Applications.” The specific fire models documented are (1) NUREG-1805, “Fire Dynamics Tools (FDTs),” (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).

Licensees may propose the use of fire models that have not been specifically V&V'd by the NRC; however, licensees are responsible for providing acceptable V&V of these fire models. The V&V documents for licensee-proposed fire models are subject to NRC review and approval under the provisions of 10 CFR 50.48(c)(4).

4.3 Fire Probabilistic Safety Assessment/Risk Analysis

Section 2.4.3.3 of NFPA 805 requires that the PSA approach, methods, and data must be acceptable to the AHJ. This regulatory position provides guidance with respect to acceptability of the approaches, methods and data used for the PSA approach. Additional guidance for the PSA approach is provided by NEI 04-02, including Sections 5.1.3, 5.3.4, J.4, and J.5.

Licensees should justify that the methods that the NRC finds acceptable for use in meeting NFPA 805 requirements are appropriate for each specific application. These analyses may use screening methods or more complex quantitative PSA methods, depending on the specific conditions of the scenario being evaluated.

When licensees choose to rely on information in an internal events-based PSA 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 in Section 2.4.2 of NFPA 805. Based on the review, the licensee should modify its internal events-based PSA model, as necessary, to meet applicable NFPA 805 requirements.

Where licensees choose to rely on past fire protection PSAs [e.g., individual plant examination of external events (IPEEE) for fires], the licensees should review these past analyses to determine their continued applicability and adequacy (e.g., inputs, assumptions, data) to meet the NFPA 805 requirements. Licensees should 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. Some detailed fire PSAs 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 detection or suppression in order to avoid any nonconservative double-counting.

RES and EPRI have documented fire PSA methods, tools, and data to support risk assessments in NUREG/CR-6850/EPRI 1011989, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," which discusses methods to perform fire risk analyses. Additional guidance on PSA quality is provided in Regulatory Guide 1.174 and Regulatory Guide 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," dated February 2004 (for trial use). The American Nuclear Society (ANS) plans to issue a standard for evaluating the technical adequacy of each plant's fire risk assessment for regulatory applications. The ANS standard is intended to provide the necessary information for determining the technical adequacy of the licensee's fire risk analyses for regulatory applications.

The fire PSAs developed by the licensees that participate in the NFPA 805 Pilot Program will be reviewed by the NRC over the course of the program, such that a separate peer review of the fire PSA will not be required. Plants that do not participate in the Pilot Program should subject their fire PSA to a peer review to the extent that adequate industry guidance is available in a timely manner to support the transition process. The industry guidance will be reviewed and accepted by the NRC prior to its application to specific fire PSAs.

The NRC will also review the results of the plant-specific peer reviews. A peer review should be conducted for all types and levels of fire PSAs, including pre-NUREG/CR- 6850-based fire PSAs, fire IPEEEs, and enhanced internal events PSAs. (In the event that adequate industry guidance is not available for conducting a fire PSA peer review, the NRC will review the fire PSA for acceptability.)

The licensee should submit the documented high-level findings from the fire PSA peer review with the 10 CFR 50.48(c) license amendment request, including the resolution (or proposed resolution) of potentially risk-significant findings. Actions required as a result of the review may be completed later, but a schedule for completion should be provided prior to license amendment request approval. Incomplete actions that could have a nonconservative effect on the outcome of a plant change evaluation, should be completed before the licensee's fire PSA is applied to the evaluation of the plant change.

The licensee is required to maintain the quality of the fire PSA in accordance with the resolution commitments in the approved license amendment request, ensuring that updates to this fire PSA (e.g., updates to incorporate post-transition plant changes) conform to the quality of the approved fire PSA. One acceptable means to maintain fire PSA quality is by periodically (e.g., no less frequent than the periodic review for the full plant PSA) performing a reduced-scope peer review, analogous to what was performed for the license amendment request. The results of these periodic licensee peer reviews should be made available to NRC inspectors for their review.

D. IMPLEMENTATION

The purpose of this section is to provide information to licensees regarding the NRC staff's plans for using this regulatory guide. No backfitting is intended or approved in connection with the issuance of this 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), as presented in (1) submittals in connection with applications for construction permits, standard plant design certifications, operating licenses, early site permits, and combined licenses; and (2) submittals from operating reactor licensees who voluntarily propose to initiate system modifications that have a clear nexus with the subject for which guidance is provided herein.

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 that 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, because it provides a voluntary alternative to the existing fire protection requirements in 10 CFR 50.48. This regulatory guide also does not involve a backfit because it does not impose requirements on licensees, and does not contain changed positions on compliance with 10 CFR 50.48(c).

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NEI 04-02, “Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c),” Revision 1, Nuclear Energy Institute, Washington, DC, September 2005, available electronically through the NRC’s Agencywide Documents Access and Management System (ADAMS), <http://www.nrc.gov/reading-rm/adams.html>, under Accession #ML052590476.

NFPA 805, “Performance-Based Standard for Fire Protection for Light-Water Reactor Electric Generating Plants,” 2001 Edition, National Fire Protection Association, Quincy, MA.⁴

² Copies may be purchased from the Electric Power Research Institute (EPRI), 3420 Hillview Ave., Palo Alto, CA 94304; telephone (800) 313-3774; fax (925) 609-1310.

³ Copies may be purchased from Electricité de France (EDF), 22-30 Avenue de Wagram, 75382, Paris Cedex 8, France.

⁴ Copies may be purchased from the National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA [phone: (800) 344-3555; fax: (800) 593-NFPA (6372)]. Purchase information is available through the NFPA’s Web-based store at <http://www.nfpa.org/catalog/product.asp?category%5Fname=&pid=80501&target%5Fpid=80501&src%5Fpid=&link%5Ftype=search>.

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Regulatory Guide 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis,” Revision 1, U.S. Nuclear Regulatory Commission, Washington, DC, November 2002.

⁵ All NUREG-series reports listed herein were published by the U.S. Nuclear Regulatory Commission, and are available electronically through the Public Electronic Reading Room on the NRC’s public Web site, at <http://www.nrc.gov/reading-rm/doc-collections/nuregs/>. Copies are also available for inspection or copying for a fee from the NRC’s Public Document Room at 11555 Rockville Pike, Rockville, MD; the PDR’s mailing address is USNRC PDR, Washington, DC 20555; telephone (301) 415-4737 or (800) 397-4209; fax (301) 415-3548; email PDR@nrc.gov. In addition, copies are available at current rates from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20402-9328, telephone (202) 512-1800; or from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161, <http://www.ntis.gov>, telephone (703) 487-4650.

⁶ All regulatory guides listed herein were published by the U.S. Nuclear Regulatory Commission. Where an ADAMS accession number is identified, the specified regulatory guide is available electronically through the NRC’s Agencywide Documents Access and Management System (ADAMS) at <http://www.nrc.gov/reading-rm/adams.html>. All other regulatory guides are available electronically through the Public Electronic Reading Room on the NRC’s public Web site, at <http://www.nrc.gov/reading-rm/doc-collections/reg-guides/>. Single copies of regulatory guides may also be obtained free of charge by writing the Reproduction and Distribution Services Section, ADM, USNRC, Washington, DC 20555-0001, or by fax to (301)415-2289, or by email to DISTRIBUTION@nrc.gov. Active guides may also be purchased from the National Technical Information Service (NTIS) on a standing order basis. Details on this service may be obtained by contacting NTIS at 5285 Port Royal Road, Springfield, Virginia 22161, online at <http://www.ntis.gov>, or by telephone at (703) 487-4650. Copies are also available for inspection or copying for a fee from the NRC’s Public Document Room (PDR), which is located at 11555 Rockville Pike, Rockville, Maryland; the PDR’s mailing address is USNRC PDR, Washington, DC 20555-0001. The PDR can also be reached by telephone at (301) 415-4737 or (800) 397-4205, by fax at (301) 415-3548, and by email to PDR@nrc.gov.

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

⁷ All Commission papers (SECYs) listed herein were published by the U.S. Nuclear Regulatory Commission, and are available electronically through the Public Electronic Reading Room on the NRC’s public Web site, at <http://www.nrc.gov/reading-rm/doc-collections/commission/secys/>. Copies are also available for inspection or copying for a fee from the NRC’s Public Document Room at 11555 Rockville Pike, Rockville, MD; the PDR’s mailing address is USNRC PDR, Washington, DC 20555; telephone (301) 415-4737 or (800) 397-4209; fax (301) 415-3548; email PDR@nrc.gov.

⁸ All NRC regulations listed herein are available electronically through the Public Electronic Reading Room on the NRC’s public Web site, at <http://www.nrc.gov/reading-rm/doc-collections/cfr/>. Copies are also available for inspection or copying for a fee from the NRC’s Public Document Room at 11555 Rockville Pike, Rockville, MD; the PDR’s mailing address is USNRC PDR, Washington, DC 20555; telephone (301) 415-4737 or (800) 397-4209; fax (301) 415-3548; email PDR@nrc.gov.

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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.

⁹ All *Federal Register* notices listed herein were issued by the U.S. Nuclear Regulatory Commission, and are available electronically through the Federal Register Main Page of the public GPOAccess Web site, which the U.S. Government Printing Office maintains at <http://www.gpoaccess.gov/fr/index.html>. Copies are also available for inspection or copying for a fee from the NRC’s Public Document Room at 11555 Rockville Pike, Rockville, MD; the PDR’s mailing address is USNRC PDR, Washington, DC 20555; telephone (301) 415-4737 or (800) 397-4209; fax (301) 415-3548; email PDR@nrc.gov.